JAGUAR

MARK 2 MODELS

2·4, 3·4 AND 3·8 LITRE

SERVICE MANUAL

(Fourth Edition)

Jaguar Cars Limited reserve the right to make changes in design, or to make additions to or improvements upon their products without incurring any obligation to install the same on vehicles previously built.

SUPPLEMENTARY INFORMATION

Any changes which have taken place since the introduction of the Mark 2 Models are covered in supplementary information sheets included at the end of each section. These sheets bear the letter "s" in the page number and have their own numbering sequence. Chassis and engine numbers at which such changes were introduced are also quoted and mention in the text of "early cars" refers to those bearing chassis or engine numbers prior to the numbers quoted in the supplementary sheets.

ISSUED BY

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SECTION A

GENERAL INFORMATION

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

Note: All references in this Manual to "right-hand side" and "left-hand side" are made assuming the person to be looking from the rear of the car or unit.

INDEX

GENERAL INFORMATION

CAR IDENTIFICATION

It is imperative that the Car and Engine numbers, together with any prefix or suffix letters, are quoted in any correspondence concerning this vehicle. If the unit in question is the Gearbox or Overdrive the Gearbox number and any prefix or suffix letters must also be quoted. This also applies when ordering spare parts.

Car Number .. ..

Stamped in the bonnet catch channel, forward of the radiator header tank.
Suffix ' DN ' to the car number indicates that an overdrive unit is fitted.
Suffix ' BW ' to the car number indicates that automatic transmission is fitted.

Engine Number .. ..

Stamped on the right-hand side of the cylinder block above the oil filter and at the front of the cylinder head casting.
7, 8 *or* 9 *following the engine number denotes the compression ratio.*

Gearbox Number .. ..

Stamped on a shoulder at the left-hand rear corner of the gearbox casing and on the top cover.
Letter ' N ' at the end of the prefix letters indicates that an overdrive unit is fitted.

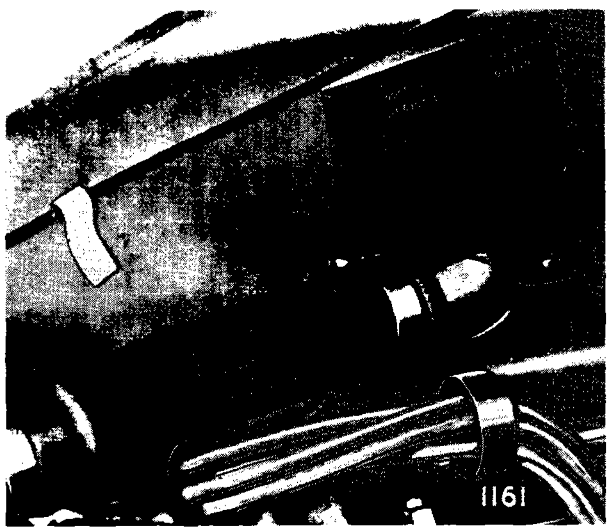


Fig. 1. The identification numbers are also stamped on a plate situated in the engine compartment (2.4 litre illustrated).

Body Number .. ..

Stamped on a plate attached to the right-hand side of the scuttle.

Key Numbers **(i)** .. .. **(ii)** .. ..

Two different types of key are provided to enable the car to be left with the luggage boot and cubby locker locked, on the occasions when it is required to leave the ignition key with the car.
(a) The round headed key operates the ignition switch and door locks.
(b) The rectangular headed key operates the locks for the luggage boot lid and the cubby locker.

GENERAL DATA

DIMENSIONS AND WEIGHTS

Wheel base			8′ 11$\frac{3}{8}$″ (2.727 m.)
Track	Front		Rear
	4′ 7″ (1.397 m.)	disc wheels	4′ 5$\frac{3}{4}$″ (1.365 m.)
	4′ 7$\frac{1}{2}$″ (1.410 m.)	wire wheels	4′ 6$\frac{1}{8}$″ (1.374 m.)
Length (overall)			15′ 0$\frac{3}{4}$″ (4.591 m.)
Width			5′ 6$\frac{3}{4}$″ (1.695 m.)
Height			4′ 9$\frac{1}{2}$″ (1.460 m.)
Weights (dry) approximate			2.4 litre—26$\frac{1}{2}$ cwts. (1346 kg.)
			3.4—3.8 litre—27$\frac{1}{2}$ cwts. (1397 kg.)
Turning circle			33′ 6″ (10.21 m.)
Ground clearance			7″ (17.8 cm.)

CAPACITIES

		Imperial	U.S.	Litres
Engine (refill)		11 pints	13$\frac{1}{4}$ pints	6$\frac{1}{4}$
Engine (total)		13 „	15$\frac{1}{2}$ „	7$\frac{1}{2}$
Gearbox (without overdrive)		2$\frac{1}{2}$ „	3 „	1$\frac{1}{2}$
Gearbox (with overdrive)		4 „	4$\frac{3}{4}$ „	2$\frac{1}{4}$
Automatic transmission unit		15 „	18 „	8$\frac{1}{2}$
Rear axle	2.4 litre (early cars)	2$\frac{1}{4}$ „	2$\frac{3}{4}$ „	1.3
	2.4 (later cars)—3.4 and 3.8 litre	2$\frac{3}{4}$ „	3$\frac{1}{4}$ „	1.6
Cooling system (including heater)	2.4 litre	20 „	24 „	11$\frac{1}{4}$
	3.4/3.8 litre	22 „	26$\frac{1}{2}$ „	12$\frac{1}{2}$
Petrol tank		12 galls.	14$\frac{1}{2}$ galls.	54$\frac{1}{2}$

TIGHTENING TORQUES

Engine :	
Connecting rod bolts	37 lb. ft. (450 lb. ins.) (5.1 kg.m.)
Main bearing bolts	83 lb. ft. (1000 lb. ins.) (11.5 kg.m.)
Cylinder head nuts	54 lb. ft. (650 lb. ins.) (7.5 kg.m.)
Camshaft bearing cap nuts	15 lb. ft. (175 lb. ins.) (2.0 kg.m.)
Flywheel	67 lb. ft. (800 lb. ins.) (9.2 kg.m.)
Rear axle :	
Drive gear bolts—$\frac{3}{8}$″ (9.5 mm.) dia. bolts	50—60 lb. ft. (600—720 lb. ins.) (6.7—8.0 kg.m.)
$\frac{7}{16}$″ (11.1 mm.) dia. bolts	70—80 lb. ft. (840—960 lb. ins.) (9.3—10.6 kg.m.)
Differential bearing cap bolts	60—65 lb. ft. (720—780 lb. ins.) (8.0—8.7 kg.m.)
Pinion nut	120—130 lb. ft (1440—1560 lb. ins.) (16.0—17.3 kg.m.)
Thornton " Powr-Lok " differential bolts	35—45 lb. ft. (420—540 lb. ins.) (4.6—6.0 kg.m.)

PERFORMANCE DATA

The following tables give the relationship between engine revolutions per minute and road speed in miles and kilometres per hour for top gear.

It is recommended that engine revolutions **in excess of 5,500 per minute (2.4 litre) and 5,000 per minute** (3.4/3.8 **litre**) should not be exceeded for long periods.

Therefore, if travelling at sustained high speed on motorways, the accelerator should be released occasionally to allow the car to overrun for a few seconds.

Note: The figures in the following tables are theoretical and make no allowance for changes in tyre radius due to the effect of centrifugal force.

2·4 LITRE

AXLE RATIO 4.27 : 1

(Ratio for cars fitted with standard all synchromesh gearbox).

ROAD SPEED		ENGINE REVOLUTIONS PER MINUTE			
Kilometres per hour	Miles per hour	First Gear 12.98	Second Gear 8.42	Third Gear 5.67	Top Gear 4.27
16	10	1709	1108	746	562
32	20	3418	2217	1492	1124
48	30	5127	3326	2240	1687
64	40		4429	2982	2245
80	50		5515	3712	2797
96	60			4445	3348
112	70			5160	3886
128	80				4424
144	90				4957
160	100				5478

2·4 LITRE

AXLE RATIO 4.55 : 1

(Ratio for cars fitted with an overdrive
and all synchromesh gearbox).

ROAD SPEED		ENGINE REVOLUTIONS PER MINUTE				
Kilometres per hour	Miles per hour	First Gear 13.83	Second Gear 8.98	Third Gear 6.04	Top Gear 4.55	Overdrive 3.54
16	10	1821	1182	795	600	466
32	20	3642	2364	1590	1200	932
48	30		3547	2386	1797	1398
64	40		4723	3177	2393	1862
80	50			3956	2980	2319
96	60			4785	3567	2775
112	70			5496	4140	3221
128	80				4714	3667
144	90				5282	4110
160	100					4542

3·4/3·8 LITRE

AXLE RATIO 3.54 : 1

(Ratio for cars fitted with standard all synchromesh gearbox)

ROAD SPEED		ENGINE REVOLUTIONS PER MINUTE			
Kilometres per hour	Miles per hour	First Gear 10.76	Second Gear 6.98	Third Gear 4.7	Top Gear 3.54
16	10	1416	919	619	466
32	20	2833	1838	1238	932
48	30	4250	2757	1857	1398
64	40	5660	3671	2472	1862
80	50		4572	3078	2319
96	60		5472	3685	2775
112	70			4277	3221
128	80			4869	3667
144	90			5457	4110
160	100				4542
176	110				4963
192	120				5380

3·4/3·8 LITRE

AXLE RATIO 3.77 : 1

(Ratio for cars fitted with an overdrive and all synchromesh gearbox)

ROAD SPEED		ENGINE REVOLUTIONS PER MINUTE				
Kilometres per hour	Miles per hour	First Gear 11.46	Second Gear 7.44	Third Gear 5.0	Top Gear 3.77	Overdrive 2.933
16	10	1509	980	658	496	386
32	20	3018	1960	1316	992	772
48	30	4527	2939	1975	1489	1159
64	40		3913	2630	1983	1543
80	50		4873	3275	2469	1921
96	60		5833	3920	2956	2300
112	70			4550	3430	2670
128	80			5180	3906	3038
144	90			5805	4377	3405
160	100				4837	3763
176	110				5285	4113
192	120				5730	4458

OPERATING INSTRUCTIONS

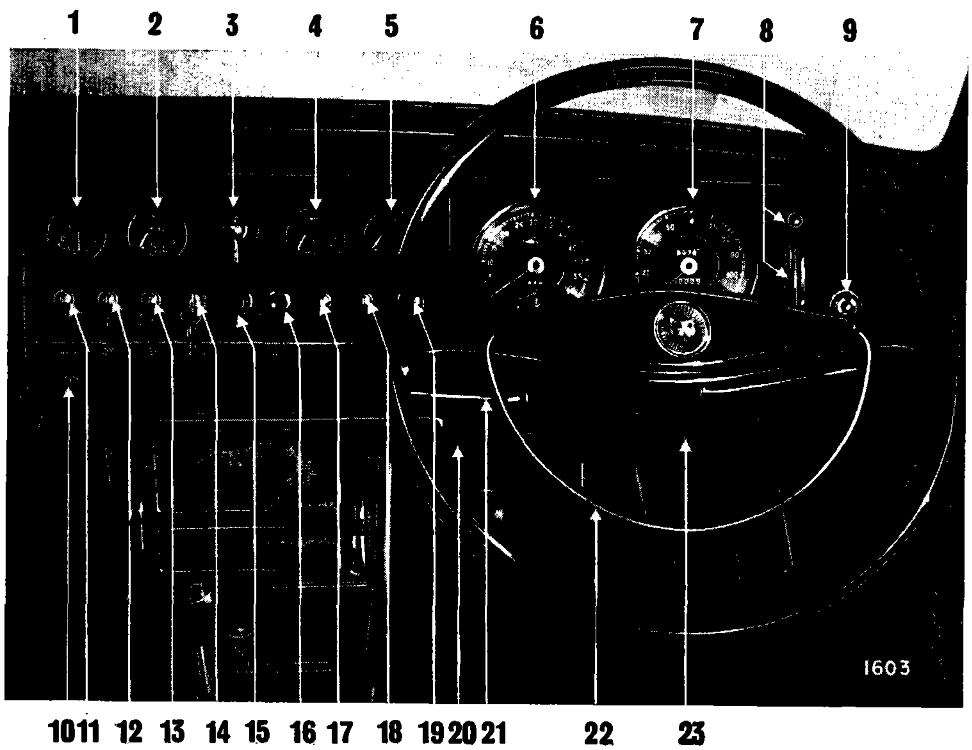


Fig. 2. Instruments and Controls—Right-hand drive.

1. Ammeter
2. Fuel Gauge.
3. Lighting switch.
4. Oil pressure gauge.
5. Water temperature gauge.
6. Revolution counter.
7. Speedometer.
8. Mixture control. (2.4 litre only)
9. Brake fluid level/Handbrake warning light
10. Scuttle ventilator control.
11. Interior light switch.
12. Panel light switch.
13. Heater fan switch.
14. Ignition switch.
15. Cigar lighter.
16. Starter switch.
17. Map light switch.
18. Windscreen wiper switch.
19. Windscreen washer switch.
20. Clock adjuster.
21. Flashing direction indicator and headlamp flashing switch.
22. Horn switch.
23. Speedometer trip control.

INSTRUMENTS

Ammeter

Records the flow of current into or out of the battery. Since compensated voltage control is incorporated, the flow of current is adjusted to the state of charge of the battery ; thus when the battery is fully charged the dynamo provides only a small output and therefore little charge is registered on the ammeter, whereas when the battery is low a continuous high charge is shown.

Oil Pressure Gauge

The electrically operated pressure gauge records the oil pressure being delivered by the oil pump to the engine ; it does not record the quantity of oil in the sump. The minimum pressure at 3,000 R.P.M. when hot should not be less than 40 lb per square inch.

Note : After switching on, a period of approximately 20 seconds will elapse before the correct reading is obtained.

Water Temperature Gauge

The electrically operated water temperature gauge records the temperature of the coolant by means of a bulb screwed into the inlet manifold water jacket.

Fuel Level Gauge

Records the quantity of fuel in the supply tank. Readings will only be obtained when the ignition is switched on. An amber warning light situated in the speedometer lights up intermittently when the petrol level in the tank becomes low. When the petrol is almost exhausted the warning light operates continuously.

Note : After switching on, a period of approximately 20 seconds will elapse before the correct reading is obtained.

Electric Clock

The clock is built in the revolution counter instrument and is powered by the battery. The clock hands may be adjusted by pushing up the winder and rotating. Starting is accomplished in the same manner.

Revolution Counter

Records the speed of the engine in revolutions per minute.

Speedometer

Records the vehicle speed in miles per hour, total mileage and trip mileage (kilometres on certain export models). The trip figures can be set to zero by pushing the winder upwards and rotating anti-clockwise.

Headlamp Warning Light

A red warning light marked " Headlamps " situated in the speedometer, lights up when the headlamps are in full beam position and is automatically extinguished when the lamps are in the dipped beam position.

Ignition Warning Light

A red warning light marked " Ign " situated in the speedometer, lights up when the ignition is switched 'on' and the engine is not running, or when the engine is running at a speed insufficient to charge the battery. The latter condition is not harmful, but always switch 'off' when the engine is not running.

Fuel Level Warning Light

An amber warning light (marked " FUEL ") situated in the speedometer lights up intermittently when the fuel level in the tank becomes low. When the fuel is almost exhausted the warning light operates continuously.

Flashing Direction Indicator—Warning Lights

The warning lights are in the form of green arrows one at each side of the quadrant situated behind the steering wheel. When the flashing indicators are in operation one of the arrows lights up on the side selected.

Mixture Control Warning Light (2.4 litre)

A red light situated above the mixture control lights up when the starting device is in operation. The mixture control lever should be returned to the off (Run) position as soon as possible, when the warning light will be automatically extinguished.

Brake Fluid Level and Handbrake Warning Light

A warning light (marked " Brake Fluid—Handbrake ") situated on the facia panel behind the steering wheel, serves to indicate if the level in the brake fluid reservoir has become low, provided the ignition is switched on. As the warning light is also illuminated when the handbrake is applied, the handbrake must be fully released before it is assumed that the fluid level is low. If with the ignition " on " and, the handbrake fully released the warning light is illuminated the brake fluid must be " topped up " immediately.

As the warning light is illuminated when the handbrake is applied and the ignition is " ON " a two-fold purpose is served. Firstly, to avoid the possibility of driving away with the handbrake applied. Secondly, as a check that the warning light bulb has not " blown ". When starting up the car with the handbrake fully applied, if the warning light does not become illuminated, the bulb should be changed immediately.

CONTROLS AND ACCESSORIES

Accelerator Pedal

Controls the speed of the engine.

Brake Pedal

Operates the vacuum assisted disc brakes on all four wheels.

Clutch Pedal

On standard and overdrive transmission cars connects and disconnects the engine and transmission. Never drive with the foot resting on the pedal and do not keep the pedal depressed for long periods in traffic. Never coast the car with the gear engaged and clutch pedal depressed.

Headlamp Dipper

Situated on the toe boards to the left of the clutch pedal. The switch is of the change over type and if the headlamps are in the full beam position a single pressure on the control will switch the lamps to the dipped beam position and they will remain so until another single pressure switches them to the full beam position again.

Gear Lever

Centrally situated and with gear positions indicated on the control knob. To engage reverse gear, first press the gear lever against the spring pressure before pushing the lever forward or pulling the lever back (in the case of 4-speed synchro gearbox). Always engage neutral and release the clutch when the car is at rest.

Handbrake Lever

Positioned at the outside of the driver's seat. The handbrake operates mechanically on the rear wheels only and is provided for parking, driving away on a hill and when at a standstill in traffic. To apply the brake, pull the lever upward and the trigger will automatically engage with the ratchet. The handbrake is released by pressing in the knob and pushing the lever downward.

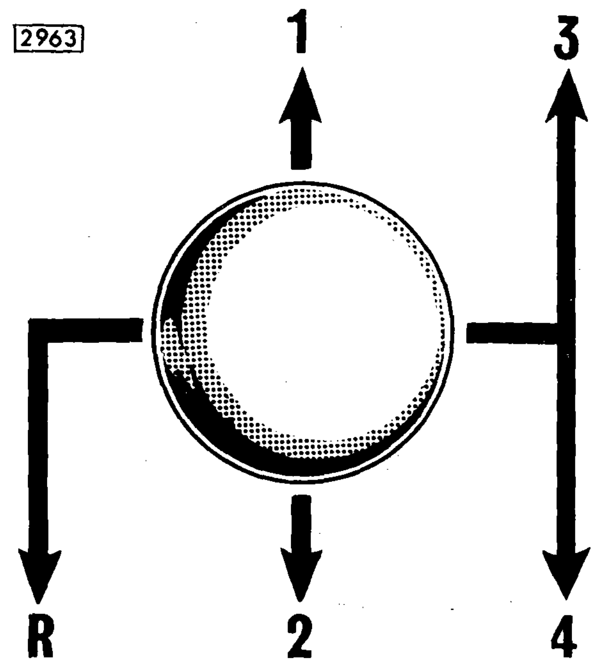


Fig. 3. Gear positions (all synchromesh gearbox).

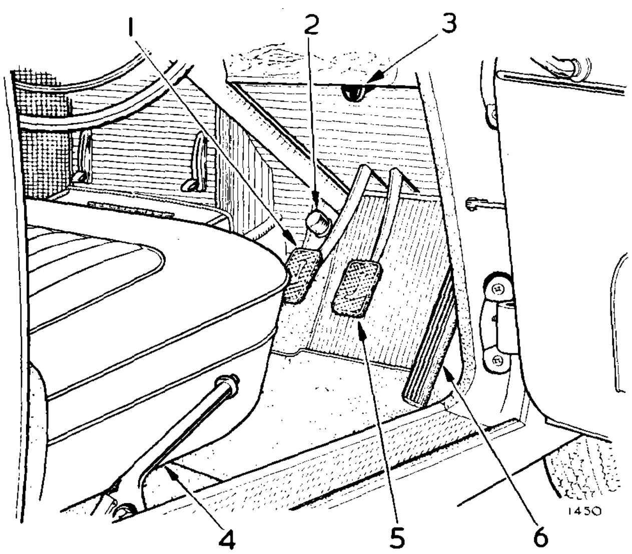


Fig. 4. Foot and hand controls.

1. Clutch pedal.
2. Headlamp dipper.
3. Bonnet lock control.
4. Handbrake.
5. Brake pedal.
6. Accelerator pedal.

Seat Adjustment

Both front seats are adjustable for reach. Push the lock bar, situated beside the inside runner, towards the inside of the car and slide into the required position. Release the lock bar and slide until the mechanism engages with a click.

Steering Wheel Adjustment

Rotate the knurled ring at the base of the steering wheel hub in an anti-clockwise direction when the steering wheel may be slid into the desired position. Turn the knurled ring clockwise to lock the steering wheel.

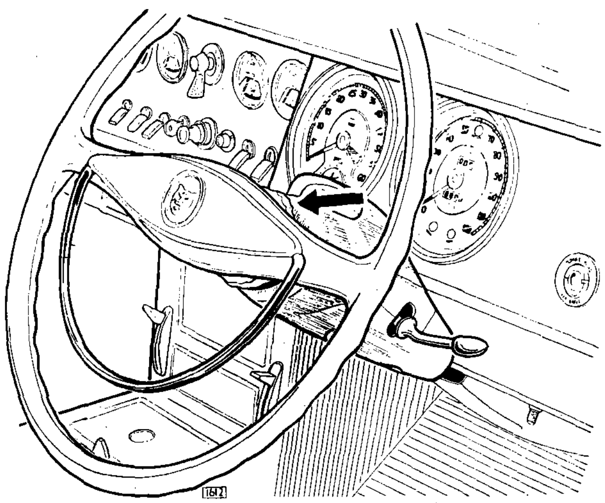


Fig. 5. Steering wheel adjustment.

Front Door Locks

The front doors may be opened from the outside by pressing the button incorporated in the door handle. The doors are opened from the inside by pulling the interior handles rearward.

Both front doors can be locked from the inside by pushing the interior handles forward and allowing them to return to their original position ; this feature only applies if the doors are fully closed before operating the interior handles.

Both front doors can be locked from the outside by means of the ignition key ; the locks are incorporated in the push buttons of the door handles.

To lock the right-hand door insert the key in the lock, rotate anti-clockwise as far as possible and allow the lock to return to its original position—the door is now locked. To unlock the right-hand door turn key clockwise as far as possible and allow the lock to return to its original position.

To lock the left-hand door rotate key clockwise ; to unlock, rotate key anti-clockwise.

KEYLESS LOCKING is obtainable by first pushing the interior door handle fully forward and allowing it to return to its original position. If the door is now closed from the outside with the push button of the handle **fully depressed** the door will become locked.

Warning.—If the doors are to be locked by this method the ignition key should be removed beforehand (or the spare key kept on the driver's person) as the only means of unlocking the front doors is with this key.

Rear Door Locks

The rear doors may be opened from the outside by pressing the button incorporated in the door handle. The doors are opened from the inside by pushing the interior door handle forward.

The rear doors are locked by pulling the interior door handles rearward.

Horn Switch

Depress the semi-circular ring attached to the steering wheel to operate the twin horns.

Ignition Switch

Inserting the key provided in the switch and turning clockwise will switch on the ignition.

Never leave the ignition on when the engine has stopped, a reminder of such circumstances is provided by the ignition warning light situated in the speedometer.

Interior Light Switch

Lift the switch lever (marked "Interior") to illuminate the car interior. To provide ease of entry into the car at night, the interior lights are automatically switched on when any one of the doors is opened, and are extinguished when the door is closed.

Lighting Switch

From "Off" can be rotated clockwise into three positions, giving in the first location, side and tail, in the second location, head, side and tail, and in the third position, fog, side and tail lamps.

(Fog lamps are not fitted on cars for U.S.A.).

Panel Light Switch

Lift the switch lever (marked "Panel") to enable the instruments to be read at night and to provide illumination of the switch markings. The switch has two positions "DIM" and "BRIGHT" to suit driver's requirements. The panel lights will only operate when the side lights are switched on.

Starter Switch

Press the button (marked " Starter ") with the ignition switched on to start the engine. Release the switch immediately the engine fires and never operate the starter when the engine is running.

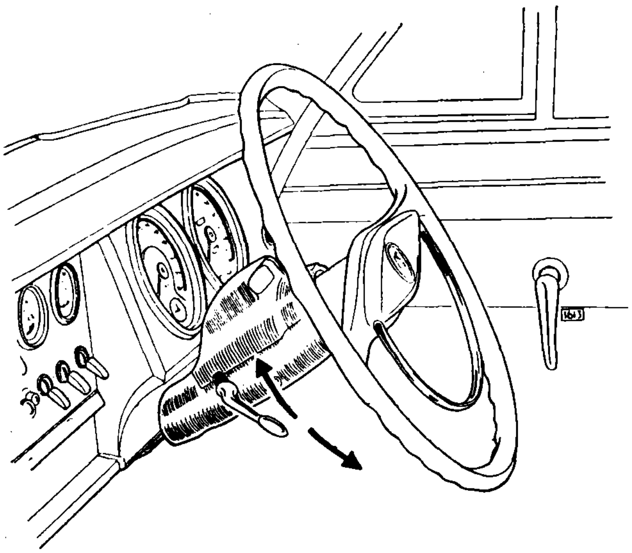


Fig. 6. Flashing direction indicator control (on early cars control was on opposite side of steering column).

Flashing Direction Indicators

The flashers are operated by a lever behind the steering wheel. To operate the flashing direction indicators on the right-hand side of the car move the lever clockwise ; to operate the left-hand side indicators move the lever anti-clockwise. While the flashing indicators are in operation one of the warning lights in the quadrant behind the steering wheel lights up on the side selected.

Headlamp Flashers

To flash the headlamps as a warning signal, lift and release the flashing indicator lever in quick succession. The headlamps can be flashed when the lights are " OFF " or when they are in the dipped beam position ; they will not " flash " in the main beam position.

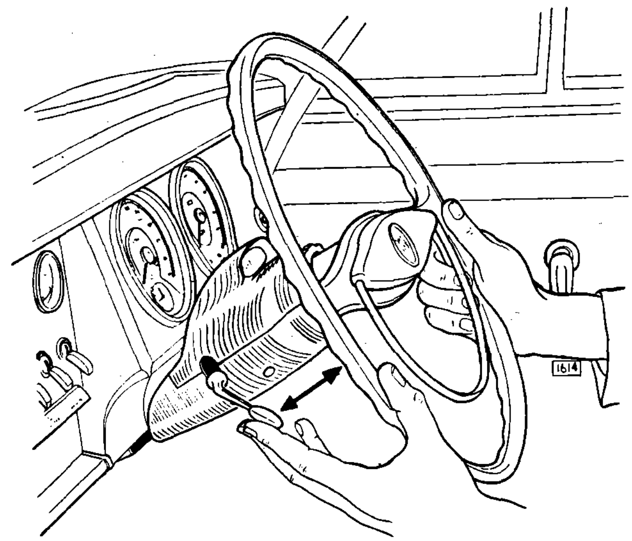


Fig 7. Method of " flashing " the headlamps (on early cars lever was on opposite side of steering column)

Map Light

Lift the switch (marked " Map ") to illuminate the lamp situated above the instrument panel ; the light will only operate when the side lights are switched " ON ".

Glove Box Light

A lamp in the glove box is automatically illuminated when the lid is opened and the side lamps are "ON ".

Braking Lights

Twin combined tail and brake lights are situated at the rear of the car. The latter automatically lights up when the footbrake is applied.

Reversing Light

The reversing light is automatically brought into operation when reverse gear is engaged and the ignition is switched on.

Luggage Compartment Illumination

The luggage compartment is automatically illuminated by a lamp when the lid is opened. The lamp operates only when the side lights are switched on.

Cigar Lighter

To operate, press holder (marked " Cigar ") into the socket and remove the hand. On reaching the required temperature, the holder will return to the extended position. Do not hold lighter in the ' pressed in ' position.

Windscreen Wipers

The wipers are controlled by a three position switch (marked " Wiper "). Lift the switch to the second position (Slow) which is recommended for all normal adverse weather conditions and snow.

For conditions of heavy rain and for fast driving in rain lift the switch to the third position (fast). This position should not be used in heavy snow or with a drying windscreen, that is, when the load on the motor is in excess of normal ; the motor incorporates a protective cut-out switch which under conditions of excessive load cuts off the current supply until normal conditions are restored. When the switch is placed in the "OFF" position the wipers will automatically return to a " Park " position along the lower edge of the windscreen.

Windscreen Washer

The windscreen washer is electrically operated and should be used in conjunction with the windscreen wipers to remove foreign matter that settles on the windscreen.

Lift the switch lever (marked " Washer ") and release immediately when the washer should operate immediately; release the switch when sufficient water has been delivered to the windscreen.

Car Heating Fan Control

The car heating and ventilating system consists of a heating element and a 2-speed electrically driven fan.

Fresh air is introduced into the system by opening the scuttle ventilator and switching on the fan. Air from the interior can be re-circulated by closing the scuttle ventilator and switching on the fan.

To open the scuttle ventilator pull the lever (marked " Vent ") situated in the parcel shelf below the instrument panel rearward.

Operation of the fan is required mainly when the car is stationary or running at a slow speed. At higher road speeds it will be found possible to dispense with the fan as air will be forced through the system due to the passage of the car through the air.

To switch on the heater fan lift the switch lever (marked " Fan ") to the second position for " slow " speed and to the third position for maximum speed whichever is required.

Car Heating Temperature Control

The temperature control (marked " Hot-Cold ") situated below the instrument panel operates a valve which controls the flow of air through the heater. With the control placed in the " Cold " position the supply of air from the heating element is completely cut off so that cold air can be admitted for ventilating the car in hot weather.

Placed in the hot position the maximum amount of air passes through the heating element. By placing the control in the intermediate position varying degrees of heat may be obtained.

Car Heating Distribution Control

The distribution control (marked " Car-Screen ") situated below the instrument panel controls the proportion of air directed to the windscreen or the car interior. Placed in the fully upward position the maximum amount of air will be admitted into the car interior. Placed in the fully downward position the maximum amount of air is directed to the windscreen for demisting or defrosting. By placing the control in intermediate positions, varying proportions of air can be directed into the car interior and to the windscreen.

Bonnet Lock Control

The bonnet lock is controlled from the driving compartment. To open the bonnet pull the control knob, situated under the facia on the right-hand side. This will release the bonnet which will now be retained by the safety catch. Insert the fingers under the nose of the bonnet and lift the safety catch upwards when the bonnet may be raised. The bonnet is automatically retained in the fully open position by the action of the hinge springs. The bonnet is self-locking when pushed down firmly into the closed position.

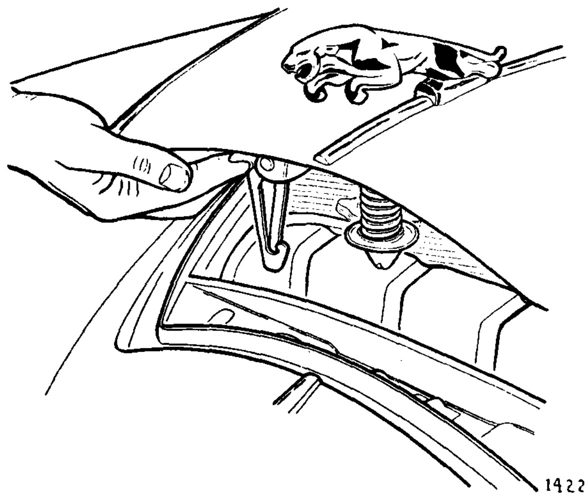


Fig. 8. Bonnet safety catch.

Fuel Tank Filler

The fuel tank filler is situated in a recess in the left-hand rear wing, and is provided with a hinged cover.

No-Draught Ventilation

No-draught ventilator windows incorporating quick locking catches are fitted to the front windows.

To open the window, release the locking catch and set the window to the desired position. The initial opening of the window gives extraction of air from the body, when the window is opened further, air is forced into the body due to the angle of the ventilator and forward motion of the car. Using the no-draught ventilator windows as extractors (that is partly open), has, to a minor degree, the effect of demisting the windscreen.

The rear doors are provided with ventilators to enable the air from the car interior to be extracted.

To open the ventilator pull the lever inwards until the desired position is obtained.

Spare Wheel and Jacking Equipment

The spare wheel is housed in a compartment underneath the luggage boot floor and is accessible after removal of the circular lid.

The wheel brace and jack are retained in clips at the front and top of the luggage compartment. The jack handle is stored in the tool container.

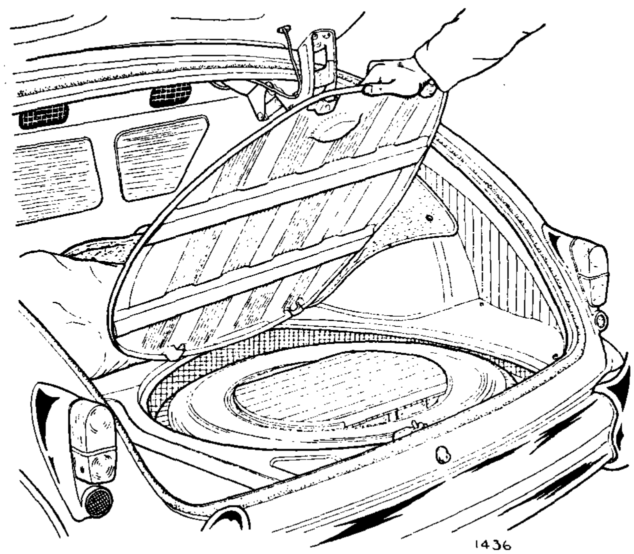


Fig. 9. The spare wheel is housed in a compartment underneath the luggage boot floor. The container for the hand tools and jack handle is also stored in this compartment.

Tools

The container for the hand tools and jack handle is housed in the spare wheel compartment. This compartment is accessible after removal of the circular lid which forms part of the luggage boot floor.

Luggage Compartment

The luggage compartment is unlocked by inserting the key in the lock immediately below the lid, and rotating clockwise through half a turn. Press the lock to release the catch when the lid can be raised ; the boot lid is automatically retained in the fully open position by the action of the hinge springs.

WHEEL CHANGING

(Disc Wheels)

Whenever possible, the wheel changing should be carried out with the car standing on level ground and in all cases with the handbrake fully applied.

The spare wheel is housed in a compartment underneath the luggage boot floor ; the wheel changing equipment is retained in clips attached to the front and top of the luggage compartment.

Unlock the luggage compartment by turning the key in the lock, situated immediately below the lid, through half a turn. Press the lock, when the lid will be released. Raise the lid as far as possible where it will be retained by the action of the hinge springs.

Lift out the circular lid which forms part of the luggage boot floor. Unscrew the spare wheel clamping handle and lift out the wheel. Remove the jack and wheel brace from the clips at the top of the luggage compartment, and the jack handle from the tool kit.

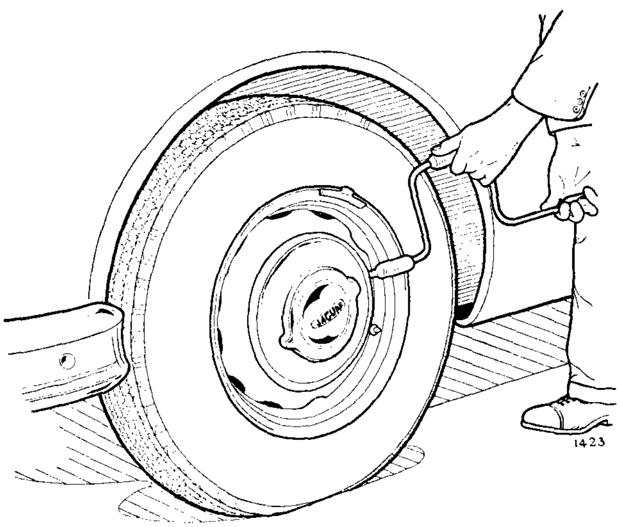


Fig. 10. Removal of the wheel nave plate. To avoid damaging the nave plate do not allow it to fall on to the ground.

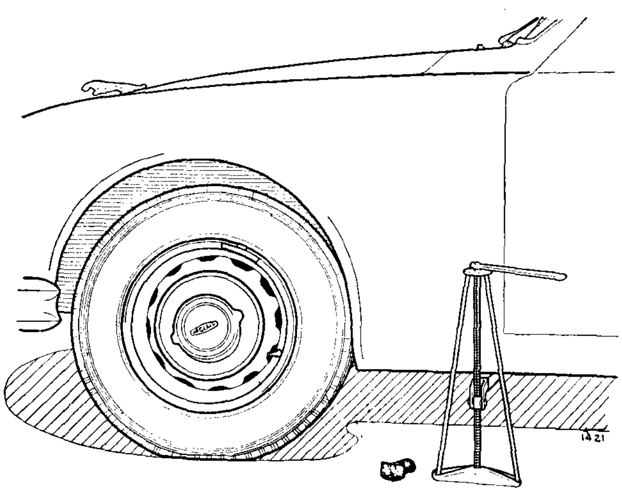


Fig 11. The jack in position for raising the left-hand front wheel.

Changing a Front Wheel

Remove the wheel nave plate by levering off with the blade end of the wheel brace. Using the wheel brace loosen, but do not remove, the five wheel nuts ; all wheel nuts have right-hand threads, that is, they are unscrewed anti-clockwise.

Remove the rubber plug from the front jacking socket on the side to be raised. Insert the square portion of the jack well home in socket and elevate the jack with the ratchet handle fitted side marked ' LIFT ' upwards, until the wheel is clear of the ground. Remove the wheel nuts and withdraw the road wheel.

Mount the spare wheel on the fixing studs and start all five nuts on the threads by rotating clockwise. Apply the wheel brace and run up all the nuts until they are tight. Lower the jack, using the jack ratchet handle side marked ' LOWER ' upwards, until the weight of the car is on the wheel and finally tighten all wheel nuts.

Fit the nave plate over two of the three mounting posts and secure by a sharp tap from the hand at a point in line with the third mounting post.

Changing a Rear Wheel

First remove the rear wheel valance as follows : Open the rear door and with the blade end of the wheel brace or a coin turn the two screws, which secure the front end of the valance, through half a turn in an anti-clockwise direction. Remove the valance by withdrawing downwards and forward.

Remove the wheel nave plate by levering off with the blade end of the wheel brace. Using the wheel brace, loosen, but do not remove, the five wheel nuts ; all wheel nuts have right-hand threads, that is, they are unscrewed anti-clockwise.

Remove the rubber plug from the rear jacking socket on the side to be raised. Insert the square portion of the jack well home in the socket and elevate the jack with the ratchet handle fitted side marked ' LIFT ' upwards, until the wheel is clear of the ground. Remove the wheel nuts and withdraw the road wheel.

Mount the spare wheel on the fixing studs and start all five nuts on the threads by rotating clockwise. Apply the wheel brace and run up all the nuts until they are tight. Lower the jack, using the jack ratchet handle side marked ' LOWER ' upwards, until the weight of the car is on the wheel and finally tighten all wheel nuts.

Fit the nave plate over two of the three mounting posts and secure by a sharp tap from the hand at a point in line with the third mounting post.

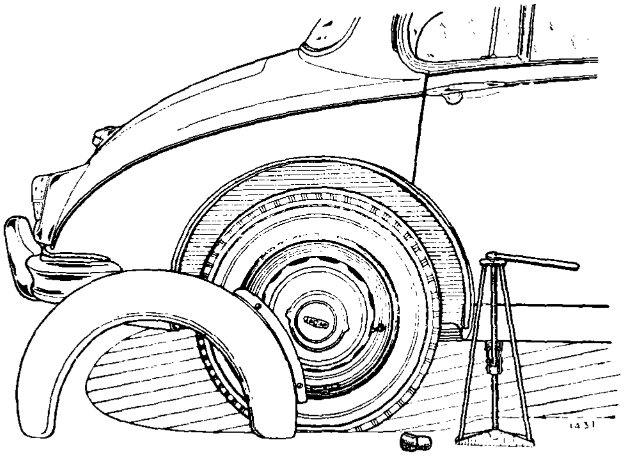


Fig. 12. The jack in position for raising the right-hand rear wheel.

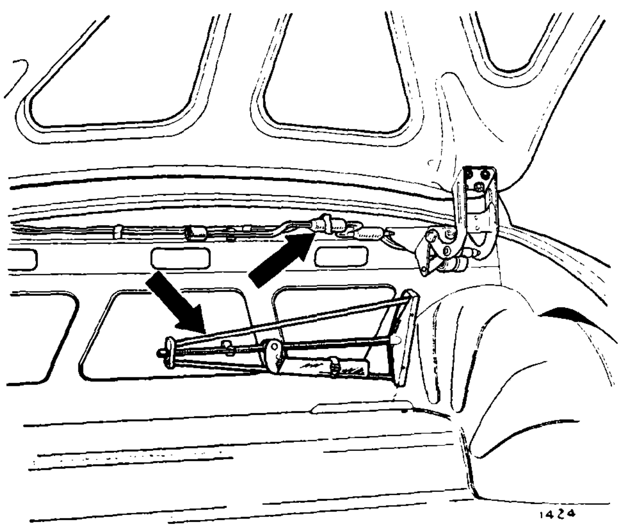


Fig. 13. The wheel brace and jack are retained in clips at the front of the luggage compartment. The jack handle is stored in the tool container.

Wire Spoke Wheels

Remove the copper and hide mallet from the tool kit. Using the mallet, slacken but do not remove the hub cap ; the hub caps are marked ' Right (off) side ' or ' Left (near) side ' and the direction of rotation to remove, that is, clockwise for the right-hand side and anti-clockwise for the left-hand side.

Remove the rubber plug from the front or rear jacking socket on the side to be raised. Insert the square portion of the jack well home in the socket and elevate the jack with the ratchet handle fitted side marked ' LIFT ' upwards, until the wheel is clear of the ground. Remove the hub cap and withdraw the road wheel.

Mount the spare wheel on the splined hub. Refit the hub and tighten as much as possible by rotating the hub cap in the required direction, that is, anti-clockwise for the right-hand side and clockwise for the left-hand side.

Lower the jack by using the ratchet handle with the side marked ' LOWER ' uppermost, until the weight of the car is on the wheels.

Finally, tighten the hub cap fully with the copper and hide mallet.

STARTING AND DRIVING

Prior to Starting

Before starting the engine the new owner should be familiar with the location and function of the instruments and controls.

Ensure that the water level in the radiator and the oil level in the sump are correct. Check for sufficient petrol in the tank.

Place the gear lever in the neutral position and check that the handbrake is applied.

2.4 LITRE

Starting from Cold

For starting from cold the mixture control (marked Start) should be moved up to the fully rich (Cold) position.

Switch on the ignition and press the starter switch button but **do not touch the accelerator.** Release the starter button as soon as the engine fires—this is important. If for any reason the engine does not start, do not operate the starter switch again until both the engine and starter motor have come to rest.

As soon as the engine speed increases slide the mixture control to the intermediate (Hot) position ; this position will be felt as a marked resistance in the slide.

Drive off at a moderate speed progressively moving the mixture control to the off (Run) position until the knob is at the bottom of the slide and the red warning light is extinguished.

Starting in Moderate Temperature

In warm weather or if the engine is not absolutely cold, it is usually possible to start the engine with the mixture control in the intermediate (Hot) position by adopting the procedure given above.

Starting when Hot

Do not use the mixture control. If the engine does not start immediately, slightly depress the accelerator pedal when making the next attempt.

Do NOT pump the accelerator pedal as owing to the action of an accelerating pump in the carburettor an excessively rich mixture will be admitted into the engine.

Difficult Starting (Engine Hot)

On extremely hot days or when the engine is stopped after a fast climb, occasional difficulty may be experienced in starting immediately.

This may be due to a temporary richness of mixture. On no account pump the accelerator, but slowly depress it to about one-third of its travel, maintaining this position until the engine fires.

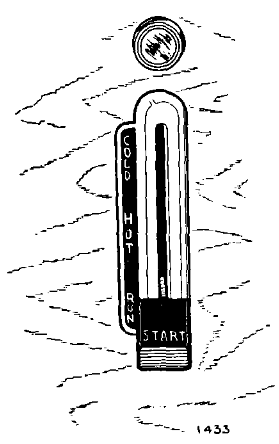


Fig. 14. Carburetter mixture control and warning light (2.4 litre model)

Use of the Mixture Control—Important

Use of the mixture control (marked ' Start ') brings into operation a starting device which provides the richer mixture necessary for starting. Do NOT permit the starting device to remain in operation longer than is necessary but return the control to the (Run) position as soon as the engine will allow. Unnecessary use of the mixture control will result in increased cylinder bore wear.

A reminder that the starting device is in operation is provided by a red warning light immediately above the mixture control slide. When the control is returned to the (Run) position the starting device is taken out of action and the warning light is extinguished.

3.4/3.8 LITRE

Starting from Cold

It is not necessary to use any manual choke control when starting from cold, since the auxiliary starting carburettor is entirely automatic and controls the mixture strength without assistance from the driver. The starting carburettor automatically cuts out when the temperature of the water in the cylinder head reaches 35°C.

When starting from cold do not depress the accelerator pedal until the engine has run for a few seconds.

Warming up

Do not operate the engine at a fast speed when first started but allow time for the engine to warm up and the oil to circulate. A thermostat is incorporated in the cooling system to assist rapid warming up. In very cold weather run the engine at 1,500 r.p.m. with the car stationary until a rise in temperature is indicated on the temperature gauge.

Driving

(a) Careful adherence to the ' Running-in Instructions' given on the next page, will be amply repaid by obtaining the best performance and utmost satisfaction from the car.

(b) The habit should be formed of reading the oil pressure gauge, water temperature gauge and ammeter occasionally as a check on the correct functioning of the car. Should an abnormal reading be obtained an investigation should be made immediately.

(c) Always start from rest in first or second gear ; on a hill always use first gear. To start in a higher gear will cause excessive clutch slip and premature wear. Never drive with a foot resting on the clutch pedal and do not keep the clutch depressed for long periods in traffic.

(d) The synchromesh gearbox provides a synchronized change into second, third and top. When changing gear the movement should be slow and deliberate.

When changing down a smoother gear change will be obtained if the accelerator is left depressed to provide the higher engine speed suitable to the lower gear. Always fully depress the clutch pedal when changing gear.

(e) Gear changing may be slightly stiff on a new car but this will disappear as the gearbox becomes ' run-in'.

(f) Always apply the footbrake progressively; fierce and sudden application is bad for the car and tyres. The handbrake is for use when parking the car, when driving away on a hill and when at a standstill in traffic.

' Running-in ' Instructions

Only if the following important recommendations are observed will the high performance and continued good running of which the Jaguar is capable be obtained.

During the ' running-in ' period do not allow the engine to exceed the following speeds :

2.4 Litre

First 500 miles (800 km.)	2,500 r.p.m.
From 500—1,000 miles (800—1,600 km.)	3,000 r.p.m.
From 1,000—2,000 miles (1,600—3,200 km.)	4,000 r.p.m.

3.4/3.8 Litre

First 1,000 miles (1,600 km.)	2,500 r.p.m.
From 1,000—2,000 miles (1,600—3,200 km.)	3,000 r.p.m.

Continue to drive without overstressing the engine.

Have the engine sump drained and refilled and the oil filter attended to as recommended at the free service, that is, after the first 500 miles (800 km.).

Traffic Hazard Warning Device (U.S.A. Only).

The traffic hazard warning system operates in conjunction with the four flashing turn indicator lamps fitted to the car and the operation of a toggle switch on a sub-panel will cause these four lamps to flash simultaneously.

A red warning lamp is incorporated in the circuit to indicate that the hazard warning system is in operation.

Electrically Heated Backlight (Optional Extra).

An electrically heated backlight to provide demisting and defrosting of the rear window is available as an optional extra.

A heating element, consisting of a fine wire mesh between the laminations of glass, is connected to the wiring harness and functions only when the ignition and heater switches are in the ON position.

An amber warning lamp situated in the facia panel, lights up when the backlight heater is switched on. A resistance in the circuit through the side and headlamp switch automatically dims the warning lamp for night driving.

THE STEERING COLUMN LOCK

Description

A "WASO-WERKEN" combined ignition switch/steering column lock is available as an optional extra and replaces the normal ignition switch in the instrument panel.

The switch/lock unit is mounted on an extension arm attached to the steering column below the steering wheel and has three operative positions—Drive, Garage and Stop; the fourth position, Start, not being used.

The normal ignition, which becomes inoperative, is retained in the instrument panel.

Operation of Switch

1. Drive.
   This is the normal driving position. The key cannot be withdrawn in this position and the ignition is "ON".
2. Garage.
   This is the normal stop position. The key can be withdrawn leaving the car capable of being steered with the ignition "OFF".
3. Stop.
   This is the locked stop position. The key can be removed leaving the steering locked and the ignition "OFF".
   To unlock the steering, insert the key in the lock and turn to Garage or Drive position.

AUTOMATIC TRANSMISSION

Operating and Maintenance

2.4 LITRE, 3.4 AND 3.8 LITRE

GENERAL DESCRIPTION

The transmission assembly consists of a three-element hydraulic torque converter followed by two planetary gear sets which permit the elimination of the clutch pedal and normal gear-shift lever. The planetary gear sets incorporate free-wheels and are controlled by hydraulically-operated band and disc clutches.

The manual control lever allows selection of the following conditions :—

P (Park). A pawl is mechanically engaged with teeth on the main shaft. A hydraulic interlock prevents engagements at speeds above 3 to 5 m.p.h. (5 to 8 k.p.h.).

N (Neutral). All clutches are disengaged and there is no drive beyond the torque converter.

D (Drive). Automatic changes between the low gear and intermediate gear and between the intermediate gear and direct drive.

Changes from low to intermediate gear and intermediate to direct drive depend upon the combination of road speed and throttle position ; the larger the throttle opening the higher the speed at which the change occurs. This is achieved by mechanically combining the motions of a mechanical centrifugal governor and the throttle linkage. The resultant motion operates a hydraulic valve.

Depression of the accelerator pedal beyond normal travel causes a " kick-down " change from direct to intermediate gear. Below 52 m.p.h. (84 k.p.h.) a downshift from direct to intermediate gear can be obtained by depressing the accelerator to the full throttle position short of "kick-down". [2.4 litre 40 m.p.h. (64 k.p.h.)]. No "kickdown" downshift is possible for intermediate to low gear.

The torque converter and a gear reduction are operative in the low intermediate gears. Direct drive is obtained by coupling the engine directly to the main shaft by a disc clutch. The relevant road speeds are given in " Transmission Data ".

Manual L (Low). A low gear train and the torque converter are operative and no automatic change can occur. Manual changes between L and D may be made while the car is in motion but changes into L should be avoided at speeds above 45 m.p.h. (72 k.p.h.) [2.4 litre, 35 m.p.h. (56 k.p.h.)].

R (Reverse). A reverse-gear train and the torque converter are operative. A hydraulic interlock prevents engagement of the reverse clutch at forward speeds above 10 m.p.h. (16 k.p.h.) [2.4 litre, 9 m.p.h. 14½ k.p.h.)].

Electrical connection to the starter is made only when N and P are selected. An anti-creep device traps brake fluid pressure when the car is stationary after the brakes have been applied. Opening the throttle releases the pressure.

TRANSMISSION DATA

Maximum torque ratio of converter	2.15 : 1
Low gear reduction	2.308 : 1
Intermediate gear reduction	1.435 : 1
Direct drive—no converter	1 : 1
Reverse gear reduction	2.009 : 1

AUTOMATIC GEAR CHANGE

Upshifts

	2.4 litre mph.	2.4 litre kph.	3.4/3.8 litre mph.	3.4/3.8 litre kph.
Low to intermediate—light throttle	11	18	11	18
Low to intermediate—full throttle	32	43	40	54
Intermediate to direct—light throttle	20	27	23	31
Intermediate to direct—full throttle	50	67	64	86
Intermediate to direct—after " kick-down "	63	84	78	105

Downshifts

		mph.	kph.	mph.	kph.
Direct to intermediate—closed throttle		13	17	16	21
Intermediate to low—closed throttle		3	5	4	6
Direct to intermediate—" kick down "	Up to	55	89	68	109
Parking pawl permitted to engage	Below	3	5	3 to 5	5 to 8
Reverse gear permitted to engage	Below	9	14.5	10	16
Manual change from drive to low to be **avoided**	Above	35	56	45	72

DRIVING INSTRUCTIONS

The operation of the automatic transmission is controlled by the position of the selector lever which is indicated by the quadrant pointer. The quadrant marked P,N,D,L,R, is situated in front of the steering wheel.

Selector

The lever must be raised when selecting P, L or R and when moving from P to any other position. When the ignition is switched on the letters P,N,D,L,R, in the quadrant become illuminated ; when the side lights are switched on the illumination is automatically dimmed.

To start the engine the selector lever must be in the P or N positions.

P or Park provides a safe, positive lock on the rear wheels when the car is stopped. Movement of the selector lever to the P position actuates a mechanical locking device in the transmission which prevents the rear wheels from turning in either direction. For this reason, should the car be pushed from front or rear with sufficient force, the car will skid on the rear tyres.

This condition is quite similar to that encountered when a car with conventional transmission is parked in gear or with the handbrake applied firmly. The fact that the engine may be started with the selector in P position is convenient when parked on an incline.

When the car is stopped on a hill and the P (Park) position is selected, the parking mechanism may become very firmly engaged due to the load on the pawl. To disengage the parking pawl under these conditions the following procedure should be adopted :—

To release transmission from P (Park) when facing UP HILL.

1. Start the engine.
2. Release the handbrake.
3. Select D and **hold** lever in this position (irrespective of the direction in which it is desired to move off).
4. Depress accelerator slowly until the car moves forward, indicating the release of the parking pawl.
5. The car is now " free " and can be driven away in the desired direction.

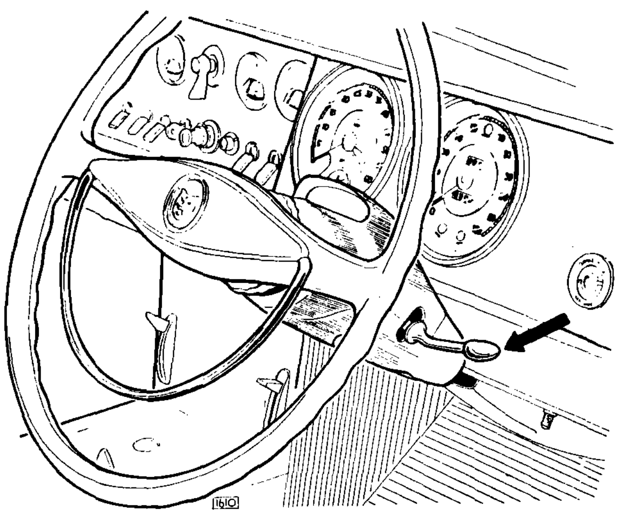


Fig. 15. Selector control lever (on early cars lever was on opposite side of steering column).

To release transmission from P (Park) when facing DOWN HILL.

1. Start the engine.
2. Release the handbrake.
3. Select R and **hold** lever in this position (irrespective of the direction in which it is desired to move off).
4. Depress accelerator slowly until the car moves backward, indicating the release of the parking pawl.
5. The car is now " free " and can be driven away in the desired direction.

N or Neutral position permits idling the engine without the possibility of setting the car into motion by pressure on the accelerator and may be used when starting the engine. It is inadvisable to engage neutral for coasting.

D or Drive provides the normal forward driving range and includes automatic shifting between the low, intermediate and direct drive ranges. Virtually all forward driving, accelerating and stopping can be done with the lever in the D position. Once the engine is started and the lever is moved to D it can be left in this position for all normal driving. When accelerating, the transmission shifts automatically from low to intermediate between 11 and 40 m.p.h. (18 and 64 k.p.h.) [2.4 litre, 11 and 32 m.p.h. (18 and 51 k.p.h.)] and from intermediate to direct between 23 and 64 m.p.h. (37 and 80 k.p.h.) [2.4 litre, 20 and 50 m.p.h. (32 and 80 k.p.h.)] depending on the position of the accelerator pedal. On deceleration, it will shift automatically from direct drive to intermediate at approximately 16 m.p.h. (28 k.p.h.) [2.4 litre, 13 m.p.h. (21 k.p.h.)] and from intermediate to low at approximately 4 m.p.h. (6 k.p.h.) [2.4 litre, 3 m.p.h. (5 k.p.h.)].

L or Low is an emergency engine power range for use on unusually long and steep grades or for braking on descents, for extra heavy pulling, and for rocking the car out of mud, sand or snow.

R for Reverse position of the selector lever provides reverse driving range.

Intermediate Speed Hold. A switch mounted on the facia provides a means for the driver to obtain a downshift from direct to intermediate without depressing the accelerator pedal (as advised under the head " Additional Power and Acceleration ") and to retain the drive in the intermediate range. This will be found convenient for overtaking or when hill climbing.

With the switch in the " IN " position no upshift will take place between intermediate and direct drive ; placing the switch lever in the " OUT " position will cause the transmission to shift to direct drive, provided the normal upshift speed has been obtained.

Warning. Do NOT allow the maximum permitted engine revolutions to be exceeded through allowing the " Intermediate Speed Hold " to remain in operation longer than necessary, or by switching in the " hold " at speeds in excess of 75 m.p.h. (121 k.p.h.) [2.4 litre, 60 m.p.h. (97 k.p.h.)].

Additional Power and Acceleration in D range can be obtained as follows :—

(a) Below 52 m.p.h. (84 k.p.h.) [2.4 litre, 40 m.p.h. (64 k.p.h.)] depress the accelerator pedal to the full throttle position to effect a change into the intermediate range ; the drive will continue in the intermediate range until the release of the accelerator or approximately 64 m.p.h. (103 k.p.h.) [2.4 litre, 50 m.p.h. (80 k.p.h.)].

(b) Between 52 m.p.h. and 68 m.p.h. (84 k.p.h. and 109 k.p.h.) [2.4 litre, 40 and 50 m.p.h. (64 and 80 k.p.h.)] depress the accelerator pedal all the way to the floorboard to effect a "kick-down"

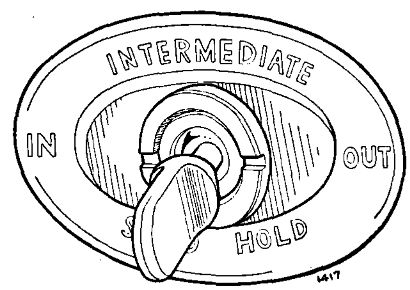


Fig. 16. Intermediate speed hold switch.

change into intermediate range ; the drive will continue in intermediate range until release of the accelerator or approximately 78 m.p.h. (126 k.p.h.) [2.4 litre, 63 m.p.h. (101 k.p.h.)]. is reached.

Hard Pulling, such as encountered in deep snow, mud or other adverse driving conditions, is best accomplished in the L range.

Rocking out of Mud, Sand or Snow is accomplished with the accelerator pedal slightly depressed and held steady while making quick alternative selections of L and R ranges.

Anti-Creep is a special braking feature which prevents the car from creeping forward when stopped on level ground or slight grades, as long as the ignition key is turned on. Apply the footbrake to stop the car and then remove the foot from the brake pedal. The car will not creep forward or backward. Any movement of the accelerator pedal, or turning off the ignition key. releases the anti-creep action.

Push Starting may sometimes be necessary, as in the case of a flat battery. Turn ignition key ON, place selector lever in the N position. The car may now be pushed and when it has reached 15 to 20 m.p.h. (24 to 32 k.p.h.) move the selector lever to D or L position. **Do not tow the car to start the engine—it may overtake the tow car.**

Engine Braking, for descending long mountainous grades, is easily secured by bringing the car speed below 45 m.p.h. (72 k.p.h.) [2.4 litre, 35 m.p.h. (65 k.p.h.)] and momentarily depressing the accelerator while placing the selector lever in the L position.

Prolonged Idling is sometimes unavoidable. In such cases, as a safety precaution, move the selector lever to the P or N position.

Towing should be done with the selector lever in the N position. Car should not be towed in excess of 30 m.p.h. (48 k.p.h.).

MAINTENANCE

The oil necessary for the operation of the torque converter is common with that used in the transmission. The total oil capacity of the transmission assembly is approximately 15 Imperial pints (18 U.S. pints ; 8.5 litres), but when draining the transmission a small quantity of oil will remain in the unit and the amount required to refill it will be that needed to bring the oil level to the FULL mark on the dipstick as described in " Draining and Refilling Transmission " below.

Every 1,250 miles (2,000 km.)

Check Transmission Oil Level as follows :—

1. Release the catch and slide each front seat as far rearward as possible. Remove the two front seat cushions.
2. Unscrew the chrome plate knob situated between the two front seats at the rear of the leather cover.
3. Lift the leather cover clear of the rear securing stud and pull the cover rearwards slightly to release the two locating clips under the heater controls. Remove the leather cover by lifting forward and upward when the circular rubber cover plate will be visible.
4. Remove the cover plate to expose the dipstick. Clean the area around the dipstick hole.
5. With the car on a level floor set handbrake firmly. Set the selector lever in the "P" position and start engine. With the footbrake applied move the selector lever to " L " and raise the transmission fluid temperature by running the engine at 800 R.P.M. for 2 or 3 minutes.
6. Remove the dipstick and wipe it dry. With the foot still on the brake and the selector lever at " L " run the engine at its normal idling speed and check the fluid level. Add sufficient oil to bring the level up to the full mark on the dipstick. DO NOT OVERFILL. The space between the " Full " and " Low " marks on the dipstick represent approximately one pint.

Every 10,000 miles (16,000 km.)

Drain and Refill Transmission on Early Cars as follows :—

1. Release the catch and slide each front seat as far rearwards as possible. Remove the two front seat cushions.

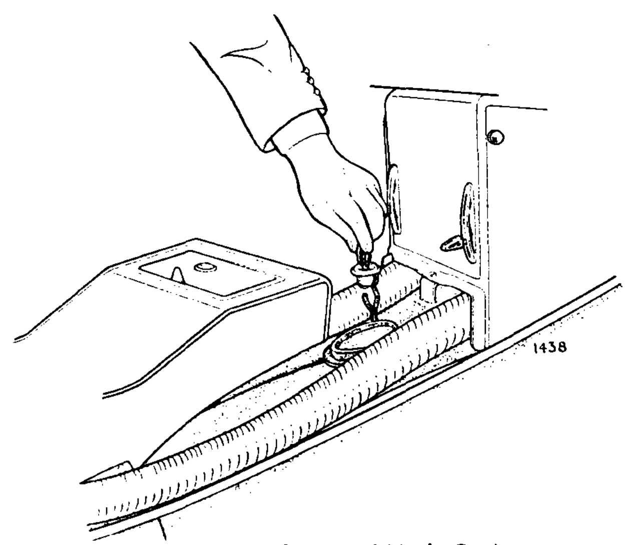


Fig. 17. Dipstick removal (Early Cars).

2. Unscrew the chrome plated knob situated between the two front seats at the rear of the leather cover.
3. Lift the leather cover clear of the rear securing stud and pull the cover rearwards slightly to release the two locating clips under the heater controls. Remove the leather cover by lifting forward and upwards when the circular rubber cover plate will be visible.
   With the car on a level floor, set the hand brake fully on. Set the selector lever in the " P " position and start engine.
4. With the foot brake applied move the selector lever to " L " and raise the transmission fluid temperature by running the engine at 800 R.P.M. for two or three minutes.
5. Stop the engine and remove the cover plate to expose the dipstick. Clean the area around the dipstick hole.
6. Remove the transmission oil pan drain plug (A, Fig. 18).
   Remove the converter housing cover plate and rotate the converter until the drain plug is in a position for draining. Remove the converter drain plug (B).
7. To facilitate draining, remove the square headed converter pressure take-off plug from the bottom of the housing attached to the left-hand side of the transmission casing (C).
8. After oil has drained, refit and tighten the drain plugs in the transmission oil pan and converter. Refit the converter housing cover plate. Refit and tighten the converter pressure take-off plug.
9. Pour 10 Imperial pints (12 U.S. pints ; 5.7 litres) of the recommended grade of oil into the transmission through the dipstick hole.
10. Start the engine and idle for approximately one minute with the selector lever set in the L position to transfer the oil to the converter from the transmission case.
11. With the engine still idling and the selector lever in the L position, add additional oil (approximately 5 Imperial pints, 6 U.S. pints or 2.8 litres) to bring the level to the FULL mark on the dipstick. DO NOT OVERFILL. Finally, recheck the level of the oil as described in " Check Transmission Oil Level ".

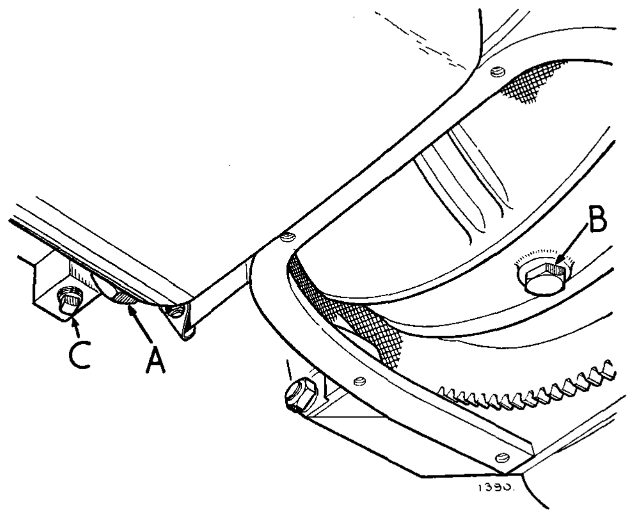


Fig. 18. Drain plugs (converter housing cover plate removed).

RECOMMENDED LUBRICANTS

Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent Caltex/Texaco
Mobil ATF 200	Castrol T.Q.	Shell Donax T6	Esso Automatic Transmission Fluid	Energol Automatic Transmission Fluid, Type "A"	Nolmatic	Texamatic Fluid

S.A.E. Automatic Transmission Fluid, Type "A" or Type "A" Suffix "A".

Transmission and torque converter oil capacity : 15 Imperial pints (18 U.S. pints ; 8.5 litres).

SUMMARY OF MAINTENANCE

Daily

Check radiator water level.

Check engine oil level.

Weekly

Check tyre pressures.

Check fluid level in brake and clutch master cylinder reservoirs.

Monthly

Check battery electrolyte level and connections.

Every 1,250 miles (2,000 km.)

Check fluid in Automatic Transmission unit (if fitted).

Check fluid level in power assisted steering reservoir (if fitted).

Every 2,500 miles (4,000 km.)

Drain engine sump and refill.

Clean oil filter element and renew seal. (Felt element only).

Check gearbox oil level and top up if necessary.

Check rear axle oil level and top up if necessary.

Lubricate steering box.

Lubricate steering idler housing (early cars).

Lubricate steering tie-rod ball joints.

Lubricate wheel swivels.

Lubricate propeller shaft universal joints (early cars).

Lubricate propeller shaft splines (early cars).

Lubricate carburetter hydraulic piston dampers (3.4/3.8 litre).

Clean and re-oil air cleaner (oil bath type).

Lubricate distributor and check contact points.

Clean, adjust and test sparking plugs.

Check clutch pedal free travel and adjust if necessary (early cars).

Check handbrake adjustment (early cars).

Check carburetter slow running.

Every 5,000 miles (8,000 km.)

Carry out 2,500 miles service.

Tune carburetters.

Clean carburetter filters.

Clean fuel line filter.

Lubricate door hinges.

Lubricate rear wheel bearings.

Spray rear springs (avoid rubber mountings).

Check fan belt and adjust if necessary (2.4 models).

Clean and lubricate brake servo air cleaner.

Renew oil filter element and seal.

Examine brake friction pads for wear.

Clear drain holes in bottoms of doors.

Adjust top timing chain (if required).

Check front wheel alignment.

Carry out oil can lubrication of (a) seat runners and adjusting mechanism, (b) handbrake lever ratchet, (c) door locks, (d) boot hinges and lock, (e) bonnet hinges and catches, (f) windscreen wiper arms, (g) accelerator linkage, (h) fuel filler cover hinge, (i) handbrake cable compensator, (j) generator end bush.

Every 10,000 miles (16,000 km.)

Carry out 2,500 miles and 5,000 miles service.

Renew air cleaner element (paper type).

Drain and refill gearbox (and overdrive if fitted).

Clean overdrive oil pump filter (if overdrive fitted).

Clean engine sump strainer (early cars only).

Drain and refill rear axle.

Lubricate front wheel bearing hubs.

Clean fuel pump filter. (Early cars only).

Check and tighten all chassis and body nuts, screws and bolts.

Check rear wheel bearing end-float and adjust if necessary.

Renew sparking plugs.

Drain and re-fill Automatic Transmission unit (if fitted).

Check headlamp alignment and adjust as necessary.

RECOMMENDED LUBRICANTS

Component	Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent/ Caltex/ Texaco
Engine	Mobil Special or Mobil Super	Castrol GTX	Shell Super Oil	Esso Extra Motor Oil 10W/30 Esso Extra Motor Oil 20W/40	Super Visco Static 10W/40	Q20-50 or Q5500*	Havoline 20 W/40 or 10W/30*
Upper cylinder lubrication ..	Mobil Upperlube	Castrollo	Shell U.C.L. or Donax U.	Esso U.C.L.	U.C.L.	Adcoid Liquid	Regent U.C.L.
Gearbox .. .. .. Carburetter hydraulic piston dampers .. .. .. Distributor oil can points ... Oil can lubrication	Mobiloil A	Castrol GTX	Shell X-100 30	Esso Motor Oil 20W/30	Energol SAE 30	NOL 30	Havoline 30
Rear axle	Mobilube GX 90	Castrol Hypoy	Spirax 90 E.P.	Esso Gear oil GP 90/140	Gear oil SAE 90 E.P.	Hypoid 90	Multigear Lubricant E.P. 90
Steering box (standard steering)	Mobilube GX 140	Castrol Hi-press	Spirax 140 E.P.	Esso Gear oil GP 90/140	Gear oil SAE 140 E.P.	NOL EP 140	Multigear Lubricant EP 140
Propeller shaft (early cars) .. Front wheel bearings .. .. Rear wheel bearings .. .. Distributor cam	Mobilgrease MP	Castrolease LM	Retinax A	Esso Multi-purpose Grease H	Energrease L.2	LB 10	Marfax All Purpose
Steering idler housing (early cars) Steering tie-rods .. .. Wheel swivels .. .. .. Door hinges	Mobilgrease MP	Castrolease LM	Retinax A	Esso Multi-purpose Grease H	Energrease L.2	LB 10	Marfax All Purpose
Automatic transmission unit .. Power steering system	Mobil ATF 200	Castrol TQ	Shell Donax T 6	Esso Automatic Transmission Fluid	Automatic Transmission Fluid Type 'A'	Nolmatic	Texamatic Fluid

* These oils should NOT be used in worn engines requiring overhaul.

If an SAE 30 or 40 oil has previously been used in the engine a slight increase in oil consumption may be noticed but this will be compensated by the advantages gained.

RECOMMENDED HYDRAULIC FLUID

Braking System and Clutch Operation

Braking System and Clutch Operation

Castrol/Girling Crimson Clutch/Brake Fluid is recommended. This conforms to S.A.E. 70 R3 specification modified for additional safety to give a higher boiling point.

Where this is not available, only guaranteed to conform to S.A.E. 70 R3 specification may be used as an alternative.

SERVICE DEPARTMENTS

Factory:

The Service Department,
Jaguar Cars Limited, Coventry, England.
Telephone No. Allesley 2121

London:

Messrs. Henlys Ltd.,
The Hyde, Hendon, London, N.W.9.
Telephone No. Colindale 6565

U.S.A.:

The Technical Service Department,
Jaguar Cars Inc.,
734 Grand Avenue, Ridgefield, New Jersey 07657,
U.S.A.

Canada:

The Technical Service Department,
British Motor Holdings (Canada) Ltd.,
4445 Fairview Street,
P.O. Box 5033,
Burlington,
Ontario, Canada.

CONVERSION TABLES

METRIC INTO ENGLISH MEASURE

1 millimetre is approximately $\frac{1}{25}$", and is exactly .03937".
1 centimetre is approximately $\frac{3}{8}$", and is exactly .3937".
1 metre is approximately $39\frac{3}{8}$", and is exactly 39.37" or 1.0936 yards.
1 kilometre is approximately $\frac{5}{8}$ mile, and is exactly .6213 miles.
1 kilogramme is approximately $2\frac{1}{4}$ lbs., and is exactly 2.21 lbs.
1 litre is approximately $1\frac{3}{4}$ pints, and is exactly 1.76 pints.
To convert metres to yards, multiply by 70 and divide by 64.
To convert kilometres to miles, multiply by 5 and divide by 8 (approx.).
To convert litres to pints, multiply by 50 and divide by 88.
To convert grammes to ounces, multiply by 567 and divide by 20.
To find the cubical contents of a motor cylinder, square the diameter (or bore), multiply by 0.7854, and multiply the result by the stroke.
1 M.P.G.—0.3546 kilometres per litre or 2.84 litres per kilometre.

KILOMETRES INTO MILES

Kilo.	Miles	Kilo.	Miles	Kilo.	Miles	Kilo.	Miles	Kilo.	Miles
1	$\frac{5}{8}$	16	10	31	$19\frac{1}{4}$	46	$28\frac{5}{8}$	60	$37\frac{1}{4}$
2	$1\frac{1}{4}$	17	$10\frac{5}{8}$	32	$19\frac{7}{8}$	47	$29\frac{1}{4}$	70	$43\frac{1}{2}$
3	$1\frac{7}{8}$	18	$11\frac{1}{4}$	33	$20\frac{1}{2}$	48	$29\frac{7}{8}$	80	$49\frac{3}{4}$
4	$2\frac{1}{2}$	19	$11\frac{3}{4}$	34	$21\frac{1}{8}$	49	$30\frac{1}{2}$	90	$55\frac{7}{8}$
5	$3\frac{1}{8}$	20	$12\frac{3}{8}$	35	$21\frac{3}{4}$	50	$31\frac{1}{8}$	100	$62\frac{1}{8}$
6	$3\frac{3}{4}$	21	13	36	$22\frac{3}{8}$	51	$31\frac{3}{4}$	200	$124\frac{1}{4}$
7	$4\frac{3}{8}$	22	$13\frac{5}{8}$	37	23	52	$32\frac{1}{4}$	300	$186\frac{3}{8}$
8	5	23	$14\frac{1}{4}$	38	$23\frac{5}{8}$	53	$32\frac{7}{8}$	400	$248\frac{1}{2}$
9	$5\frac{5}{8}$	24	$14\frac{7}{8}$	39	$24\frac{1}{4}$	54	$33\frac{1}{2}$	500	$310\frac{3}{4}$
10	$6\frac{1}{4}$	25	$15\frac{1}{2}$	40	$24\frac{7}{8}$	55	$34\frac{1}{8}$	600	$372\frac{7}{8}$
11	$6\frac{7}{8}$	26	$16\frac{1}{8}$	41	$25\frac{1}{2}$	56	$34\frac{3}{4}$	700	435
12	$7\frac{1}{2}$	27	$16\frac{3}{4}$	42	$26\frac{1}{8}$	57	$35\frac{3}{8}$	800	$497\frac{1}{8}$
13	$8\frac{1}{8}$	28	$17\frac{3}{8}$	43	$26\frac{3}{4}$	58	36	900	$559\frac{1}{4}$
14	$8\frac{3}{4}$	29	18	44	$27\frac{3}{8}$	59	$36\frac{5}{8}$	1000	$621\frac{3}{8}$
15	$9\frac{3}{8}$	30	$18\frac{5}{8}$	45	28				

PINTS AND GALLONS TO LITRES

Pints	Gallons	Litres Approx.	Litres Exact	Pints	Gallons	Litres Approx.	Litres Exact
1	1/8	1/2	.57	40	5	23	22.75
2	1/4	1	1.14	48	6	27	27.30
3	3/8	1 1/2	1.71	56	7	32	31.85
4	1/2	2 1/4	2.27	64	8	36 1/2	36.40
8	1	4 1/2	4.54	72	9	41	40.95
16	2	9	9.10	80	10	45 1/2	45.50
24	3	13 1/2	13.65	88	11	50	50.05
32	4	18	18.20	96	12	54 1/2	54.60

RELATIVE VALUE OF MILLIMETRES AND INCHES

mm.	Inches	mm.	Inches	mm.	Inches	mm.	Inches
1	0.0394	26	1.0236	51	2.0079	76	2.9922
2	0.0787	27	1.0630	52	2.0473	77	3.0315
3	0.1181	28	1.1024	53	2.0866	78	3.0709
4	0.1575	29	1.1417	54	2.1260	79	3.1103
5	0.1968	30	1.1811	55	2.1654	80	3.1496
6	0.2362	31	1.2205	56	2.2047	81	3.1890
7	0.2756	32	1.2598	57	2.2441	82	3.2284
8	0.3150	33	1.2992	58	2.2835	83	3.2677
9	0.3543	34	1.3386	59	2.3228	84	3.3071
10	0.3937	35	1.3780	60	2.3622	85	3.3465
11	0.4331	36	1.4173	61	2.4016	86	3.3859
12	0.4724	37	1.4567	62	2.4410	87	3.4252
13	0.5118	38	1.4961	63	2.4803	88	3.4646
14	0.5512	39	1.5354	64	2.5197	89	3.5040
15	0.5906	40	1.5748	65	2.5591	90	3.5433
16	0.6299	41	1.6142	66	2.5984	91	3.5827
17	0.6693	42	1.6536	67	2.6378	92	3.6221
18	0.7087	43	1.6929	68	2.6772	93	3.6614
19	0.7480	44	1.7323	69	2.7166	94	3.7008
20	0.7874	45	1.7717	70	2.7559	95	3.7402
21	0.8268	46	1.8110	71	2.7953	96	3.7796
22	0.8661	47	1.8504	72	2.8347	97	3.8189
23	0.9055	48	1.8898	73	2.8740	98	3.8583
24	0.9449	49	1.9291	74	2.9134	99	3.8977
25	0.9843	50	1.9685	75	2.9528	100	3.9370

RELATIVE VALUE OF INCHES AND MILLIMETRES

Inches	0	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$
0	0.0	1.6	3.2	4.8	6.4	7.9	9.5	11.1
1	25.4	27.0	28.6	30.2	31.7	33.3	34.9	36.5
2	50.8	52.4	54.0	55.6	57.1	58.7	60.3	61.9
3	76.2	77.8	79.4	81.0	82.5	84.1	85.7	87.3
4	101.6	103.2	104.8	106.4	108.0	109.5	111.1	112.7
5	127.0	128.6	130.2	131.8	133.4	134.9	136.5	138.1
6	152.4	154.0	155.6	157.2	158.8	160.3	161.9	163.5
Inches	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{15}{16}$
0	12.7	14.3	15.9	17.5	19.1	20.6	22.2	23.8
1	38.1	39.7	41.3	42.9	44.4	46.0	47.6	49.2
2	63.5	65.1	66.7	68.3	69.8	71.4	73.0	74.6
3	88.9	90.5	92.1	93.7	95.2	96.8	98.4	100.0
4	114.3	115.9	117.5	119.1	120.7	122.2	123.8	125.4
5	139.7	141.3	142.9	144.5	146.1	147.6	149.2	150.8
6	165.1	166.7	168.3	169.9	171.5	173.0	174.6	176.2

SUPPLEMENTARY INFORMATION
TO
SECTION A "GENERAL INFORMATION"

AUTOMATIC TRANSMISSION
MAINTENANCE

Models affected	Chassis Numbers.	
2.4 litres ..	109308 and subs.	126499 and subs.
3.4 litre ..	155965 and subs.	177304 and subs.
3.8 litre	205364 to 210000. 230001 and subs. 217573 and subs.	

Every 1,250 miles (2,000 km.)

Check Transmission Fluid Level as follows :

1. Raise the bonnet. The dipstick will be found forward of the carburetters, adjacent to the radiator top water hose.
2. With the car on a level floor, set the handbrake firmly. Set the selector lever in the P position and start engine. With the footbrake applied

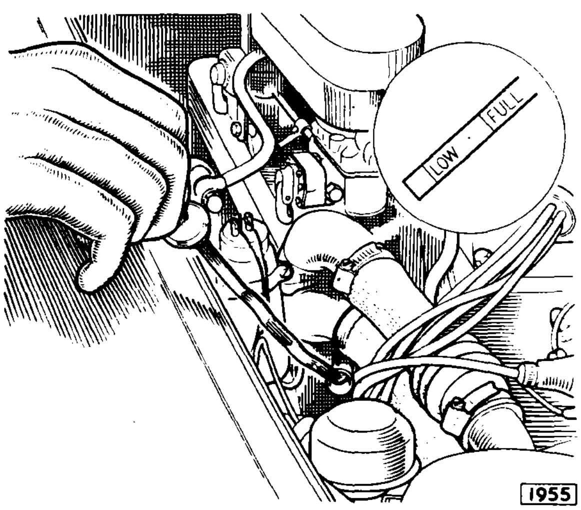


Fig. 19. Removing dipstick from filler tube.

move the selector lever to L and raise the transmission fluid temperature by running the engine at 800 r.p.m. for 2 or 3 minutes.

3. Clean the end of the filler tube. Remove the dipstick and wipe it dry. With the foot still on the brake and the selector lever at L run the engine at its normal idling speed and check the fluid level. Add sufficient fluid to bring the level up to the "Full" mark on the dipstick. DO NOT OVERFILL. The space between the "Full" and "Low" marks on the dipstick represents approximately one pint.

Every 10,000 miles (16,000 km)

Drain and Refill Transmission as follows :

1. Raise the bonnet. The dipstick will be found forward of the carburetter adjacent to the radiator top water hose.
2. With the car on a level floor, set the handbrake firmly. Set the selector lever in the P position and start engine. With the footbrake applied move the selector lever to L and raise the transmission fluid temperature by running the engine at 800 r.p.m. for 2 or 3 minutes.
3. Stop the engine. Clean the end of the filler tube.
4. Remove the transmission oil pan drain plug. (Page A.23).
5. Remove the converter housing cover plate and rotate the converter until the drain plug is in position for draining. Remove the converter drain plug. (B).
6. To facilitate draining, remove the square-headed converter pressure take-off plug from the bottom of the housing attached to the left-hand side of the transmission casing (C).
7. After fluid has drained, refit and tighten the drain plugs in the transmission oil pan and

converter. Refit the converter housing cover plate. Refit and tighten the converter pressure take-off plug.

8. Pour 10 Imperial pints (12 U.S. pints; 5.7 litres) of the recommended grade of fluid into the transmission through the filler tube.
9. Set the selector lever in the P position and start engine. With the footbrake applied move the selector lever to L and run the engine at 800 r.p.m. for 2 or 3 minutes to transfer fluid from the transmission case to the converter.
10. With the foot still on the brake and the selector lever at L run the engine at its normal idling speed and add additional fluid (approximately 5 Imperial pints, 6 U.S. pints or 2.8 litres) to bring the level up to the "Full" mark on the dipstick. DO NOT OVERFILL.

AUTOMATIC TRANSMISSION 35 UNIT

Models Affected	Chassis Number
3.4 Litre Mk 2 R.H. Drive	171615
3.4 Litre Mk 2 L.H. Drive	181429
3.8 Litre Mk 2 R.H. Drive	235332
3.8 Litre Mk 2 L.H. Drive	224738

Cars bearing the above and subsequent chassis numbers are fitted with Borg Warner Type 35 unit, when automatic transmission is installed.

Driving instructions, routine maintenance and full service details are given under separate cover (Publication No. E.150).

JAGUAR SUPPLEMENTARY INFORMATION FOR 240 & 340 CARS

Except for the information contained in this Supplement, reference must be made to the Jaguar Mk. 2 Service Manual (Publication No. E.121) or to the 35 Automatic Transmission Service Manual (Publication No. E.150)

Issued by

JAGUAR CARS LIMITED · COVENTRY · ENGLAND

Telephone	*Code*	*Telex*	*Telegraphic Address*
ALLESLEY 2121(PBX)	BENTLEYS SECOND	31622	"JAGUAR" COVENTRY

Publication No. E.151/1

Section AA

GENERAL INFORMATION

Summary of Routine Maintenance for 240 & 340 cars

EVERY 3,000 MILES (5,000 km.)

Check coolant level in radiator.

Check tyre pressures (including spare wheel).

Check battery electrolyte level.

Check fluid level in brake and clutch master cylinder reservoirs.

Top up carburetter hydraulic piston dampers.

Check carburetter slow running.

Clean, adjust and test spark plugs.

Lubricate distributor; check contact points and ignition timing.

Drain engine sump and refill.

Check gearbox oil level (and overdrive if fitted).

Check fluid level in automatic transmission.

Check rear axle oil level.

EVERY 6,000 MILES (10,000 km.)
Carry out 3,000 miles (5,000 km.) service

Tune carburetters. (Clean carburetter filters 340 only).

Clean fuel line filter bowl.

Check fan belt adjustment (240 only).

Adjust top timing chain (if required).

Renew oil filter element and seal.

Clean and lubricate brake servo air cleaner.

Top up steering unit.

Top up power steering reservoir (if fitted, 340 only).

Lubricate all grease nipples (excluding wheel bearings).

Lubricate door hinges.

Clear drain holes in bottom of doors and body sills.

Examine brake friction pads for wear.

Check front wheel alignment.

Carry out oil can lubrication of (a) seat runners and adjusting mechanism, (b) handbrake lever ratchet, (c) door locks, (d) boot hinges and lock, (e) bonnet hinges and catch, (f) windscreen wiper arms, (g) fuel filler cover hinge, (h) accelerator linkage, (i) handbrake cable compensator, (j) generator end bush.

EVERY 12,000 MILES (20,000 km.)
Carry out 3,000 (5,000 km.) and 6,000 (10,000 km.) miles service

Drain and refill gearbox (and overdrive if fitted).

Clean overdrive oil pump filter.

Drain and refill rear axle.

Lubricate front and rear wheel bearings.

Check front and rear wheel bearing end-float and adjust if necessary.

Renew spark plugs.

Renew air cleaner element.

Renew fuel feed line filter element and sealing washers.

Check headlamp alignment and adjust if necessary.

Check and tighten all body nuts, screws and bolts.

EVERY 21,000 MILES (35,000 km.)

Drain automatic transmission unit; wash out oil pan.

Adjust front and rear bands; refill with fresh fluid.

Water Temperature Gauge

At the chassis numbers quoted, a revised water temperature gauge was introduced. This instrument, operated in the same manner as its predecessor, records the engine temperature as detailed below.

Chassis Number	*Model*
1J 2037	240 R.H. Drive
1J 30225	240 L.H. Drive
1J 51118	340 R.H. Drive
1J 80222	340 L.H. Drive

The dial is divided into three segments—White, "Normal" and Red. With the indicator in the White segment, the engine has not yet reached operating temperature; with the indicator in the "Normal" segment, the engine is fully warmed up and is at operating temperature. Should the indicator advance to the Red segment, the engine is over-heating and the cause must be investigated immediately.

ENGINE

Inlet Valve Guide Seals

From introduction of the 240 and 340 models, oil seals are fitted to the inlet valve guides. These seals are effective in reducing the amount of oil being drawn down the valve guides into the combustion chambers.

To fit to existing cylinder heads, a complete set of parts is required.

Inlet Guide	6 off
Valve Collar	6 off
Cotters	12 off
Spring Seat	6 off
Circlip	6 off

Springs and valves remain unchanged.

Fitting

Replace the existing valve guides as detailed on page B.s.8.

Ensure that the seal is seated in the groove machined in the top of the valve guide.

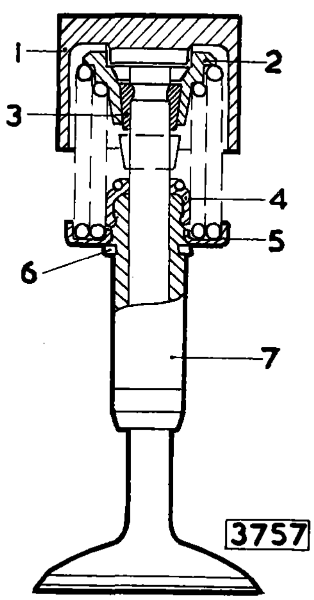


Fig. 1

1 Tappet
2 Valve collar
3 Cotters
4 Oil seal
5 Spring seat
6 Circlip
7 Inlet valve guide

Ignition Timing

Set the Ignition Timing as detailed on page B.44.

Note that the timing for 240 cars is 12° B.T.D.C. and that the timing scale is now located on the rim of the crankshaft damper. The scale is marked in crankshaft degrees from 0° (T.D.C.) to 13° advance (B.T.D.C.).

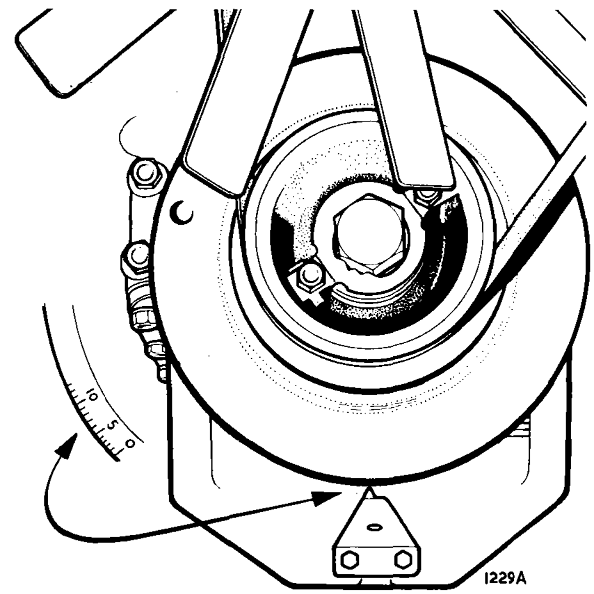


Fig. 2 *The timing scale on the rim of the crankshaft damper*

Remove the air cleaner and air intake elbow. Start the engine and warm up to normal operating temperature. Switch off the engine.

Unscrew each throttle adjusting screw until just clear of its stop with the throttle fully closed. Screw in each adjusting screw 1½ turns.

Slacken both clamping bolts on the throttle spindle interconnection link. Disconnect the jet interconnection by slackening the clamping bolts.

Mark for reassembly and remove the piston/suction chamber units.

Screw in each jet adjusting nut until the jet is flush with the bridge of the carburetter (or fully up if this position cannot be obtained). Replace the piston/suction chamber units as marked.

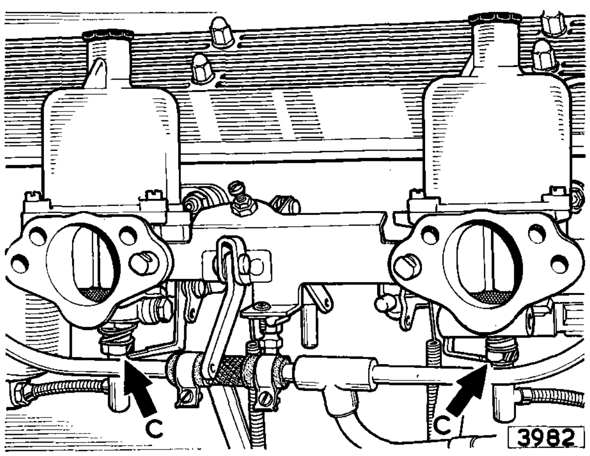


Fig. 2
C Jet adjusting nuts

Check that each piston falls freely on to the bridge when lifted by the lifting pin and released from the highest position. If not, refer to instructions given under "Jet Centring" before proceeding further.

Turn down each jet adjusting nut two full turns.

Re-start the engine and adjust the throttle adjusting screws to give the correct idling speed as indicated on the tachometer. Using a balance meter, or by listening to the "hiss" from each air intake, check the synchronisation of the carburetters. Alter the throttle adjusting screws until synchronisation is obtained with the correct idling speed.

Turn the jet adjusting nut of each carburetter (up to weaken or down to enrich) by an equal amount until the fastest idling speed consistent with even running is achieved. Readjust the throttle screws if idling speed has varied from the correct value. Check for correct mixture strength by gently pushing up the lifting pin of the *front* carburetter 1/32" (.8 mm.) after taking up all free movement of the pin.

If the engine speed increases and continues to run faster, mixture is too rich. If the engine speed decreases, mixture is too weak.

If engine speed increases momentarily and then runs smoothly, mixture strength is correct.

Repeat the operation on the rear carburetter and recheck the front carburetter as both are inter-dependent.

Set the throttle interconnection clamps so that the link pin is just clear of the lower edge of the fork with the throttles fully closed. Tighten the clamps.

With both jet levers at their lowest positions, set the jet interconnection clamps so that both jets begin to move simultaneously.

Reconnect the choke wire allowing slight free play before it starts to pull on the jet levers. Operate the choke lever on the facia panel until the linkage is about to move the jets; adjust the fast idle screws to give idling speed of 1,000 r.p.m. with the engine hot. Compare the intensity of the air intake at each carburetter at 1,000 r.p.m.

Refit the air intake elbow and air cleaner. Fit the crankcase breather pipe. Top up the hydraulic piston dampers.

Jet Centring

The piston should fall freely on to the bridge of the carburetter when the lifting pin is released with the jet in its highest position. If it will not, the jet unit requires centring.

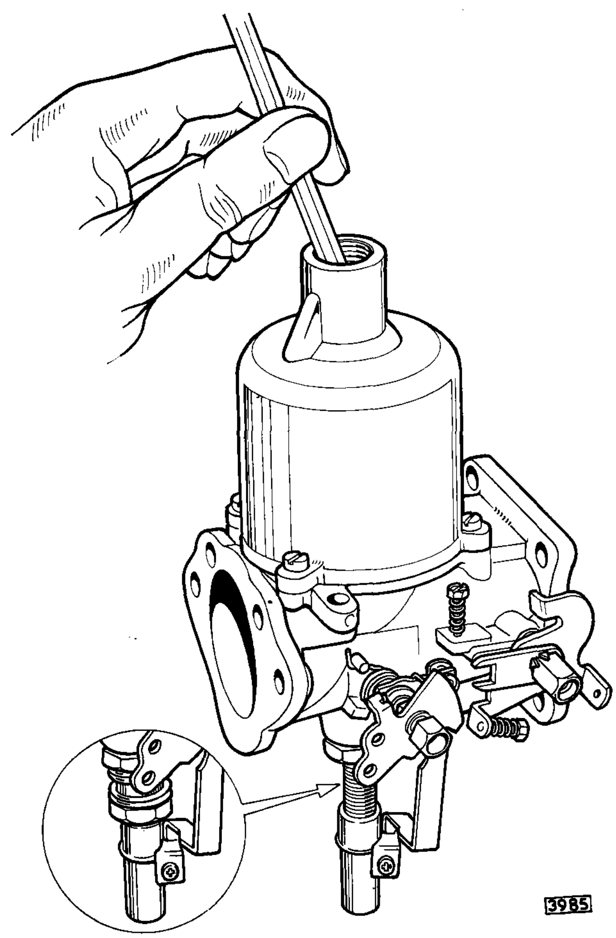


Fig. 3 *Centring the jet*

Remove the jet head screw to release the control linkage. Withdraw the jet, disconnecting the fuel feed pipe union in the float chamber and removing the rubber sealing washer and adjusting nut. Remove the jet locking spring and adjusting nut. Replace the jet and insert the fuel feed pipe connection into the float chamber. Slacken the jet locking nut until the assembly is free to rotate.

Remove the piston damper and apply pressure to the top of the piston rod with a pencil. Tighten the jet locking nut keeping the jet hard up against the bearing.

Check that the piston will now fall freely on the bridge.

Repeat the centring operation if necessary.

Refit the jet locking spring and adjusting nut. Before replacing the fuel feed pipe, fit the rubber sealing washer over the end of the plastic pipe so that at least $\frac{3}{16}$" (4.8 mm.) of pipe protrudes. Reassemble the controls. Top up the hydraulic piston damper.

Float Chamber Fuel Level

Remove and invert the float chamber lid. With the needle valve held in the closed position by the weight of the float only, there should be $\frac{1}{8}$–$\frac{3}{16}$" (3.2–4.8 mm.) gap between the float lever and the rim of the lid.

Bend at the crank if the gap is incorrect.

Later cars are fitted with a different float chamber lid with a plastic float incorporating a stop which eliminates the need to alter float level.

Carburetter Needle

The needle size is determined during engine development and will provide the correct mixture strength unless extremes of temperature, humidity or altitude are encountered.

To check that the correct needle is fitted, mark the position of the piston/suction chamber unit for reassembly and remove.

Slacken the needle clamping screw, extract the needle and check that the letters TL are stamped on the shank.

Refit the needle and lock in position so that the shoulder on the needle shank is flush with the piston base.

Reassemble the piston/suction chamber as marked on removal. Top up the hydraulic piston damper.

Carburetter Cleaning

Stalling at idling speed may be caused by dirt on the inside bore of the suction chamber or outside diameters of the piston.

Mark for reassembly; remove the piston/suction chamber unit. Using a petrol moistened cloth, clean the inside bore of the suction chamber and the two diameters of the piston. Lightly oil the piston rod *only* and reassemble the unit as marked. Top up the hydraulic dampers.

Fault Finding

The following instructions deal solely with the adverse effect caused by some malfunctioning of the carburetters. The assumption is made that there is sufficient clean fuel in the tank; the ignition and timing are correct and that the battery is in good condition and state of charge. If these conditions are not fulfilled, they may present symptoms very similar to those given below:—

Symptom	*Cause*	*Remedy*
Erratic running Stalling at idle	Sticking piston: Dirty piston or suction chamber	Clean
Lack of power	Jet out of centre	Centre
High fuel consumption	Bent needle	Fit new
Hesitation at pick-up	Low damper oil level Incorrect grade of oil	Top up Replace with correct grade of oil
Fuel leak from float chamber/ feed pipe union	Rubber sealing washer displaced or damaged	Fit new
Float chamber flooding	Dirty, worn float chamber needle valve Punctured float Incorrect fuel level (Early cars)	Clean or renew valve Fit new Check and reset level

CARBURETTERS AND FUEL SYSTEM FOR 340

The carburetters fitted to 340 cars are S.U. HD6 units similar to those employed on 3.4 Mk. 2 cars.

Servicing instructions for these remain unaltered from those given in Section C, pages C.13 to C.21 inclusive, except in the following respects:—

ROUTINE MAINTENANCE

Mileage intervals for routine maintenance on 340 cars have been increased. Refer to the Summary of Routine Maintenance given at the beginning of this supplement.

The flat filter gauze in the fuel feed line referred to on page C.15 has been replaced by a renewable fibre filter element.

Recommended servicing is the same as detailed for 240 cars.

Section DD

COOLING SYSTEM FOR 240 & 340 CARS

In conjunction with the revised inlet manifold on 240 cars, the thermostat is contained in a separate housing interposed between the manifold and the water outlet elbow.

An air bleed valve is positioned in the air vent aperture in the water outlet elbow to ensure that any air in the system is expelled to the radiator filler neck above coolant level.

Section FF

AUTOMATIC TRANSMISSION

As an Optional Extra, Automatic Transmission (Borg Warner type 35EG for 240 cars and type 35FG for 340 cars) is available.

Detailed servicing instructions for these units are given under separate cover—Publication No. E.150.

Section PP

ELECTRICAL AND INSTRUMENTS

BATTERY

Battery details vary from those stated on page P6–P10 in respect of the type, capacity and filling procedure only.

Initial charging and re-charging data remain identical.

	240	340
Battery type	C9	C11/9
Voltage	12	12
Number of plates per cell	9	11
Capacity at 10 hour rate	53	60
Capacity at 20 hour rate	60	67

Both batteries are of the "clean top" pattern with a manifold vent cover replacing the vent plugs previously fitted.

Withdrawing the manifold cover will permit topping up the battery in the normal manner.

Warning: Rubber sealing plugs are not incorporated in the manifold cover.
When removing the battery, it is ESSENTIAL that extreme care is taken to ensure that it is not tipped to any degree.
Failure to ensure this will result in acid burning to the operator and the car.

DISTRIBUTOR

The distributor for the 340 remains identical to that described on page P.s.1 with the exception of servicing procedure.

The distributor for 240 cars differs in respect of the type, test data and servicing procedure as follows:—

DISTRIBUTOR DATA

Compression ratio	8 : 1
Lucas Ignition Distributor Model No.	25 D.6
Lucas Service No.	41208
Cam dwell angle	35°±3°
Contact breaker gap	.014–.016" (.36–.41 mm.)
Contact breaker spring tension (measured at free contact)	18-24 ozs.
Ignition timing	12° B.T.D.C.

IGNITION DISTRIBUTOR TEST DATA

			VACUUM TIMING ADVANCE TESTS — The distributor must be run immediately below the speed at which the centrifugal advance begins to function to obviate the possibility of an incorrect reading being registered.				CENTRIFUGAL TIMING ADVANCE TESTS — Mount distributor in centrifugal advance test rig and set to spark at zero degrees at 100 r.p.m.				
Distributor Type	Lucas Service Number	Lucas Vacuum Unit Number	Vacuum in inches of mercury and advance in degrees — Inches	Degrees	No advance in timing below-ins. of mercury	Lucas Advance Springs Number	Accelerate to-RPM and note advance in degrees — RPM	Degrees	Decelerate to-RPM and note advance in degrees — RPM	Degrees	No advance in timing below-RPM
			20	11–13							
			13	9½–12½					850	7½–9½	
25D6	41208	5/17/12	9½	6–8½	2½	416168	1,600	10–12			250
			6½	1½–5					400	½–2½	
			4	0–½							

SERVICING (22D6 and 25D6 Distributors)

22D6 and 25D6 distributors embody a shaft bearing of sintered iron, honed to very fine limits, consequently, fitting a replacement bearing is impracticable. In the case of excessive bush wear the distributor should be replaced with a new or Factory re-conditioned unit.

The shaft must be free to rotate with end-play not exceeding .006" (.15 mm.). If, after drilling, pinning and caulking, the shaft assembly is end tight, a sharp tap against the end of the shaft with a hide mallet will flatten the pips on the washer and permit free rotation of the assembly.

FOG LAMPS

Fog lamps, as shown on page P27, are not fitted as standard equipment to 240 and 340 cars but are available as optional equipment.

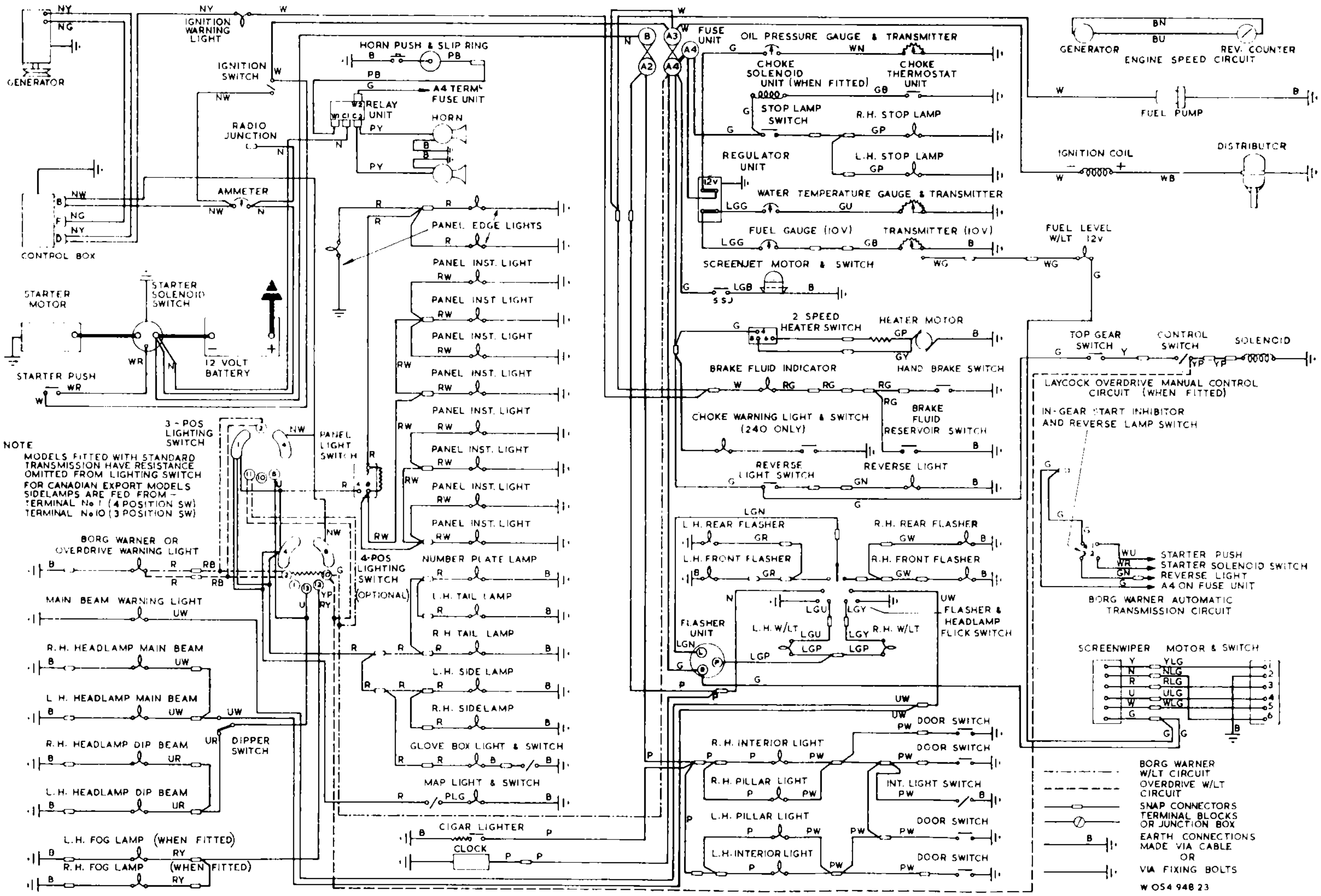
The necessary electrical wiring cables from the switch to the lamp connections are, however, included in the main harness.

When fitting fog lamps, the main 3-position lighting switch (OFF—SIDE—HEAD) should be replaced with a 4-position switch (OFF—SIDE—HEAD—FOG). Both switches are fully interchangeable.

The mounting points in the front wings are blanked off by two grill escutcheons which must be removed.

WIRING DIAGRAM

A revised wiring diagram (W 054 948 23) is included in this supplement. Refer to this illustration when making connections or when tracing faults in the electrical system.



CABLE COLOUR CODE

B BLACK
U BLUE
N BROWN
R RED
P PURPLE
G GREEN
S SLATE
W WHITE
Y YELLOW
D DARK
L LIGHT
M MEDIUM

When a cable has two colour code letters, the first denotes the main colour and the second denotes the tracer colour.

JAGUAR 240 AND 340 (HOME AND EXPORT MODELS)

SECTION B

ENGINE

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

INDEX *(continued)*

INDEX *(continued)*

ENGINE

All the 2.4 litre, 3.4 litre and 3.8 litre Mark 2 models are fitted with the twin overhead camshaft XK type engine fitted with the " B " type cylinder head. The 2.4 litre engine is fitted with $\frac{5}{16}''$ lift camshafts whereas the 3.4 and 3.8 litre engines are fitted with $\frac{3}{8}''$ lift camshafts.

The engine number will be observed stamped on the right-hand side of the cylinder block above the oil filter head and at the front of the cylinder head casting.

Model	Compression Ratio	Engine Number Prefix	Colour of Cylinder Head
2.4 litre	7 : 1 and 8 : 1	BG	Light Blue
3.4 litre	7 : 1, 8 : 1 and 9 : 1	KG	Light Blue
3.8 litre	7 : 1, 8 : 1 and 9 : 1	LA	Dark Blue

Compression ratios of 7 to 1 or 8 to 1 are specified for the 2.4 litre engine and 7 to 1, 8 to 1 or 9 to 1 for the 3.4/3.8 litre, the differences in compression ratio being obtained by varying the crown design of the piston.

The compression ratio of an engine is indicated by 7, 8, 9 following the engine number.

In the event of the engine number reaching 9999/—the second prefix letter is changed and the numbering recommences.

DATA

Camshaft

Number of journals	Four per shaft
Journal diameter	1.00"—.0005" —.001" (25.4 mm. —.013 mm.) —.025
Thrust taken	Front end
Number of bearings	Four per shaft (eight half bearings)
Type of bearing	White metal steel backed shell
Diameter clearance	.0005" to .002" (.013 to .05 mm.)
Permissible end float	.0045" to .008" (.11 to .20 mm.)
Tightening torque—Bearing cap nuts	9 lb. ft. (108 lb. ins.) (1.24 kg.m.)

ENGINE

Connecting Rod

Length centre to centre—2.4 litre	5⅝" (13.28 cm.)
3.4 and 3.8 litre	7¾" (19.68 cm.)
Big end—Bearing type	Lead bronze steel backed shell, lead indium coated
Bore for big end bearing	2.233" to 2.2335" (56.72 to 56.73 mm.)
Big end—Width	1 3/16" —.006" —.008" (30.16 mm. —.15 mm.) —.20
Big end—Diameter clearance	.0023" to .0039" (.06 mm. to .10 mm.)
Big end—side clearance	.0058" to 0087" (.15 mm. to .22 mm.)
Bore for small end bush	1.00" ±.0005" (25.4 mm. ±.013 mm.)
Small end bush—Type	Phosphor bronze—steel backed
Small end—Width	1 5/64" (27.4 mm.)
Small end bush—Bore diameter	.875" +.0002" —.0000" (22.22 mm. +.005 mm.) —.000
Tightening torque—Con rod bolts	37 lb. ft. (450 lb. ins.) 5.1 kg.m.)

Crankshaft

Number of main bearings	Seven
Main bearing—Type	White metal steel backed shell
Journal diameter	Front, centre, rear 2.750" to 2.7505" (69.85 to 69.86 mm.) Intermediate 2.7495" to 2.750" (69.84 to 69.85 mm.)
Journal length	
Front	1 11/16" ±.005" (42.86 mm. ±.13 mm.)

Centre	$1\frac{3}{4}''$ +.0005″ +.001″ (44.45 mm. +.013 mm.) +.025
Rear	$1\frac{7}{8}''$ (47.63 mm.)
Intermediate	$1\frac{7}{32}''$ ±.002″ (30.96 mm. ±.05 mm.)
Thrust taken	Centre bearing thrust washers
Thrust washer—Thickness	.092″ ±.001″ and .096″ ±.001″ (2.33 mm. ±.025 mm. and 2.43 mm. ±.025 mm.)
End clearance	.004″ to .006″ (.10 to .15 mm.)
Main bearing—Length	
Front .. .. / Centre .. .. / Rear	$1\frac{1}{2}''$ ±.005″ (38.1 mm. ±.13 mm.)
Intermediate	1″ ±.005″ (25.4 mm. ±.13 mm.)
Diameter clearance	.0015″ to .003″ (.04 to .08 mm.)
Crankpin—Diameter	2.086″ +.0006″ —.000″ (52.98 mm. +.015 mm.) —.000
Length	$1\frac{3}{16}''$ +.0007″ —.0002″ (30.16 mm. +.018 mm.) —.006
Regrind undersize	.010″, .020″, .030″ and .040″ (.25, .51, .76 and 1.02 mm.)
Minimum diameter for regrind	—.040″ (1.02 mm.)
Tightening torque—main bearing bolts	83 lb. ft. (1,000 lb. ins.) (11.5 kg.m.)

ENGINE

Cylinder Block

Material—2.4 and 3.4 litre	Chromium iron
—3.8 litre	" Brivadium " dry liners
Cylinder bores—Nominal—2.4 and 3.4 litre	83 mm. +.0127 mm. (3.2677″ +.0005″) —.0064 mm. —.00025″
—3.8 litre	87 mm. +.0127 mm. (3.4252″ +.0005″) —.0064 mm. —.00025″
Maximum rebore size	+.030″ (.76 mm.)
Bore size for fitting liners—2.4 and 3.4 litre	3.391″ to 3.392″ (86.13 to 86.16 mm.)
—3.8 litre	3.561″ to 3.562″ (90.45 to 90.49 mm.)
Outside diameter of liner—2.4 and 3.4 litre	3.3945″ to 3.3955″ (86.22 to 86.25 mm.)
—3.8 litre	3.563″ to 3.566″ (90.45 to 90.58 mm.)
Interference fit	.0025″ to .0045″ (.06 to .11 mm.)
Overall length of liner—2.4 litre	$5\frac{15}{16}$″ (15.08 cm.)
—3.4 and 3.8 litre	$6\frac{31}{32}$″ (17.7 cm.)
Outside diameter of lead-in—2.4 and 3.4 litre	3.389″ to 3.391″ (86.08 to 86.13 mm.)
—3.8 litre	3.558″ to 3.560″ (90.37 to 90.42 mm.)
Size of bore honed after assembly—2.4 and 3.4 litre	83 mm. (3.2677″)
in cylinder block—Nominal—3.8 litre	87 mm. (3.4252″)
Main line bore for main bearings	2.9165″ +.0005″ —.0000″ (74.08 +.013 mm.) —.000 mm.)

Cylinder Head

Type	" B " Type
Material	Aluminium Alloy
Valve seat angle—Inlet	45°
—Exhaust	45°

Valve throat diameter—Inlet	$1\frac{1}{2}$" (38.1 mm.)
—Exhaust	$1\frac{3}{8}$" (34.9 mm.)
Tightening torque—Cylinder head nuts	54 lb. ft. (650 lb. ins.) (7.5 kg.m.)
Firing order	1, 5, 3, 6, 2, 4 No. 1 cylinder being at the rear of the engine unit.

Gudgeon Pin

Type	Fully floating
Length	2.840" to 2.845" (72.14 to 72.26 mm.)
Inside diameter	$\frac{5}{8}$" (15.87 mm.)
Outside diameter	.8750" to .8752" (22.22 to 22.23 mm.)

Lubricating System

Oil pressure (hot)	40 lb. per sq. in. at 3,000 r.p.m.
Oil pump—Type	Eccentric rotor
—Clearance at end of lobes	.010" maximum (.25 mm.)
—End clearance	.004" maximum (.10 mm.)
—Clearance between outer rotor and body ..	.010" maximum (.25 mm.)

Piston and Piston Rings

Make	Brico
Type	Semi-split skirt
Piston	
Skirt clearance .. .. (*measured at bottom of skirt at 90° to gudgeon pin axis*)	.0011" to .0017" (.028 to .043 mm.)
Gudgeon pin bore	.8749" to .8751" (2.223 to 2.227 mm.)

Compression height	2.4 litre	3.4 litre	3.8 litre
7 : 1 compression ratio	2.034″ to 2.039″ (51.66 to 51.79 mm.)	1.690″ to 1.695″ (42.93 to 45.05 mm.)	1.846″ to 1.841″ (46.76 to 46.89 mm.)
8 : 1 compression ratio	2.115″ to 2.120″ (53.72 to 53.85 mm.)	2.163″ to 2.168″ (54.94 to 55.067 mm.)	2.069″ to 2.064″ (52.42 to 52.55 mm.)
9 : 1 compression ratio	— —	2.258″ to 2.263″ (57.35 to 57.48 mm.)	2.247″ to 2.242″ (56.94 to 57.07 mm.)

Piston rings—Number
Compression—2.4 litre 3
—3.4 and 3.8 litre— 2

Oil control—2.4, 3.4 and 3.8 litre 1

Piston rings—Width
Compression .. .. 0.077″ to .0787″ (1.97 to 2.00 mm.)

Oil Control .. .. .155″ to .156″ (3.94 to 3.96 mm.)

Piston rings—Thickness
Compression .. .. .124″ to .130″ (3.15 to 3.30 mm.)

Oil control .. .. .119″ to .127″ (3.02 to 3.23 mm.)

Piston rings—Side clearance in groove
Compression .. .. .001″ to .003″ (.02 to .07 mm.)

Oil Control .. .. .001″ to .003″ (.02 to .07 mm.)

Piston rings—Gap when fitted to cylinder bore
Compression .. .. .015″ to .020″ (.38 to .51 mm.)

Oil control .. .. .011″ to .016″ (.28 to .41 mm.)

Sparking Plugs

Make .. .. Champion

Type	2.4 litre	3.4 litre	3.8 litre
7 : 1 compression ratio	N.5	UN.12Y	UN.12Y
8 : 1 compression ratio	N.5	UN.12Y	UN.12Y
9 : 1 compression ratio	—	UN.12Y	UN.12Y
Gap	.025″ (.64 mm.)	.025″ (.64 mm.)	.025″ (.64 mm.)

* Champion N.8 for U.S.A., Canada and Mexico

Tappets and Tappet Guides

Tappet—Material	Cast iron (chilled)
—Outside diameter	1.3738″ to 1.3742″ (34.89 to 34.90 mm.)
—Diameter clearance	.0008″ to .0019″ (.02 to .048 mm.)
Tappet guide—Material	Austenitic iron
—Inside diameter (before reaming) ..	1.353″ to 1.357″ (34.37 to 34.48 mm.)
—Reaming size (when fitted to cylinder head)	1.375″ +.0007″ —.0000″ (34.925 mm. +.018 mm. —.000)
—Interference (shrink) fit in head ..	.003″ (.07 mm.)

Timing Chains and Sprockets

Type	Duplex
Pitch	⅜″ (9.5 mm.)
Number of pitches—Top chain	100
—Bottom chain—2.4 litre	68
—3.4 and 3.8 litre ..	82
Crankshaft sprocket—Teeth	21
Intermediate sprocket, outer—Teeth	28
Intermediate sprocket, inner—Teeth	20
Camshaft sprocket—Teeth	30
Idler Sprocket	21

Valve Timing	**2.4 litre**	**3.4 and 3.8 litre**
Inlet valve opens	10° B.T.D.C.	15° B.T.D.C.
Inlet valve closes	50° A.B.D.C.	57° A.B.D.C.
Exhaust valve opens	57° B.B.D.C.	57° B.B.D.C.
Exhaust valve closes	15° A.T.D.C.	15° A.T.D.C.

(with valve clearances set at .010″ [.25 mm.])

Valves and Valve Springs

Valves—Material, Inlet	Silicon chrome steel
Exhaust	21–4–NS
Valve head diameter, Inlet	$1\frac{3}{4}'' \pm .002''$ (44.45 mm. $\pm$ .05 mm.)
Exhaust	$1\frac{5}{8}'' \pm .002''$ (41.27 mm. $\pm$ .05 mm.)
Valve stem diameter, Inlet and Exhaust	$\frac{5}{16}''$ —.0025" —.0035" (7.95 mm. —.06 mm. —.09 mm.)
Valve lift—2.4 litre	$\frac{5}{16}''$ (7.95 mm.)
—3.4 and 3.8 litre	$\frac{3}{8}''$ (9.5 mm.)
Valve clearance—Inlet	.004" (.10 mm.)
—Exhaust	.006" (.15 mm.)
Valve seat angle—Inlet	45°
—Exhaust	45°
Valve spring—Free length. Inner	$1\frac{21}{32}''$ (.42 mm.)
Outer	$1\frac{15}{16}''$ (49.2 mm.)
Valve spring—Fitted length. Inner	$1\frac{7}{32}''$ (30.96 mm.)
Outer	$1\frac{5}{16}''$ (33.34 mm.)
Valve spring—Fitted load Inner	30.33 lbs. (13.76 kg.)
Outer	48.375 lbs. (21.94 kg.)
Valve spring—Solid length (max.) Inner	.810" (20.57 mm.)
Outer	.880" (22.35 mm.)
Number of free coils Inner	6
Outer	5
Diameter of wire Inner	12 SWG (.104") (2.64 mm.)
Outer	10 SWG (.128") (3.25 mm.)

Valve Guide and Valve Seat Insert

Valve guides—Material	Cast iron
Valve guide—Length, Inlet	$1\frac{13}{16}''$ (46.04 mm.)

Exhaust	$1\frac{15}{16}''$ (49.21 mm.)
Valve guide—Inside diameter—Inlet	$\frac{5}{16}''$ $\begin{smallmatrix}-.0005''\\-.0015''\end{smallmatrix}$ (7.94 mm. $\begin{smallmatrix}-.013\text{ mm.}\\-.038\text{ mm.}\end{smallmatrix}$)
Exhaust	$\frac{5}{16}'' \pm .0005''$ (7.94 mm. $\pm$ .01 mm.)
Interference fit in head	.0005″ to .0022″ (.013 to .055 mm.)
Valve seat inserts—Material	Cast iron (centrifugally cast)
Inside diameter Inlet	$1\frac{1}{2}''$ $\begin{smallmatrix}+.003''\\-.001''\end{smallmatrix}$ 38.1 $\begin{smallmatrix}+.076\text{ mm.})\\-.025\text{ mm.})\end{smallmatrix}$
Exhaust . .	1.379″ to 1.383″ (35.03 to 35.13 mm.)
Interference (shrink) fit in head .	.003″ (.076 mm.)

ROUTINE MAINTENANCE

DAILY

Checking the engine Oil Level

Check the oil level with the car standing on level ground otherwise a false reading will be obtained.

Remove the dipstick and wipe it dry. Replace and withdraw the dipstick ; if the oil level is on the knurled patch, with the engine hot or cold, no additional oil is required. If the engine has been run immediately prior to making an oil level check, wait one minute after switching off before checking the oil level.

Note : Almost all modern engine oils contain special additives, and whilst it is permissible to mix the recommended brands it is undesirable. If it is desired to change from one brand to another this should be done when the sump is drained, and the Oil Company's recommendation in regard to flushing procedure should be followed.

EVERY 2,500 MILES (4,000 KM.)

Changing the Engine Oil

Note : Under certain adverse conditions, conducive to oil dilution and sludge formation, more frequent oil changing than the normal 2,500 mile (4,000 km.) period is advised. Where the car is used mainly for low-speed city driving, stop-start driving particularly in cold weather or in dusty territory the oil should be changed at least every 1,000 miles (1,6000 km.).

The draining of the sump should be carried out at the end of a run when the oil is hot and therefore will flow more freely. The drain plug is situated at the right-hand rear corner of the sump. When the engine oil is changed, the oil filter which is situated on the right-hand side of the engine, must also receive attention. First, drain the oil from the filter by removing the flat-headed drain plug situated at the bottom of the filter head ; do not disturb the domed plug as this retains the oil pressure relief valve. In the instance of the downward pointing oil filters fitted to later engine units, a drip tray must be positioned beneath the filter while the canister and filter are detached. Unscrew the central bolt and remove the canister and element. Thoroughly wash these parts in petrol and allow to dry out. When replacing the canister ensure that the circular rubber seal in the filter head is renewed. (Attention is drawn to the importance of renewing the filter element at 5,000 miles (8,000 km.) intervals).

Paper oil filter elements must be renewed—NOT WASHED

Distributor—Lubrication

Take great care to prevent oil or grease from getting on or near the contact breaker points.

Remove the moulded cap at the top of the distributor by springing back the two clips. Lift off the rotor arm and apply a few drops of engine oil around the screw now exposed. It is not necessary to remove the screw as it has a clearance to permit the passage of oil.

Apply one drop of oil to the post on which the contact breaker pivots. Lightly smear the cam with grease. Lubricate the centrifugal advance mechanism by injecting a few drops of engine oil through the aperture at the edge of the contact breaker base plate.

Distributor Contact Breaker Points

Check the gap between the contact points with feeler gauges when the points are fully opened by one of the cams on the distributor shaft.

The correct gap is .014"—.016" (.36—.41 mm.).

If the gap is incorrect, slacken the two screws securing the fixed contact plate and turn the eccentric-headed adjustment screw in its slot until the required gap is obtained. Tighten the securing screws and re-check the gap.

Examine the contact breaker points. If the contacts are burned or blackened, clean them with fine carborundum stone or very fine emery cloth. Afterwards wipe away any trace of grease or metal dust with a petrol moistened cloth.

Cleaning of the contacts is made easier if the contact breaker lever carrying the moving contact is removed. To do this, remove the nut, insulating piece and connections from the post to which the end of the contact breaker spring is anchored. The contact breaker lever can now be lifted off its pivot post.

Air Cleaner— 2.4 litre Model

Oil Bath Type

The periods at which maintenance should be carried out will vary according to the conditions under which the car is operated. For normal conditions every 2,500 miles (4,000 km.) can be taken as the proper cleaning periods, but in dusty territories more frequent cleaning, as often as 1,000 miles (1,600 km.) or less may be necessary.

Unscrew the wing nut and remove the top cover. Lift out the filter element and oil base. Wash the element by swishing it up and down in a bowl of paraffin and allow to drain thoroughly. Empty the oil from the oil base and clean out the accumulated sludge. Fill the oil base with engine oil to the level indicated by the arrow. It is unnecessary to re-oil the filter element as this is done automatically when the car is driven. Ensure that the top cover gasket is in good condition and re-assemble the filter.

Air Cleaner—3.4 and 3.8 litre Models

Oil Bath Type

The oil bath cleaner is situated underneath the left-hand front wing and should be completely removed from the car for attention.

The periods at which maintenance should be carried out will vary according to conditions under which the car is operated. For normal conditions every 2,500 miles (4,000 km.) can be taken as the proper cleaning periods, but in dusty territories more frequent cleaning, as often as 1,000 miles (1,600 km.) or less, may be necessary.

Slacken the clip and disconnect the large diameter hose from the cleaner. Slacken the pinch bolt securing the cleaner in the circular retainer and lift out the cleaner complete. Remove the rubber band, unscrew the central screw and withdraw the shell and top cover from the oil base. Lift out the filter element, and wash the element by swishing it up and down in a bowl of paraffin and allow to drain thoroughly. Empty the oil from the oil base and clean out the accumulated sludge. Fill the oil base with engine oil to the level indicated by the arrow. It is unnecessary to re-oil the filter element as this is done automatically when the car is driven. Ensure that the top cover gasket is in good condition.

Re-insert the centre screw through the shell and top cover and assemble to oil base. Refit the rubber band to cover the joint between shell and oil base.

Sparking Plugs

It is advisable to have sparking plugs cleaned on special plug cleaning and testing equipment which is possessed by most Service Stations.

After cleaning, check the gap between the electrodes. The correct gap for the respective models is given in the " Data " section. If adjustment is required, do this by setting the side electrode. Do not attempt to bend or lever against the centre electrode or the insulator may crack.

When replacing the sparking plugs ensure that the threads are clean and that the washers are in good condition.

EVERY 5,000 MILES (8,000 KM.)

Fan Belt Tension—(2.4 models and early 3.4 and 3.8 models).

When the fan belt is correctly tensioned it should be possible to depress the belt about half an inch (12 mm.) midway between the fan and dynamo pulleys.

Adjustment is effected by slackening the three dynamo mounting bolts, moving the dynamo until the correct tension is obtained and tightening the bolts.

Do not overtighten the fan belt or this will cause undue wear of the belt and water pump and dynamo bearings. Slackness of the belt may cause slippage with the possible result of a squealing noise from the belt, a reduced charging rate from the dynamo or overheating of the engine.

Oil Filter Element

It is most important to renew the oil filter element every 5,000 miles (8,000 km.) as after this mileage it will have become choked with impurities.

To guard against the possibility of the filter being neglected to the extent where the element becomes completely choked, a balance valve is incorporated in the filter head which allows *unfiltered* oil to by-pass the element and reach the bearings. This will be accompanied by a drop in the normal oil pressure of some 10 lb. sq. in. (.7 kg./cm^2.) and if this occurs the filter element should be renewed as soon as possible.

The oil filter is situated on the right-hand side of the engine and before removing the canister it will be necessary to drain the filter by removing the flat-headed drain plug situated at the bottom of the filter head ; do not disturb the domed plug as this retains the oil pressure relief valve. In the instance of the downward pointing oil filter fitted to later engine units, a drip tray must be positioned beneath the filter while the canister and filter are detached. To gain access to the element, unscrew the centre bolt when the canister complete with element can be removed. Thoroughly wash out the canister with petrol and allow to dry before inserting the new element.

When replacing the canister fit a new circular rubber in the filter head.

EVERY 10,000 MILES (16,000 KM.)

Engine Sump Strainer (Early Cars)

A gauze bowl-type strainer fitted in the bottom of the engine sump is accessible after removal of the circular cover plate.

After draining the sump during the normal changing of the engine oil, remove the setscrews securing the circular plate and withdraw the plate and strainer, noting the positions of the gaskets. Thoroughly wash the gauze in petrol and allow to dry out. Refit the strainer and cover plate using new gaskets.

Air Cleaner—3.4 and 3.8 litre Models

Paper Element Type

The air cleaner is of the paper element type and is mounted on top of the cylinder head.

No maintenance is necessary but the element should be renewed every 10,000 miles (16,000 km.) or more frequently in dusty territories.

Open the engine compartment, remove the winged nut and washer in the centre of the element container. Lift element container off centre stud, detach bottom plate and remove element ; in some instances the top cover only may lift off leaving the bottom plate behind with the element laying on top.

When replacing the element ensure the rubber sealing ring between the base and bottom cover is correctly seated otherwise air will by-pass the element. Ensure too, the element is correctly located on the bottom cover.

Recommended Lubricants

	Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent Caltex/ Texaco
Engine	Mobil Special or Mobil Super	Castrol GTX	Shell Super Oil	Esso Extra Motor Oil 10W/30 Esso Extra Motor Oil 20W/40	Super Visco Static 10W/40	Q 20-50 or Q5500*	Havoline 20W/40 or 10W/30
Upper cylinder lubrication	Mobil Upperlube	Castrollo	Shell U.C.L. or Donax U.	Esso U.C.L.	U.C.L.	Adcoid Liquid	Regent U.C.L.

* These oils should NOT be used in worn engines requiring overhaul.
If an SAE 30 or 40 oil has previously been used in the engine a slight increase in oil consumption may be noticed but this will be compensated by the advantages gained.

Capacities

	Imperial	U.S.	Litres
Engine (refill)	11 pints	13¼ pints	6¼
Engine (total)	13 pints	15½ pints	7½

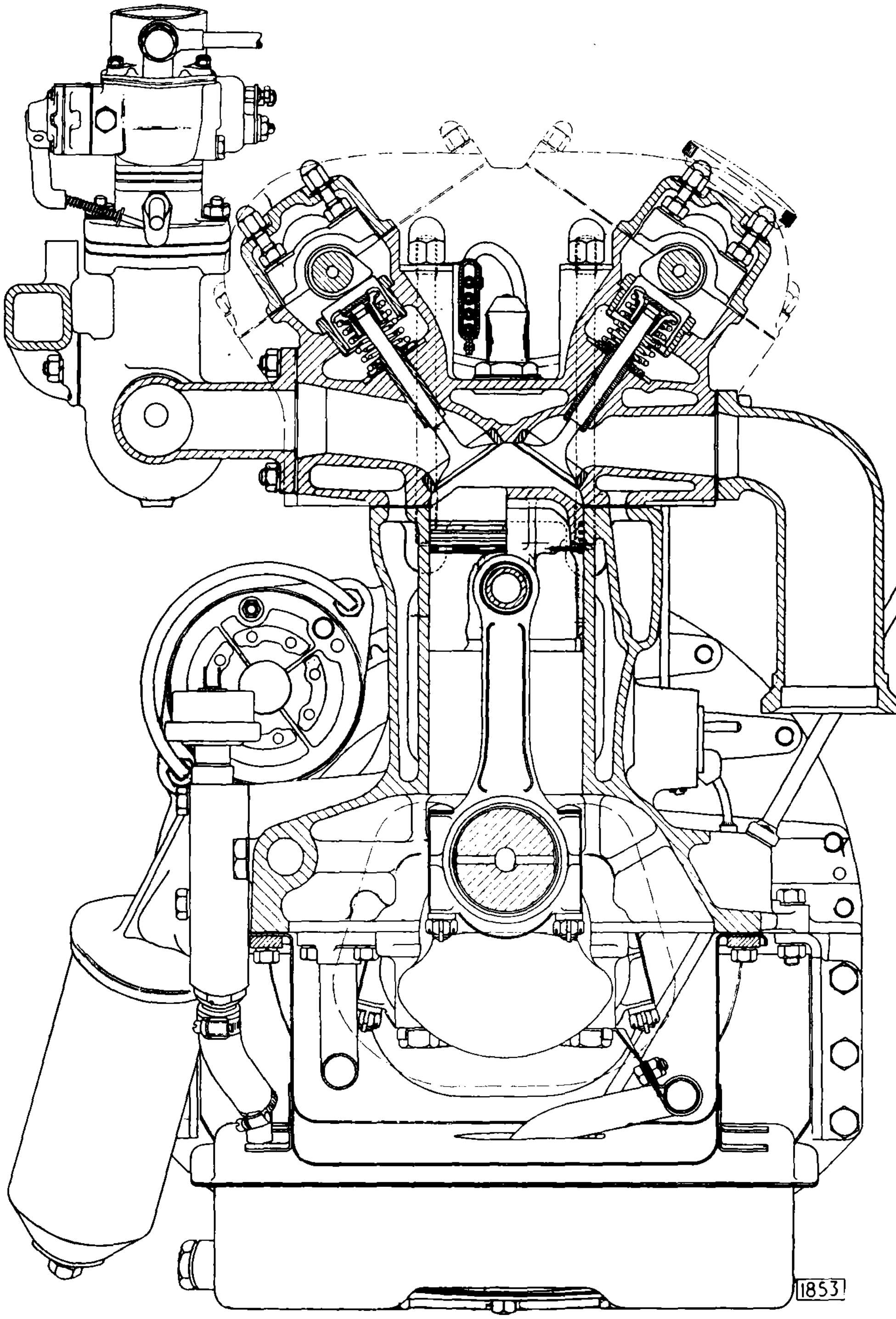


Fig. 1. Cross sectional view of engine (2.4 litre engine illustrated).

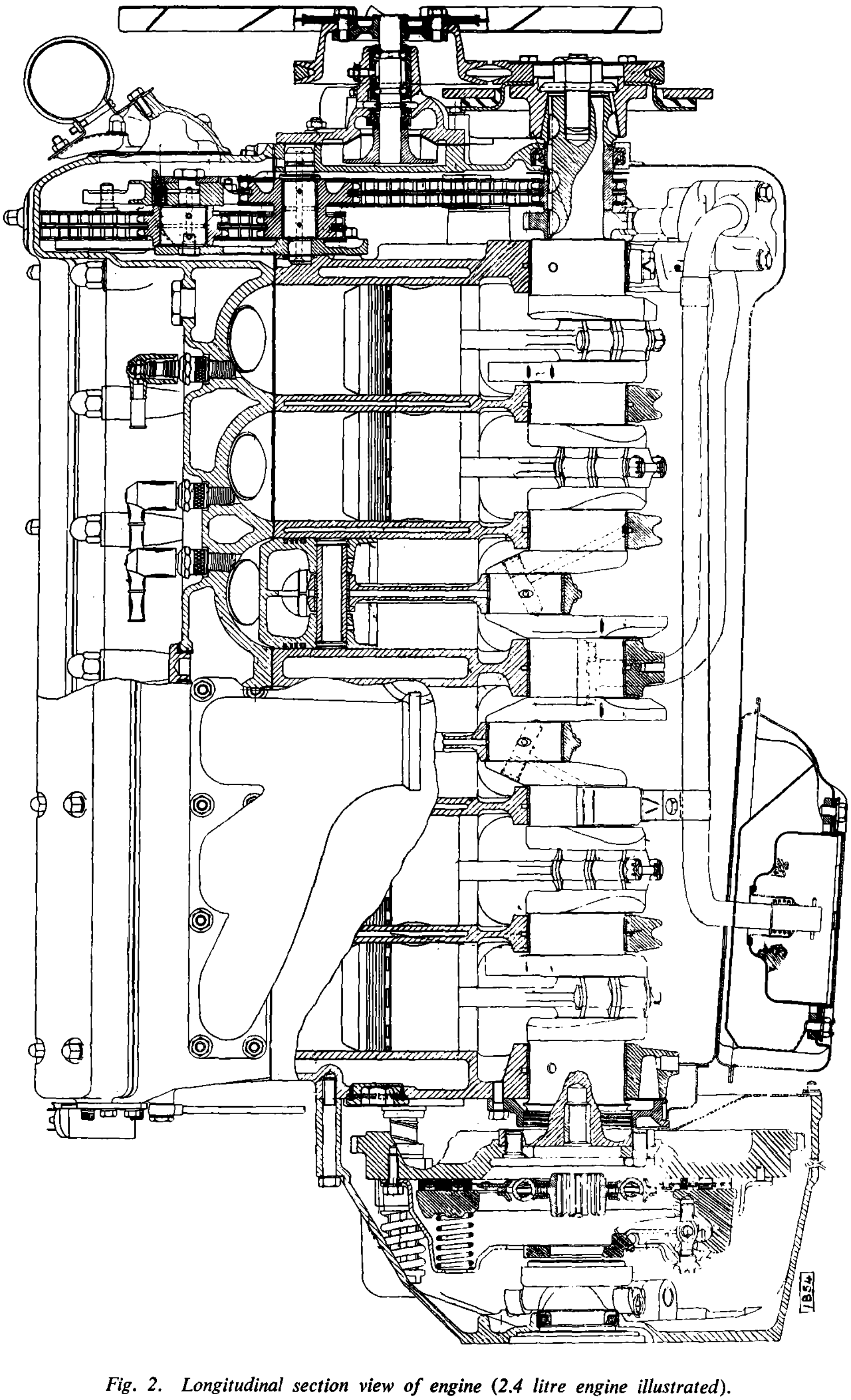


Fig. 2. Longitudinal section view of engine (2.4 litre engine illustrated).

ENGINE REMOVAL AND REFITTING

REMOVAL

Raise the bonnet, mark the hinge positions and remove the bonnet by unscrewing the four setscrews.

Remove the air cleaner and the air intake pipe.

Disconnect the battery. Remove the battery and battery platform.

Drain the engine sump and remove the dipstick.

Drain the cooling system by removing the radiator filler cap, turning the radiator drain tap remote control and the cylinder block drain tap. Conserve the coolant if anti-freeze is in use.

Remove the engine breather pipe by disconnecting the clip securing the flexible pipe to the breather housing.

Remove the washer bottle.

Slacken the clips securing the top and bottom water hoses. Remove the hoses.

Remove the dynamo connections noting that the brown/yellow wire is connected to the large terminal (if a radio is installed, the radio suppressor is also connected to the large terminal). Remove the two mounting bolts and nuts underneath the dynamo. Remove the adjusting bolt situated at the top of the dynamo; disengage the fan belt and lift out the dynamo.

Remove the radiator as follows :—

(a) remove the two setscrews securing the sides of the radiator to the body.

(b) remove the two securing nuts at the bottom of the radiator.

(c) lift out the radiator taking care not to damage the matrix with the fan blades.

(d) unscrew the four nuts securing the cowl and allow the cowl to rest on the water pump housing behind the fan until the radiator is removed.

Disconnect the exhaust system.

Disconnect the clips securing the two heater pipes at the rear of the engine and remove the pipes.

Detach the revolution counter leads from the Lucar tags on the A.C. generator situated at the rear end of the right-hand camshaft cover.

Disconnect the clutch fluid pipe at the bracket at the rear of the cylinder head.

Disconnect the oil pressure gauge pipe at the oil filter.

Detach the flexible rubber vacuum hose from the rigid pipe beneath the inlet manifold adjacent to the ignition distributor vacuum unit.

Disconnect the cable from the starter motor.

Disconnect the two snap connectors from the gearbox harness situated at the rear of the exhaust manifolds.

Withdraw the split pin from the top pin of the accelerator linkage. Disconnect the ball joint at the throttle spindle lever.

On the 2.4 litre models, disconnect the carburetter mixture control wire from the two carburetters.

Remove the lead from the head of the temperature gauge indicator unit situated beneath or in the side of the water outlet pipe for the 2.4 litre or 3.4 and 3.8 litre models respectively.

Remove the wire from the SW terminal of the ignition coil.

Remove the locknut and washer from the engine stabiliser at the rear of the cylinder block.

On 3.4 and 3.8 litre models remove the carburetters as follows :—

(a) remove both banjo bolts and the four fibre washers from the float chambers.

(b) disconnect the two return springs and the distributor vacuum pipes from the front carburetter.

(c) remove the cover on the auxiliary starting carburetter solenoid on the side of the front carburetter and disconnect the electrical cables.

(d) remove the clip attaching the overflow pipes from the float chambers to the oil filter mounting screw and disconnect the union connecting the starter pipe to the auxiliary starter carburetter.

(e) remove the split pin, plain and spring washers from the connecting link pivot pin located on the manifold between front and rear carburetters and disconnect the throttle link rod joint from the ball pin on the bell crank lever.

(f) remove the four nuts and washers securing each carburetter to the inlet manifold. Remove the carburetters.

Remove the gear lever knob, air distribution pipe cover and the rubber grommet.

Disconnect the earth strap from the clutch housing bolt.

Disconnect the speedometer cable from the rear of the gearbox.

Remove the cylinder head securing nuts, numbers 3, 6, 8 and 9. Fit engine lifting plate (Churchill Tool

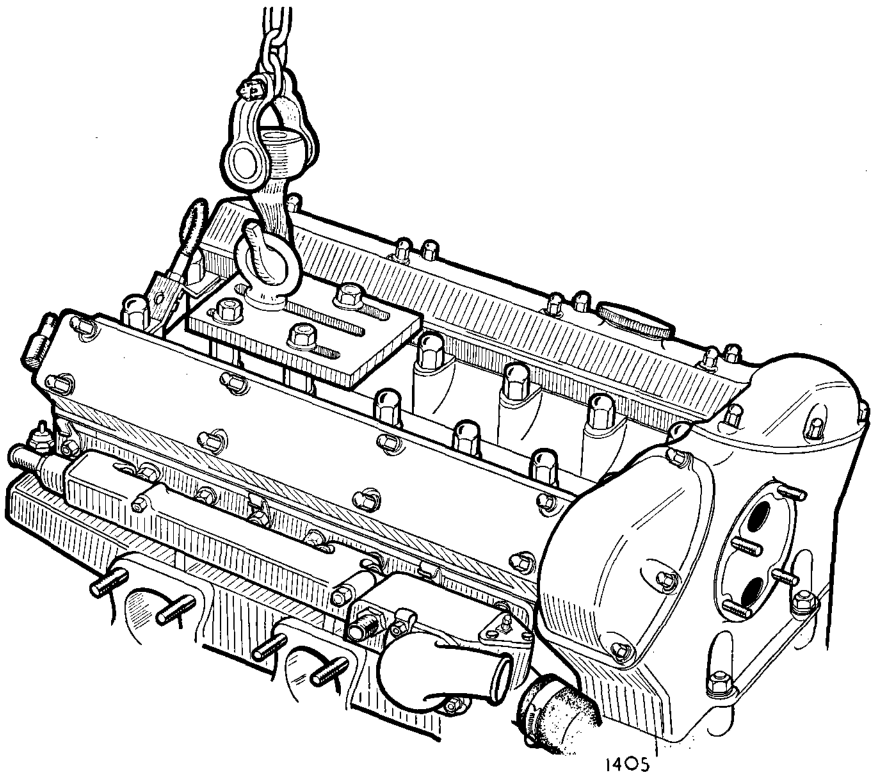


Fig. 3. Showing the lifting plate, Churchill tool No. J.8 in position on the cylinder head studs.

No. J.8) and support the engine on the lifting tackle.

Remove the setscrews securing the engine to the front engine mounting.

Remove the rear engine mounting (see pages B.66 and 67) and the propeller shaft.

In the case of a car fitted with automatic transmission proceed as follows :—

(a) remove the six setscrews securing the rear mounting to the body floor.
(b) remove the two nuts and spring washers securing the mounting plate to the two rubber mountings attached to the rear of the transmission.
(c) remove the mounting plate.
(d) disconnect the propeller shaft from the gearbox flange.
(e) remove the two setscrews securing the centre bearing.
(f) disconnect the propeller shaft from the rear axle flange and remove the propeller shaft.
(g) disconnect the control rod from the selector lever at the left side of the transmission.
(h) remove the selector cable clamp from the reverse servo cylinder on the left front side of transmission.
(i) disconnect the governor control rod from the governor lever at the rear of the transmission.
(j) remove the leads from the "anti-creep" pressure switch and disconnect the intermediate speed hold solenoid feed wire at the snap connector.

Lift the engine from the engine compartment.

REFITTING

Refitting is the reverse of the removal procedure.

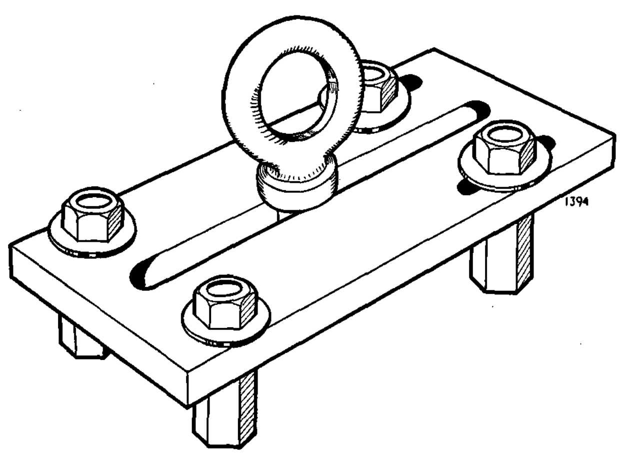


Fig. 4. The engine lifting plate, Churchill Tool No. J.8.

ENGINE—TO DISMANTLE

GENERAL

The following instructions apply when the engine components are removed in the following sequence with the engine unit out of the car. Dismantling of sub-assemblies and the removal of individual components when the engine is in the chassis frame are dealt with separately in this section.

All references made in this section to the top or bottom of the engine assume the engine to be in the normal upright position. References to the left- or right-hand side assume the engine to be upright and looking from the rear.

REMOVE STARTER

Remove the electrical cable from the terminal on the starter. Unscrew the two nuts securing the starter to the clutch housing and withdraw the starter.

REMOVE GEARBOX

Remove the set bolts and nuts securing the clutch housing to the engine and withdraw the gearbox unit. The gearbox must be supported during this operation in order to avoid straining the clutch driven plate and constant pinion shaft.

REMOVE DISTRIBUTOR

Spring back clips and remove the cover complete with high tension leads. Disconnect the electrical cable from the distributor. Slacken the clamp plate bolt and withdraw distributor. Remove the setscrew and remove the clamp plate. Note the cork seal in recess at the top of the distributor drive hole.

REMOVE CYLINDER HEAD

Disconnect the distributor vacuum feed pipe from the front carburetter. Remove the high tension leads from the sparking plugs and lead carrier from the cylinder head studs. Remove the sparking plugs. Disconnect the camshaft oil feed pipe from the rear of the cylinder head. Remove the eleven dome nuts from each camshaft cover and lift off the covers.

Remove the four dome nuts securing the breather housing and withdraw housing. Release the tension on the camshaft chain by slackening the nut on the eccentric idler sprocket shaft, depressing the spring-loaded stop peg and rotating serrated adjuster plate clockwise. Anti-clockwise rotation of the serrated

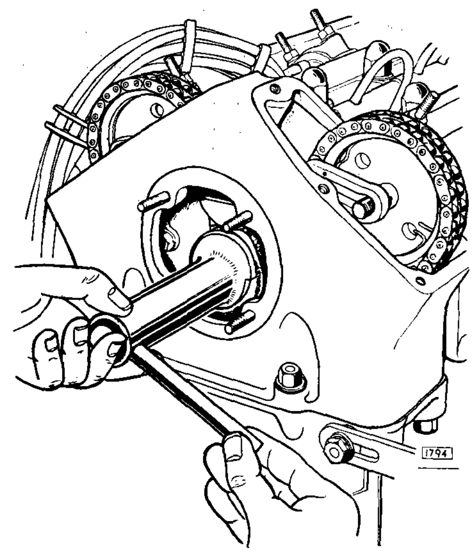


Fig. 5. The top timing chain adjuster, Churchill tool No. J.2 in position.

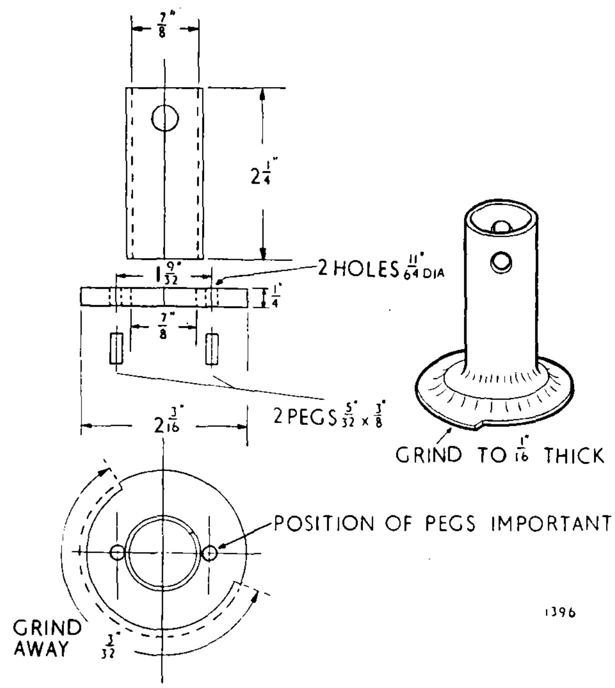


Fig. 6. Top timing chain adjusting tool.

adjuster viewed from the front of the engine tightens the chain.

Break the locking wire on the two setscrews securing the camshaft sprockets to their respective camshafts. Remove the setscrews and withdraw the sprockets from the camshafts with chain in position. Having once disconnected the camshaft sprockets do NOT rotate the engine or camshafts.

Slacken the fourteen cylinder head dome nuts and six nuts securing the front of the cylinder head a part of a turn at a time in the order shown in Fig. 11 until the nuts become free. Lift off the cylinder head complete with exhaust manifold and inlet manifolds. Remove and scrap the cylinder head gasket.

REMOVE CLUTCH AND FLYWHEEL

Unscrew the six setscrews securing the flange of the clutch cover to the flywheel and remove the clutch assembly. Note the balance marks ' B ' stamped on the clutch cover and on the edge of the flywheel.

Knock back the tabs of locking plate securing the ten flywheel bolts. Unscrew the flywheel bolts and remove the locking plate. Remove flywheel from the crankshaft flange by gently tapping with a rawhide mallet.

REMOVE FAN

Remove the fan and fan pulley from the hub by unscrewing the four set bolts fitted with shakeproof washers.

REMOVE CRANKSHAFT DAMPER

Knock back the tab washers and remove the two bolts securing the locking washer to the pulley.

Unscrew the large nut and remove the plain washer.

Insert two levers behind the damper and ease it off the split cone—a sharp tap on the edge of the cone will assist removal.

REMOVE WATER PUMP

Unscrew the set bolts and three nuts, and remove the water pump from the timing cover. Note the gasket between the pump and timing cover.

REMOVE OIL FILTER

Detach the short length of flexible pipe between the oil filter and the oil sump.

Unscrew the four set bolts securing the oil filter to the cylinder block and remove filter.

REMOVE SUMP

Drain the sump by removing the hexagon plug and washer from the right-hand side of the sump.

Remove the twenty-six setscrews securing the sump to the crankcase and the four nuts securing the sump to the timing cover. The sump can now be removed.

REMOVE OIL PUMP AND PIPES

Tap back the tab washers and unscrew the two set bolts securing the oil feed pipe from the oil pump to the bottom face of the crankcase. Withdraw the pipe from the pump.

Remove the nut and bolt securing the oil pump inlet pipe clip to the bracket on the main bearing cap.

Remove the nut and bolt securing the oil pump inlet pipe clip in the bracket on the oil pump.

Withdraw the pipe from the pump.

Tap back the tab washers from the three bolt heads securing the oil pump to the front main bearing cap. The oil pump can now be withdrawn.

Remove the coupling shaft from the squared end of the distributor and oil pump drive shaft.

REMOVE PISTONS AND CONNECTING RODS

As the pistons will not pass the crankshaft it will be necessary to withdraw the pistons and connecting rods from the top.

Remove the split pins from the connecting rod bolt nuts and unscrew nuts. Remove the connecting rod cap, noting that the corresponding cylinder numbers on the connecting rod and cap are together.

Withdraw the piston and connecting rod from top of cylinder block.

Note : Split skirt pistons MUST be fitted with the split opposite to the thrust side, that is, with the split on the left-hand or exhaust side of the engine. To facilitate correct fitting the pistons crowns are marked " Front ".

REMOVE TIMING COVER

Remove the set bolts securing the timing cover to the front face of the cylinder block. Remove the timing cover, noting that the cover is located to the cylinder block by two dowels.

REMOVE TIMING GEAR ASSEMBLY

When removing the bottom timing chain tensioner from the engine, remove the hexagon head plug and tab washer from the end of the body. Insert an Allen key into the hole until it registers in the end of the restraint cylinder. Turn the Allen key clockwise until the restraint cylinder can be felt to be fully retracted within the body. The adjuster head will then be free of the chain.

Knock back the tab washers on the two set bolts. securing the chain tensioner to the cylinder block.

Withdraw the bolts and remove the tensioner together with the conical gauze filter fitted in the tensioner oil feed hole in the cylinder block, this should be cleaned in petrol.

Unscrew the four set bolts securing the front mounting bracket to the cylinder block. Release the tabs of the tab washers and remove the two screwdriver slotted setscrews from the rear mounting bracket ; on the 3.4 and 3.8 litre models these setscrews also secure the intermediate timing chain damper bracket.

The timing gear can now be removed.

REMOVE DISTRIBUTOR DRIVE GEAR

Tap back the tab washer securing the distributor drive gear nut and remove the nut and washer. Tap the squared end of the distributor drive shaft through the gear, noting that the gear is keyed to the shaft. Remove the gear and thrust washer and withdraw the drive shaft.

REMOVE CRANKSHAFT

Knock back the tab washers securing the fourteen main bearing cap bolts. Unscrew the bolts and the main bearing caps, noting the corresponding numbers stamped on the caps and bottom face of crankcase and also the thrust washers fitted to the recesses in the centre main bearing caps.

Detach the bottom half of the oil return thread cover from the top half by unscrewing the two Allen screws. Note that the two halves are located by hollow dowels.

The crankshaft can now be lifted out from the crankcase.

ENGINE—TO ASSEMBLE

GENERAL

All references in this section to the top or bottom of the engine assume the engine to be upright, irrespective of the position of the unit when the reference is made. References to the left- or right-hand side assume the engine to be upright and looking from the rear.

FIT DISTRIBUTOR DRIVE SHAFT BUSH

If a new bush is to be fitted, press the bush into the bore of the lug at front of cylinder block.

Ream the bush in position to a diameter of $\frac{3}{4}''\ {}^{+.0005''}_{-.00025''}$ (19.05 mm. $^{+.012\text{ mm.})}_{-.006\text{ mm.})}$

FIT CRANKSHAFT

Fit the main bearing shells to the top half of the main line bore in the cylinder block. Lay the crankshaft in the bearing shells. Fit the bottom half of the oil return thread cover to the top half which is bolted to the cylinder block behind the rear main bearing. The two halves are located by hollow dowels and secured with Allen screws. The clearance between the oil return thread cover and the oil return thread on the crankshaft should be .0025" to .0055" (.06 to .14 mm.).

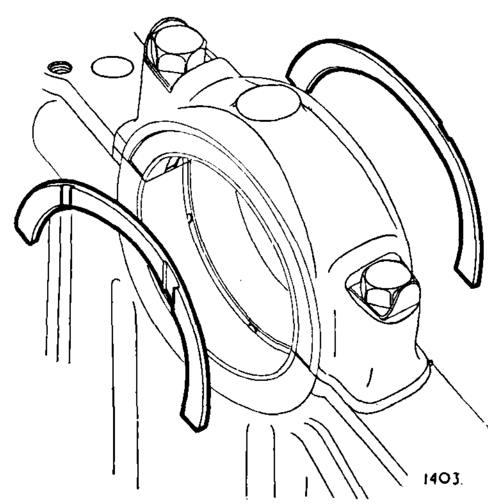


Fig. 7. The crankshaft thrust washers.

The two halves of the oil return thread cover are supplied only as an assembly together with the dowels and screws.

Fit the centre main bearing cap with a thrust washer, white metal side outward, to the recess in each side of cap. Tighten down the cap and check the crankshaft end float, which should be .004" to .006" (.10

to .15 mm.). The thrust washers are supplied in two thicknesses, standard and .004″ (.10 mm.) oversize and should be selected to bring the end float within permissible limits. The oversize thrust washers are stamped +.004″ (.10 mm.) on the steel face.

Fit the main bearing caps with the numbers stamped on the caps with the corresponding numbers stamped on the bottom face of the crankcase.

Fit the main bearing cap bolts and tab washers and tighten to a torque of 83 lb. ft. (11.5 kgm.).

Test the crankshaft for free rotation.

The tab washers for the rear main bearing bolts are longer than the remainder and the plain ends should be tapped down around the bolt hole bosses.

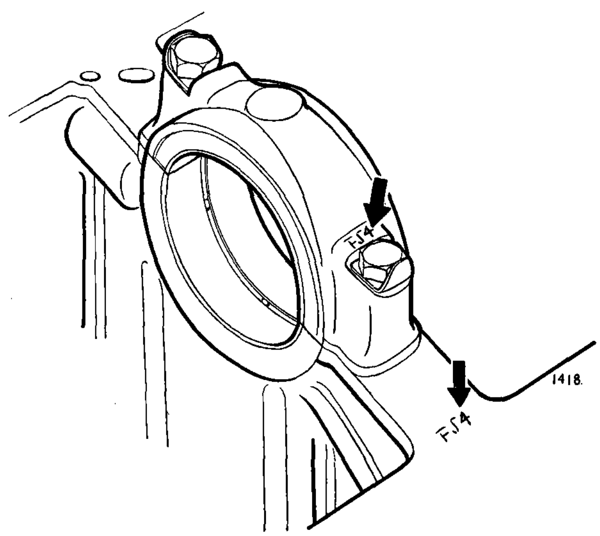


Fig. 8. Showing the corresponding numbers marked on the main bearing cap and crankcase.

FIT PISTONS AND CONNECTING RODS

Turn the engine on its side. Remove the connecting rod caps and fit the pistons and connecting rods to their respective bores from the top of the cylinder block, using a suitable piston ring compressor. The cylinder number is stamped on the connecting rod and cap, No. 1 cylinder being at rear.

Note : Semi-split skirt pistons MUST be fitted with the split opposite the thrust side, that is, with the split on the left-hand or exhaust side of the engine. To facilitate correct fitting the piston crowns are marked " Front ".

Fit the connecting rod caps to the connecting rods with the corresponding numbers together. Fit the castellated nuts and tighten to a torque of 37 lb. ft. (5.1 kg.m.). Secure nut with split pins.

FIT CRANKSHAFT GEAR AND SPROCKET

Fit the Woodruff key and drive on the crankshaft gear with widest part of boss to the rear.

Fit the Woodruff key and drive on the crankshaft sprocket. Fit oil thrower, washer and distance piece.

Turn the engine until Nos. 1 and 6 pistons are on T.D.C.

FIT DISTRIBUTOR AND OIL PUMP DRIVE GEAR

Fit the distributor drive shaft to the bush on front face of the cylinder block with the offset slot in the top of the shaft as in Fig. 9. Fit the thrust washer and drive gear to the drive shaft, noting that the gear is keyed to the shaft.

Fit the pegged tab washer with the peg in the keyway of the drive gear.

Fully tighten nut and secure with the tab washer. Check the end float of shaft which should be .004″ to .006″ (.10 to .15 mm.).

If no clearance exists fit a new oil pump/distributor driving gear which will restore the clearance.

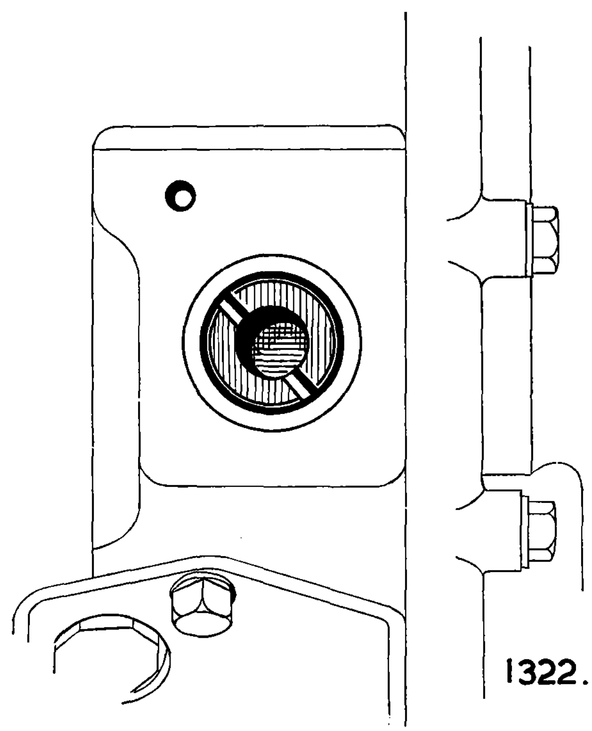


Fig. 9. Showing the position of the distributor drive shaft offset when No. 6 (front) piston is on Top Dead Centre.

FIT OIL PUMP AND PIPES

Fit the coupling shaft between the squared end of the distributor drive shaft and the driving gear of the oil pump. Secure the oil pump to the front main bearing cap by the three dowel bolts and tab washers. Check that there is appreciable end-float of the short coupling shaft. Fit the oil delivery pipe from the oil pump to the bottom face of the crankcase with a new ' O ' ring and gasket. Fit the suction pipe with a new ' O ' ring at the oil pump end.

TO ASSEMBLE TIMING GEAR

Fit the eccentric shaft to the hole in front mounting bracket. Insert the spring and locking plunger for the serrated plate to the hole in the front mounting bracket. Fit the serrated plate and secure with the shakeproof washer and nut. Fit the idler sprocket (21 teeth) to the eccentric shaft.

Fit the two intermediate sprockets (20 and 28 teeth) to their shaft with the larger sprocket forward and press the shaft through lower central hole in rear mounting bracket. Secure with the circlip at the rear of the bracket.

Fit the top timing chain (longer chain) to the small intermediate sprocket and the bottom timing chain (shorter chain) to the large intermediate sprocket.

Loop upper timing chain under the idler sprocket and offer up the front mounting bracket to the rear mounting bracket with the two chain dampers interposed between the brackets.

On the 3.4 and 3.8 litre models fit the intermediate damper to the bottom of the rear mounting bracket with two screwdriver slotted setscrews and tab washers.

Pass the four securing bolts through the holes in the brackets, chain dampers and spacers noting that shakeproof washers are fitted under the bolt heads. Secure the two mounting brackets together with four nuts and shakeproof washers.

FIT TIMING GEAR

Fit the lower timing chain damper and bracket to the front face of the cylinder block with two set bolts and locking plate.

Offer the timing gear assembly up to the cylinder block. Loop the bottom timing chain over the crankshaft sprocket and secure the mounting brackets to the front face of the cylinder block with the four long securing bolts and the two screwdriver slotted setscrews which, on the 3.4 and 3.8 models, also secure the intermediate timing chain damper bracket, but do not fully tighten these two setscrews until the four long securing bolts are tight.

TIMING CHAIN TENSIONER

Place the timing chain tensioner, backing plate and filter in position so that the spigot on the tensioner aligns with the hole in the cylinder block. Fit shims, as necessary, between the backing plate and cylinder block so that the timing chain runs centrally along the rubber slipper. Fit the tab washer and two securing bolts. Tighten the bolts and tap the tab washers against the bolt heads.

It is important that no attempt is made to release the locking mechanism until the adjuster has been finally mounted in the engine WITH THE TIMING CHAIN IN POSITION.

Remove the hexagon head plug and tab washer from the end of the body. Insert the Allen key into the hole until it registers in the end of the cylinder. Turn the key clockwise until the tensioner head moves forward under spring pressure against the chain. Do not attempt to force the tensioner head into the chain by external pressure.

Refit the plug and secure with the tab washer.

FIT TIMING COVER

Fit the circular oil seal to the recess in the bottom face of timing cover, ensuring that seal is well bedded in its groove.

Fit the timing cover gasket with good quality jointing compound and secure the timing cover to the front face of the cylinder block with the securing bolts. Do not forget to fit the dynamo adjusting link and distance piece, with the distance piece interposed between the link and the timing cover.

FIT OIL SUMP

Fit a new sump gasket to the bottom face of the crankcase. Fit the cork seal to the recess in the rear main bearing cap.

Fit the sump to the crankcase and secure with the twenty-six set screws, four nuts and washers.

Note : The short setscrew must be fitted to the right-hand front corner of the sump.

Fit the sump strainer cover in position at the bottom of the sump using new gaskets.

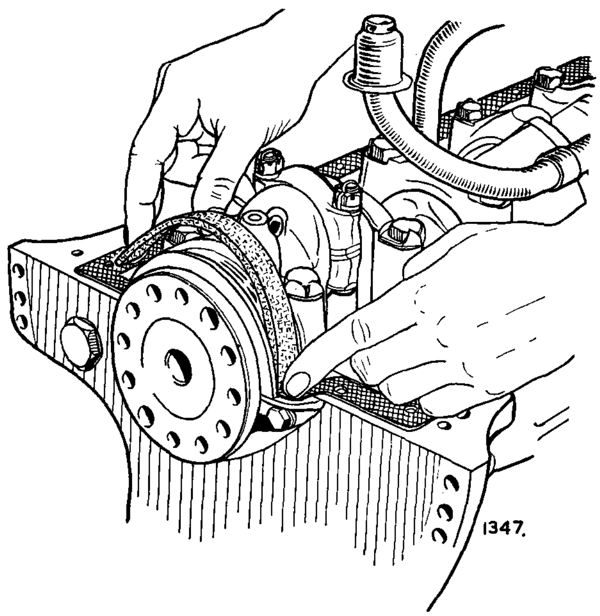


Fig. 10. Fitting the rear oil seal.

FIT FLYWHEEL AND CLUTCH

Turn the engine upright.

Check that the crankshaft flanges and the holes for the flywheel bolts and dowels are free from burrs.

Turn the engine until Nos. 1 and 6 pistons are on T.D.C. and fit the flywheel to the crankshaft flange so that the ' B ' stamped on the edge of the flywheel is at approximately the B.D.C. position. (This will ensure that the balance mark ' B ' on the flywheel is in line with the balance mark on the crankshaft which is a group of letters stamped on the crank throw just forward of the rear main journal).

Tap the two mushroom-headed dowels into position, fit the locking plate and flywheel securing set screws. Tighten the set screws to a torque of 67 lb. ft. (9.2 kg.m.) and secure with the locking plate tabs. Assemble the clutch driven plate to the flywheel, noting that one side of the plate is marked " Flywheel Side ". Centralise the driven plate by means of a dummy shaft which fits the splined bore of the driven plate and the spigot bush in the crankshaft. (A constant pinion shaft may be used for this purpose). Fit clutch cover assembly so that the ' B ' stamped adjacent to one of the dowel holes coincides with the ' B ' stamped on the periphery of the flywheel. Secure the clutch assembly with the six set screws and spring washers, tightening the screws a turn at a time by diagonal selection. Remove the dummy shaft.

FIT CYLINDER HEAD

Before refitting the cylinder head it is important to observe that if the camshafts are out of phase with piston position fouling may take place between the

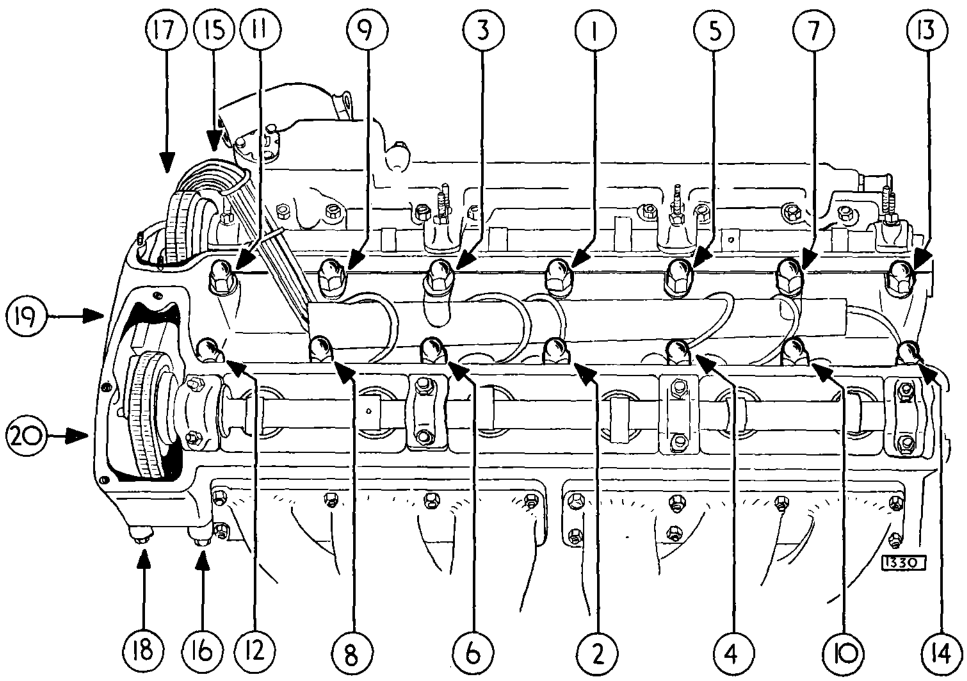


Fig. 11. Tightening sequence for the cylinder head nuts.

valves and pistons. It is, therefore, essential to adhere to the following procedure before fitting the cylinder head :—

Check that the grooves in the front flanges of the camshafts are vertical to the camshaft housing face and accurately position by engaging the valve timing gauge. If it is found necessary to rotate one of the camshafts the other camshaft must either be removed or the bearing cap nuts slackened to their fullest extent to allow the valves to be released.

Turn No. 6 (front) piston to the top dead centre position with the widest portion of the distributor drive shaft offset positioned as shown in Fig. 9.

Do NOT rotate the engine or camshafts until the camshaft sprockets have been connected to the camshafts. Fit the two camshaft sprockets complete with adjuster plates and circlips to the top timing chain and enter the guide pins in the slots in the front mounting bracket.

Fit the cylinder head gasket, taking care that the side marked " Top " is uppermost. Fit the cylinder head complete with manifolds to the cylinder block. Note that the second cylinder head stud from the front on the left-hand side is a dowel stud.

Fit the sparking plug lead carrier to the 3rd and 6th stud on the right-hand side. Fit plain washers to these and the two front stud positions and ' D ' washers to the remaining studs. Tighten the fourteen large cylinder head dome nuts a part of a turn at a time to a torque of 54 lb. ft. (7.5 kg.m.) in the order shown in Fig. 11. Also tighten the six nuts securing the front end of the cylinder head.

VALVE TIMING

Check that the No. 6 (front) piston is exactly in the T.D.C. position.

Through the breather aperture in the front of the cylinder head, slacken the lock nut securing the serrated plate.

With the camshaft sprockets on the flanges of the camshafts, tension chain by pressing locking plunger inwards and rotating serrated plate by the two holes in an anti-clockwise direction.

When correctly tensioned there should be slight flexibility on both outer sides of the chain below the camshaft sprockets, that is the chain must not be dead tight. Release the locking plunger and securely tighten the locknut. Tap the camshaft sprockets off the flanges of the camshafts.

Accurately position the camshaft with the valve timing gauge, and check that the T.D.C. marks are in exact alignment.

Withdraw the circlips retaining the adjusting plates to the camshaft sprockets and pull the adjusting plates forward until the serrations disengage. Replace the sprockets on to the flanges of camshafts and align the two holes in the adjuster plate with the two tapped holes in each camshaft flange. Engage the serrations of the adjuster plates with the serrations in the sprockets.

Note : It is most important that the holes are in exact alignment, otherwise when the setscrews are fitted the camshafts will be moved out of position. If difficulty is experienced in aligning the holes exactly, the adjuster plates should be turned through 180°, which, due to the construction of the plate, will facilitate alignment.

Fit the circlips to the sprockets and one setscrew to the accessible hole in each adjuster plate. Turn the engine until the other two holes are accessible and fit the two remaining setscrews.

Finally, recheck the timing chain tension and timing in this order. Secure the four setscrews for camshaft sprockets with new lock wire.

FIT CYLINDER HEAD OIL FEED PIPE AND OIL FILTER

Fit the cylinder head oil feed pipe from the tapped hole in the main oil gallery to the two tapped holes in the rear of the cylinder head. Secure the pipe with the three banjo bolts with a copper washer fitted to both sides of each banjo.

Fit the oil filter to the cylinder block with the four setscrews and copper washers. New gasket(s) must always be fitted between the filter and cylinder block.

Fit the short length of flexible hose between the oil filter head and the oil sump and tighten two hose clips.

FIT CRANKSHAFT DAMPER AND PULLEY

Fit a Woodruff key to the crankshaft and the split cone. Fit the split cone to the crankshaft with the widest end towards the timing cover. Fit the damper to the cone and secure with the flat washer, chamfered side outwards, and large nut. Retain the large nut with the locking plate and secure with two setscrews. Secure the setscrews with the tabs at each end of the locking plate.

FIT WATER PUMP

Fit the water pump to the timing cover with a new gasket and secure with six bolts, three nuts and spring washers.

FIT FAN

Fit the fan and pulley and secure with four setscrews and washers.

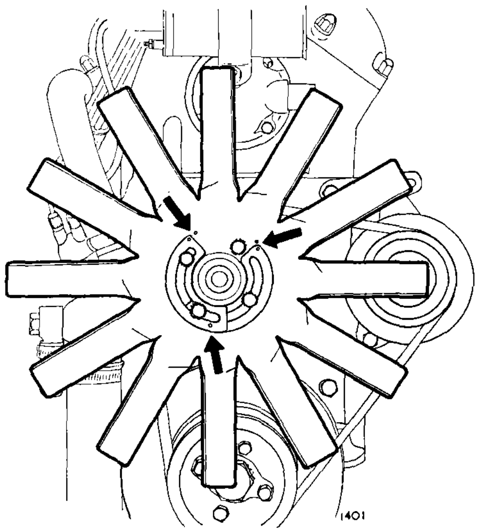


Fig. 12. The arrows indicate the balance piece location marks.

FIT DYNAMO AND FAN BELT

(2.4 models and early 3.4 and 3.8 models)

Slacken the setscrew securing the dynamo adjusting link to the timing cover and swing link upwards.

Fit the fan belt to crankshaft and fan pulleys. Offer up dynamo and engage fan belt with pulley. Secure dynamo with the two mounting bolts and the adjusting setscrew. Before finally tightening, adjust fan belt tension by pulling dynamo outwards until the belt can be flexed approximately $\frac{1}{2}''$ (12 mm.) either way in the middle of the vertical run. Tighten the adjusting setscrew and the two dynamo mounting bolts.

Note : Undue tension will create heavy wear of belt, pulleys, fan and dynamo bearings.

FIT DISTRIBUTOR AND SPARKING PLUGS

Fit the cork seal to the recess at the top of the hole for the distributor. Secure the distributor clamping plate to the cylinder block with the setscrew. Slacken the clamping plate bolt.

Set the micrometer adjustment in the centre of the scale.

Enter the distributor into the cylinder block with the vacuum advance unit connection facing the cylinder block.

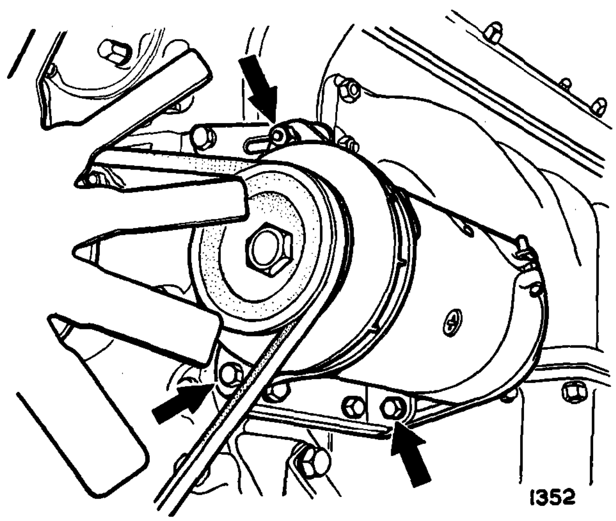


Fig. 13. The dynamo mounting bolts.

Rotate the rotor-arm until the driving dog engages with the distributor drive shaft.

Rotate the engine until the rotor-arm approaches the No. 6 (front) cylinder segment in the distributor cap.

Slowly rotate the engine until the ignition timing scale on the crankshaft damper is the appropriate number of degrees before the pointer on the sump.

Slowly rotate the distributor body until the points are just breaking.

Tighten the distributor plate pinch bolt.

A maximum of six clicks on the vernier adjustment from this setting, to either advance or retard, is allowed.

Fit the vacuum advance pipe from the distributor to the union on the front carburetter.

Fit the distributor cover and secure with the two spring clips. Fit the sparking plugs with new copper washers and attach high tension leads.

FIT CAMSHAFT COVERS

Fit each camshaft cover to the cylinder head using a new gasket. Fit the eleven copper washers and dome nuts to the cover retaining studs but do not tighten fully.

Fit the revolution counter generator and flanged plug to the rear of right-hand and left-hand camshaft covers respectively with the rubber sealing rings seated in the recesses provided. Secure with the setscrews and washers. Tighten fully the dome nuts securing the camshaft covers.

FIT STARTER

Fit the starter motor to the clutch housing with the two bolts, nuts and spring washers.

FIT GEARBOX

Fit the gearbox and clutch housing to the rear of the crankcase with setscrews and shakeproof washers.

Fit the support brackets to each side, at the bottom face of the crankcase with two bolts, nuts and spring washers, and to the clutch housing with three bolts, nuts and shakeproof washers.

DECARBONISING AND GRINDING VALVES

REMOVE CYLINDER HEAD

Remove the cylinder head as described on page 41.

REMOVE VALVES

With the cylinder head on the bench remove the inlet manifold, and the revolution counter generator.

Remove the four bearing caps from each camshaft and lift out the camshaft (note mating marks on each bearing cap).

Remove the twelve tappets and adjusting pads situated between tappets and valve stems. Lay out the tappets and pads in order, to ensure that they can be replaced in their original guides.

Obtain a block of wood the approximate size of the combustion chambers and place this under the valve heads in No. 1 cylinder combustion chamber. Press down the valve collars and extract the split cotters. Remove the collars, valve springs and spring seats. Repeat for the remaining five cylinders. Valves are numbered and must be replaced in their original locations, No. 1 cylinder being at the rear, that is the flywheel end.

DECARBONISE AND GRIND VALVES

Remove all traces of carbon and deposits from the combustion chambers from the induction and exhaust ports. The cylinder head is of aluminium alloy and great care should be exercised not to damage this with scrapers or sharp pointed tools. Use worn emery cloth and paraffin only. Thoroughly clean the water passages in the cylinder head. Clean the carbon deposits from the piston crowns and ensure that the top face of the cylinder block is quite clean particularly round the cylinder head studs. Remove any pitting in the valve seats, using valve seat grinding equipment. Reface the valves if necessary using valve grinding equipment ; grind the valves to the seats, using a suction valve grinding tool.

Clean the sparking plugs and set gaps ; if possible use approved plug cleaning and testing equipment. Clean and adjust distributor contact breaker points.

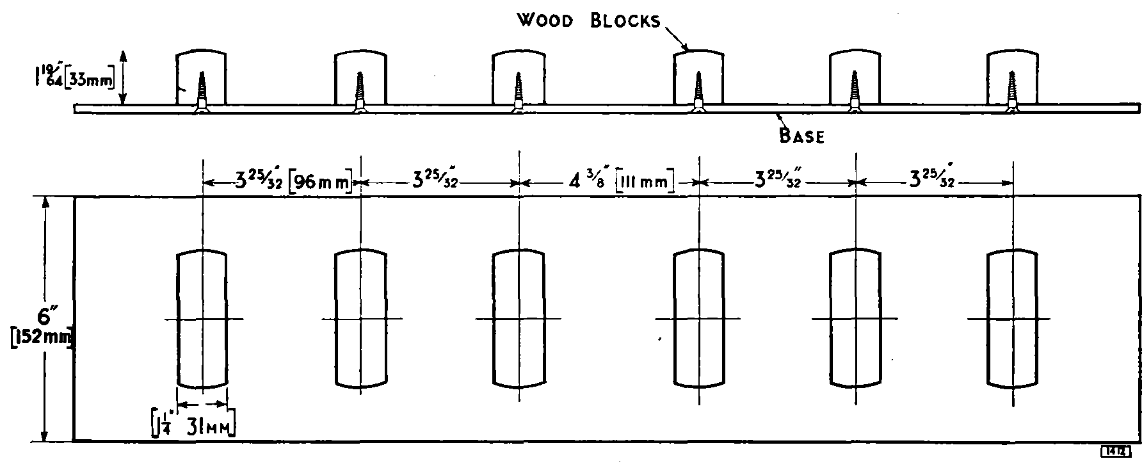


Fig. 14. Combustion chamber blocks for valve removal.

VALVE CLEARANCE ADJUSTMENT

Thoroughly clean all traces of valve grinding compound from the cylinder head and valve gear. Assemble the valves to the cylinder head. **When checking the valve clearances the camshafts must be fitted one at a time as if one camshaft is rotated when the other camshaft is in position, fouling is likely to take place between the inlet and exhaust valves. Obtain and record all valve clearances by using a feeler gauge between the back of each cam and the appropriate valve tappet.**

Correct valve clearances are :—

Inlet	.004″ (.10 mm.).
Exhaust	.006″ (.15 mm.).

Adjusting pads are available rising in .001″ (.03 mm.) sizes from .085″ to .110″ (2.16 to 2.79 mm.) and are etched on the surface with the letter ' A ' to ' Z ', each letter indicating an increase in size of .001″ (.03 mm.). Should any valve clearance require correction, remove the camshaft, tappet and adjusting pad. Observe the letter etched on the existing adjusting pad and should the recorded clearance for this valve have shown say .002″ (.05 mm.) excessive clearance, select a new adjusting pad bearing a letter two lower than the original pad.

As an example, assume that No. 1 inlet valve clearance is tested and recorded as .006″ (.15 mm.) On removal of the adjusting pad, if this is etched with the letter ' D ' then substitution with a pad bearing the letter ' F ' will correct the clearance for No. 1 inlet valve.

When fitting the camshafts prior to fitting the cylinder head to the engine it is most important that the keyway in the front bearing flange of each camshaft is perpendicular (at 90°) to the adjacent camshaft cover face (using valve timing gauge) before tightening down the camshaft bearing cap nuts.

Tighten the camshaft bearing cap nuts to a torque of 9 lb.ft. (1.24 kg.m.).

REFIT CYLINDER HEAD

Before attempting to refit the cylinder head refer to the instructions given on page 42.

COMPRESSION PRESSURES

The compression pressures for all the six cylinders should be even and should approximate to the figures given below.

If one or more compressions are weak it will most probably be due to poor valve seatings when the cylinder head must be removed and the valves and valve seats refaced and reground.

COMPRESSION PRESSURES

7 to 1 compression ratio : 125 lb per sq. in. (8.79 kg/cm²).

8 to 1 compression ratio : 155 lb per sq. in. (10.90 kg/cm²).

9 to 1 compression ratio : 180 lb per sq. in. (12.65 kg/cm²).

Pressures must be taken with all the sparking plugs removed, carburettor throttles wide open and the engine at its normal operating temperature (70°C approximately).

Note : When taking compression pressures ensure that the ignition switch is 'off'; rotate the engine by operating the push button on the starter solenoid.

On automatic transmission models it will first be necessary to remove the rubber and metal cover from the end of the solenoid to enable the switch to be operated. Check that the selector lever is in the P (Park) position before operating the starter. Replace the solenoid push button cover after the pressure tests have been taken.

THE CONNECTING ROD AND BEARINGS

The connecting rods are steel stampings and are provided with precision shell big-end bearings and steel backed phosphor-bronze small end bushes. A longitudinal drilling through the connecting rod provides an oil feed from the big end to the small end bush.

REMOVAL

As the pistons will not pass the crankshaft it will be necessary to withdraw the pistons and connecting rods from the top.

Proceed as follows :—

Remove Cylinder Head

Remove the cylinder head as described on page 41.

Remove Sump

Remove the sump as described on page 51.

Remove Piston and Connecting Rod

Remove the split pins from the connecting rod bolt nuts and unscrew the nuts. Remove the connecting rod cap, noting that the corresponding cylinder numbers on the connecting rod and cap are on the same side. Remove the connecting rod bolts and withdraw the piston and connecting rod from the top of the cylinder block.

OVERHAUL

If connecting rods have been in use for a very high mileage, or if bearing failure has been experienced, it is desirable to renew the rod(s) owing to the possibility of fatigue.

The connecting rods fitted to an engine should not vary one with another by more than 2 drams (3.5 grammes). The alignment should be checked on an approved connecting rod alignment jig. Correct any misalignment as necessary. The big end bearings are of the precision shell type and under no circumstances should they be hand scraped or the bearing caps filed.

The small ends are fitted with steel-backed phosphor-bronze bushes which are a press fit in the connecting rod. After fitting, the bush should be reamed or honed to a diameter of .875" to .8752" (22.225 to 22.23 mm.). Always use new connecting bolts and nuts at overhauls.

REFITTING

Refitting is the reverse of the removal procedure. Pistons and connecting rods must be fitted to their respective cylinders (pistons and connecting rods are stamped with their cylinder number, No. 1 being at the rear) and the same way round in the bore.

The pistons must be fitted with split on the left-hand or exhaust side of the engine. To facilitate correct fitting the piston crowns are marked " Front ", see Fig. 36.

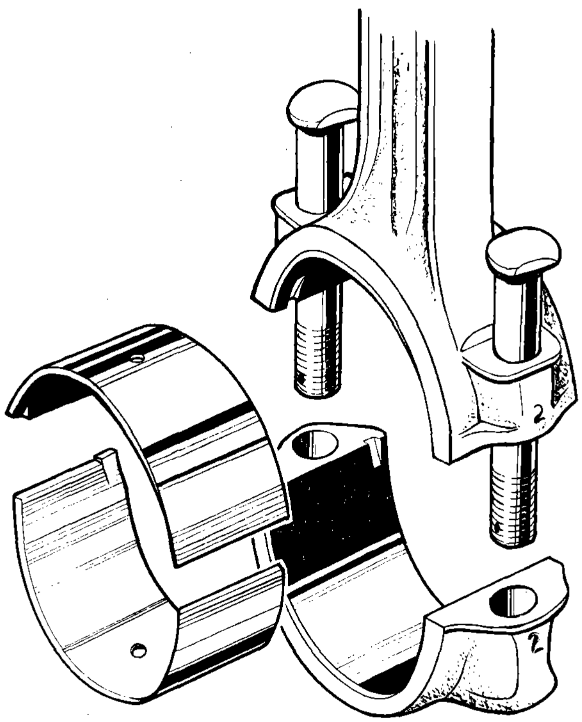


Fig. 15. The connecting rod and cap are stamped with the cylinder number.

The cap must be fitted to the connecting rod so that the cylinder numbers stamped on each part are on the same side.

Tighten the connecting rod nuts to a torque of 37 lb ft (5.1 kgm.).

BIG-END BEARING REPLACEMENT

The big-end bearings can be replaced without removing the engine from the car but before fitting the new bearings the crankpin must be examined for damage or for the transfer of bearing metal. The oilway in the crankshaft must also be tested for blockage.

Remove the sump as described on page 51.

Turn the engine until the big-end is approximately at the bottom dead centre position.

Remove the split pins from the connecting rod bolt nuts and unscrew the nuts. Remove the connecting rod cap, noting that the corresponding cylinder numbers on the connecting rod and cap are on the same side.

Lift the connecting rod off the crankpin and detach the bearing shell.

If all the big-end bearings are to be replaced they are most easily replaced in pairs, that is, in pairs of connecting rods having corresponding crank throws.

THE CAMSHAFTS

The camshafts are manufactured of cast iron and each shaft is supported in four white metal steel backed bearings. End float is taken on the flanges formed at each side of the front bearing. Oil is fed from the main oil gallery to the camshaft rear bearing housings through an external pipe. Oil then passes through the rear bearing into a longitudinal drilling in the camshaft ; cross drillings which break into this oilway feed the three remaining bearings. On later engines a drilling is made through the base of each cam into the oilway to reduce tappet noise when starting from cold.

Warning : Before carrying out any work on the camshafts the following points must be observed to avoid possible fouling between (a) the inlet and exhaust valves and (b) the valves and pistons.

(1) Do NOT rotate the engine or the camshafts with the camshaft sprockets disconnected. If, with the cylinder head removed from the engine, it is required to rotate a camshaft, the other camshaft must either be removed or the bearing cap nuts slackened to their fullest extent to allow the valves to be released.

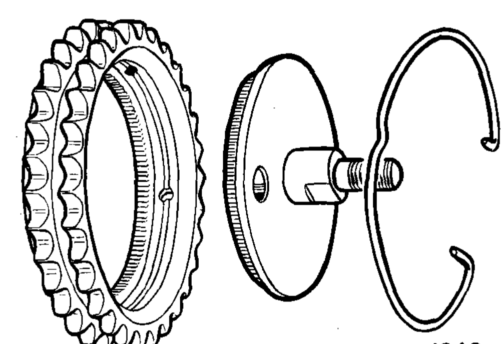


Fig. 16. Exploded view of the camshaft sprocket assembly.

(2) When fitting the camshafts to the cylinder head ensure that keyway in the front bearing flange of each camshaft is perpendicular (at 90°) to the adjacent camshaft cover face (use valve timing gauge) before tightening down the camshaft bearing cap nuts.

If this operation is being carried out with the cylinder head fitted to the engine, rotate the engine until No. 6 (front) piston is on Top Dead Centre in the firing position, that is with the distributor rotor opposite No. 6 cylinder segment, before fitting the camshafts.

REMOVAL

Remove the eleven dome nuts and copper washers securing each camshaft cover and lift off the cover.

Unscrew the three Allen setscrews attaching the revolution counter generator to the right-hand side of the cylinder head and the sealing plug from the left-hand side (note the copper washers under the heads of the setscrews and the half gaskets between the sealing plug and the cylinder head). Remove the circular rubber sealing rings.

Break the wire locking the camshaft adjuster plate setscrews.

Rotate the engine until No. 6 (front) piston is approximately on Top Dead Centre on compression stroke (firing position), that is, when the keyway in the front bearing flange of each camshaft is at 90° to the adjacent cover face (see Fig. 17).

Note the positions of the **inaccessible** adjuster plate setscrews and rotate the engine until they can be removed.

Turn back the engine to the T.D.C. position with No. 6 firing and remove the two remaining setscrews.

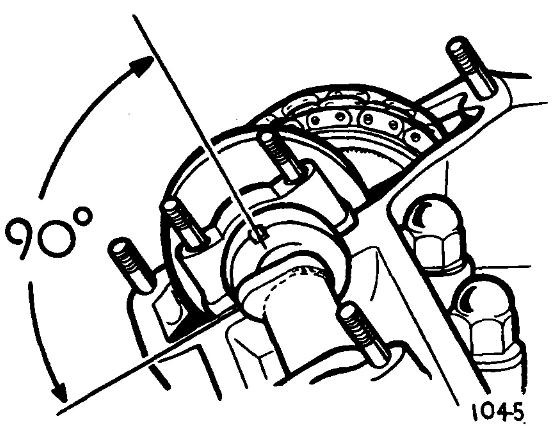


Fig. 17. When fitting a camshaft the keyway must be at 90° to the camshaft cover face.

Tap the sprockets off their respective camshaft flanges. Release the eight nuts securing the bearing caps a turn at a time. Remove the nuts, spring washers and ' D ' washers from the bearing studs.

Remove the bearing caps, noting that the caps and cylinder head are marked with corresponding numbers. Also note that the bearing caps are located to the lower bearing housings with hollow dowels.

If the same bearing shells are to be replaced they should be refitted to their original positions.

The camshaft can now be lifted out from the cylinder head.

REFITTING

Check that No. 6 (front) piston is exactly on T.D.C. on the compression stroke (firing position), that is, with the distributor rotor opposite No. 6 cylinder segment.

Replace the shell bearings—in their original positions if the same bearings are being refitted.

Replace each camshaft with the keyways in the front bearing flange at 90° to the adjacent cover face (using the valve timing gauge).

Refit the bearing caps to their respective positions and the ' D ' washers, spring washers and nuts.

Tighten down the bearing caps evenly a turn at a time. Finally tighten the nuts to a torque of 9 lb. ft. (1.24 kg.m.).

Set the valve timing as described on page 64.

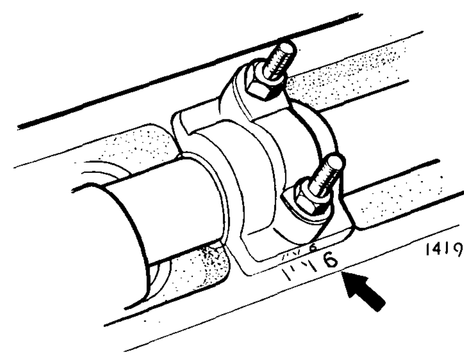


Fig. 18. Showing the corresponding numbers on the bearing cap and cylinder head.

OVERHAUL

It is unlikely, except after very high mileages, to find wear in the camshafts and camshaft bearings. The camshaft bearings are of the precision shell type and under no circumstances should these be hand scraped or the bearing caps filed. Undersize bearings are not supplied.

THE CRANKSHAFT

The counterbalanced crankshaft is of manganese molybdenum steel and is supported in seven precision shell bearings. End thrust of the crankshaft is taken on two semi-circular white metal faced steel thrust washers fitted in recesses in the centre main bearing cap. A torsional vibration damper is fitted at the front end of the crankshaft.

Initially, the crankshaft is itself balanced both statically and dynamically and is then re-balanced as an assembly with the flywheel and clutch unit attached.

REMOVAL

Proceed as detailed under " Engine—To Dismantle " on page 21.

OVERHAUL

Regrinding of the crankshaft journals is generally recommended when wear or ovality in excess of .003″ (.08 mm.) is found. Factory reconditioned crankshafts are available on an exchange basis, subject to the existing crankshaft being fit for satisfactory reconditioning, with undersize main and big end bearings —.010″ (.25 mm.), —.020″ (.51 mm.), —.030″ (.76 mm.), and —.040″ (1.02 mm.).

Grinding beyond the limits of .040″ (1.02 mm.) is not recommended and under such circumstances a new crankshaft should be obtained.

New crankshaft thrust washers should be fitted, these being in two halves located in recesses in the centre main bearing cap. Fit the main bearing cap with a thrust washer, white metal side outwards, to the recess in each side of cap. Tighten down the cap and check the crankshaft end float, which should be .004″ to .006″ (.10 to .15 mm.). The thrust washers are supplied in two thicknesses, standard and .004″ (.10 mm.) oversize and should be selected to bring the end float within the required limits. It is permissible to fit a standard size thrust washer to one side of the main bearing cap and an oversize washer to the other. Oversize thrust washers are stamped .004″ on the steel face.

Ensure that the oil passages in the crankshaft are clear and perfectly clean before re-assembling. If the original crankshaft is to be refitted, remove the Allen headed plugs in the webs (which are secured by staking) and thoroughly clean out any accumulated sludge with a high pressure jet followed by blowing out with compressed air.

After refitting the plugs, secure by staking with a blunt chisel.

REFITTING

Proceed as detailed under " Engine—To Re-assemble " on page 23.

CRANKSHAFT DAMPER AND PULLEY

A torsional vibration damper is fitted at the front end of the crankshaft.

The damper consists of a malleable iron ring bonded to a thick rubber disc. An inner member also bonded to the disc is attached to a hub which is keyed to a split cone on the front extension of the crankshaft.

The crankshaft damper and pulley are balanced as an assembly and if they are to be separated mark each part before dismantling so that they can be refitted in their original positions.

REMOVAL

In order to remove the crankshaft damper it will first be necessary to remove the radiator. Remove the two setscrews securing the radiator at the sides and the nuts from the two mountings at bottom of the radiator. On cars fitted with a fan cowl remove the four nuts and hang the cowl on the fan. Lift out the radiator taking care not to damage the matrix on the fan blades.

Remove the fan belt after slackening the dynamo and pushing towards the engine.

On the 3.4 and 3.8 litre models remove the locking washer securing the damper bolt by knocking back the tabs and unscrewing the two setscrews. Unscrew the large damper securing bolt and remove the flat washer. Insert two levers behind the damper and ease it off the split cone—a sharp tap on the end of the cone will assist removal.

On the 2.4 litre model remove the locking washer securing the damper bolt by knocking back the tabs and unscrewing the two setscrews. Remove the four remaining setscrews when the pulley and damper can be removed.

OVERHAUL

Examine the rubber portion of the damper for signs of deterioration and if necessary fit a new one. Also examine the crankshaft pulley for signs of wear and renew if necessary. The drive should be taken on the ' V ' faces of the pulley ; renew the pulley if a new fan belt bottoms in the ' V ' groove.

REFITTING

Refitting is the reverse of the removal procedure. On the 2.4 litre model fit the damper to the hub so that the timing scale is at the same side as the keyway in the hub.

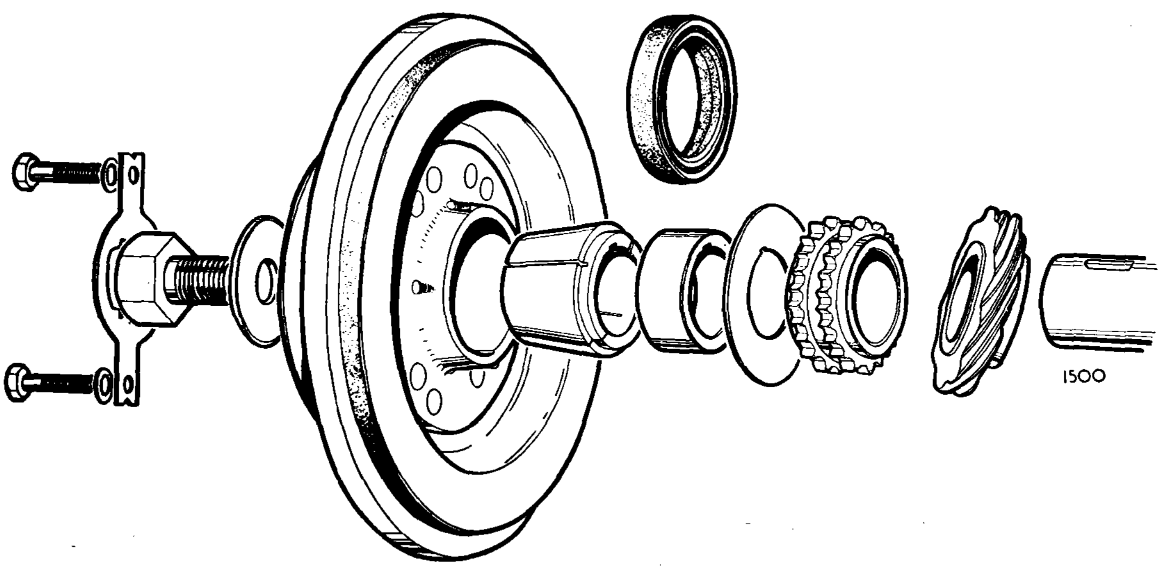


Fig. 19. The crankshaft damper (3.4/3.8 litre illustrated).

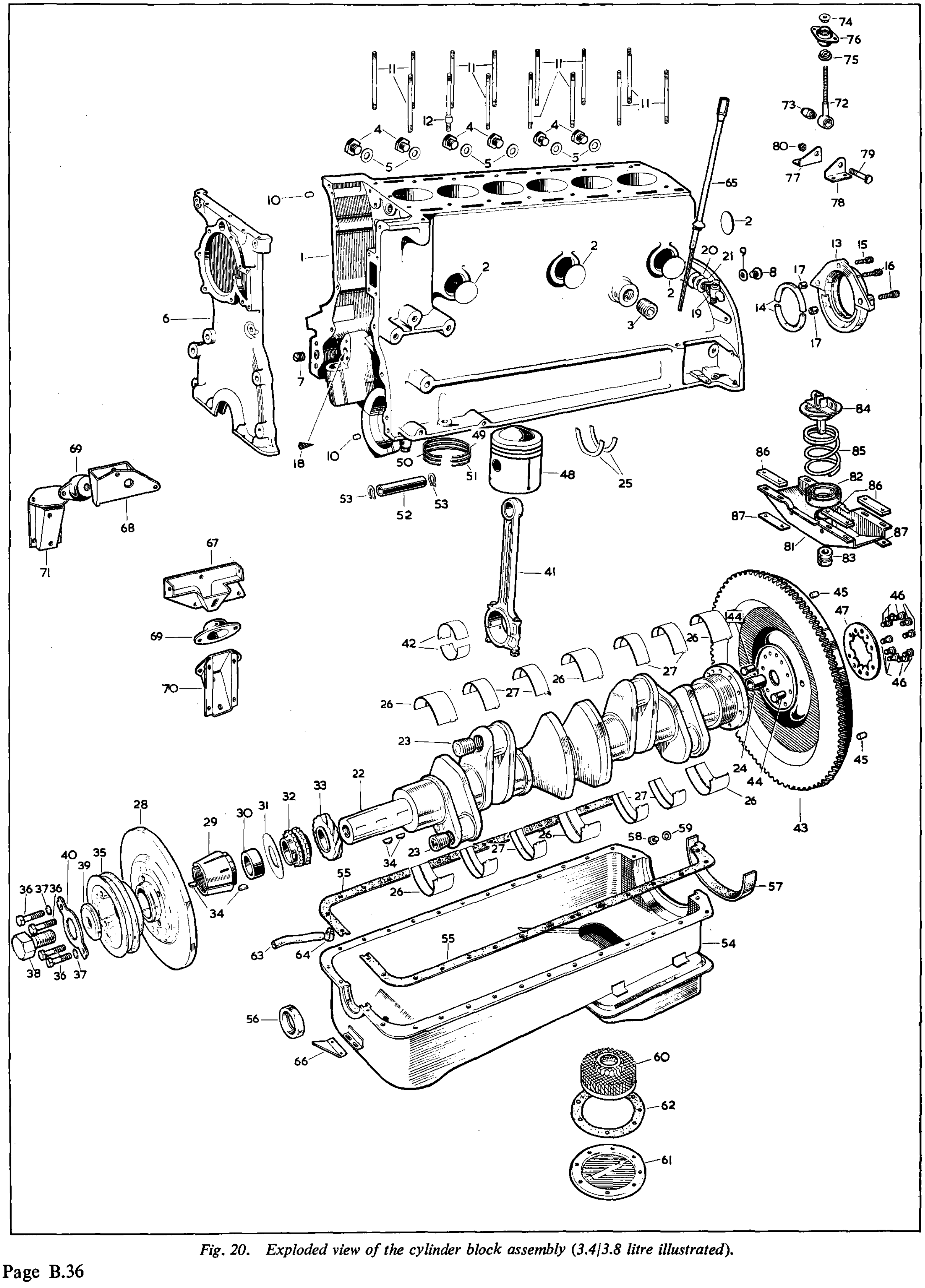


Fig. 20. *Exploded view of the cylinder block assembly (3.4/3.8 litre illustrated).*

1. Cylinder block
2. Core plug
3. Plug
4. Plug
5. Copper washer
6. Front timing cover
7. Plug
8. Headed plug
9. Copper washer
10. Dowel
11. Stud (plain)
12. Stud (dowel)
13. Cover
14. Oil seal
15. Cap screw
16. Cap screw
17. Ring dowel
18. Filter gauze
19. Water drain tap
20. Copper washer
21. Fibre washer
22. Crankshaft
23. Screwed plug
24. Bush
25. Thrust washer
26. Main bearing (front, centre and rear)
27. Main bearing (intermediate)
28. Crankshaft damper
29. Cone
30. Distance piece
31. Oil thrower
32. Gear (timing chain)
33. Gear (oil pump drive)
34. Key
35. Pulley
36. Bolt
37. Washer
38. Bolt
39. Washer
40. Tab washer
41. Connecting rod
42. Big end bearing
43. Flywheel
44. Dowel
45. Dowel
46. Setscrew
47. Plate
48. Piston
49. Pressure ring (upper)
50. Pressure ring (lower)
51. Scraper ring (Maxiflex)
52. Gudgeon pin
53. Circlip
54. Oil sump
55. Gasket
56. Seal
57. Seal
58. Drain plug
59. Copper washer
60. Filter basket
61. Cover
62. Gasket
63. Hose
64. Clip
65. Dipstick
66. Ignition timing pointer
67. Front engine mounting (left-hand)
68. Front engine mounting (right-hand)
69. Front engine mounting
70. L.H. flange support bracket
71. R.H. flange support bracket
72. Stabilising link
73. Bush
74. Stepped washer
75. Stepped bush
76. Rubber mounting
77. R.H. bearing bracket
78. L.H. bearing bracket
79. Bolt
80. Nut
81. Channel support
82. Spring seat
83. Centre bush
84. Spring retainer
85. Coil spring
86. Packing block
87. Bolt

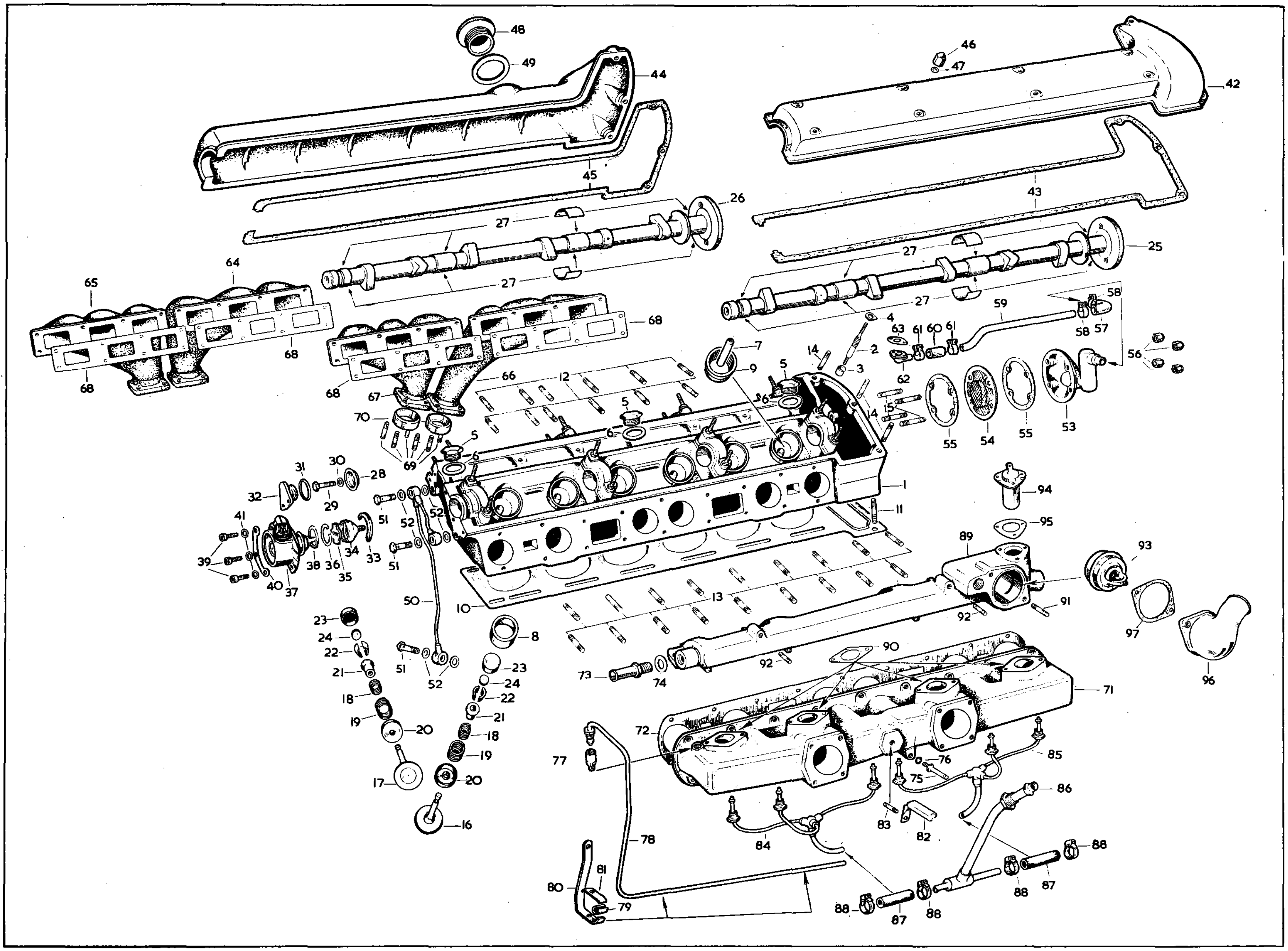


Fig. 21. Exploded view of cylinder head (3.4/3.8 litre illustrated).

1. Cylinder head
2. Camshaft bearing cap and cover stud
3. Ring dowel
4. 'D' washers
5. Core plug
6. Copper washer
7. Inlet valve guide
8. Insert for inlet valve
9. Guide for tappet
10. Cylinder head gasket
11. Cylinder head stud
12. Exhaust manifold stud
13. Inlet manifold stud
14. Camshaft cover stud
15. Breather housing stud
16. Inlet valve
17. Exhaust valve
18. Inner valve spring
19. Outer valve spring
20. Valve spring seat
21. Valve stem collar
22. Valve stem cotters
23. Valve tappet
24. Valve clearance adjusting pad
25. Inlet camshaft
26. Exhaust camshaft
27. Camshaft bearing shell
28. Exhaust camshaft oil thrower
29. Setscrew
30. Copper washer
31. Sealing ring
32. Flanged sealing plug
33. Rear camshaft bearing seal
34. Driving dog adaptor
35. Driving dog
36. Circlip
37. Rev. counter generator
38. 'O' ring
39. Screw
40. Plate washer
41. Lock washer
42. Inlet camshaft cover
43. Gasket
44. Exhaust camshaft cover
45. Gasket
46. Dome nut
47. Copper washer
48. Oil filler cap
49. Fibre washer
50. Oil pipe
51. Banjo bolt
52. Copper washer
53. Front cover and breather housing
54. Gauze filter
55. Gasket
56. Dome nut
57. Elbow hose
58. Clip
59. Breather pipe
60. Hose
61. Clip
62. Elbow
63. Gasket
64. Exhaust manifold (front)
65. Exhaust manifold (rear)
66. Exhaust manifold (front)
67. Exhaust manifold (rear)
68. Gasket
69. Stud
70. Sealing ring
71. Inlet manifold
72. Gasket
73. Adaptor
74. Copper washer
75. Pivot pin
76. Spring washer
77. Adaptor
78. Brake vacuum servo pipe
79. Rubber sleeve
80. Hanger bracket
81. Clamp
82. Bracket
83. Stud
84. Starting pipe (L.H.)
85. Starting pipe (R.H.)
86. Starting pipe
87. Neoprene tube
88. Clip
89. Water outlet pipe
90. Gasket
91. Stud
92. Stud
93. Thermostat
94. Thermostat, automatic choke
95. Gasket
96. Water outlet elbow
97. Gasket

THE CYLINDER BLOCK

The cylinder block is of chromium iron and is integral with the crankcase. The main bearing housings are line bored and the caps are not interchangeable, corresponding numbers being stamped on the caps and the bottom face of the crankcase for identification purposes. In the case of the 3.8 litre cylinder block, pressed in dry liners are fitted.

OVERHAUL

Check the top face of the cylinder block for truth. Check that the main bearing caps have not been filed and that the bores for the main bearings are in alignment. If the caps have been filed or if there is misalignment of the bearing housings the caps must be re-machined and the bearing housings line bored.

After removal of the cylinder head studs prior to reboring, check the area around the stud holes for flatness. When the edges of the stud holes are found to be raised they must be skimmed flush with the surrounding joint face, to ensure a dead flat surface on which to mount the boring equipment.

Reboring is normally recommended when the bore wear exceeds .006″ (.15 mm.). Reboring beyond the limit of .030″ (.76 mm.) is not recommended and when the bores will not clean out at .030″ (.76 mm.), liners and standard size pistons should be fitted.

In the instance of the 3.8 litre cylinder block the worn liners must be pressed out from below utilizing the illustrated stepped block.

Before fitting the new liner, lightly smear the cylinder walls with jointing compound to a point half way down the bore and also smear the top outer surface of the liner.

Press the new liners in from the top and lightly skim the tops of the liners flush with the top face of the cylinder block.

Bore out and hone the liners to suit the grade (or grades) of pistons to be fitted. (See piston grades on page 53).

The following oversize pistons are available : +.010″ (.25 mm.), +.020″ (.51 mm.) and .030″ (.76 mm.).

Following reboring the blanking plugs in the main oil gallery should be removed and the cylinder block oilways and the crankcase interior thoroughly cleaned. After cleaning, paint the crankcase interior with heat and oil resisting paint.

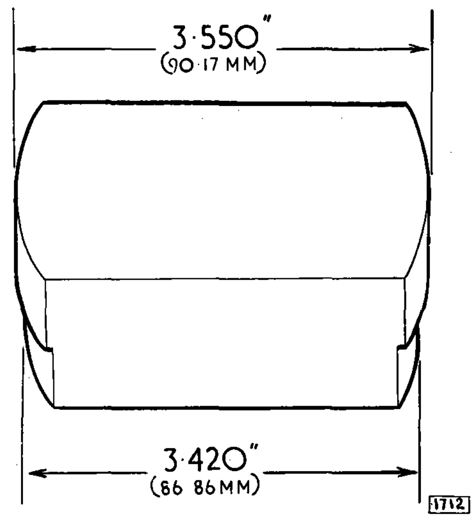


Fig. 22. Stepped block for 3.8 litre cylinder liner removal.

THE CYLINDER HEAD

The cylinder head is manufactured of aluminium alloy and has machined hemispherical combustion chambers. Cast iron valve seat inserts, tappet guides and valve guides are shrunk into the cylinder head castings.

Warning : Before carrying out any work on the cylinder head the following points should be observed to avoid possible fouling between (a) the inlet and exhaust valves, and (b) the valves and pistons.

(1) Do NOT rotate the engine or the camshafts with the camshaft sprockets disconnected.
If, with the cylinder head removed from the engine, it is required to rotate a camshaft, the other camshaft must either be removed or the bearing cap nuts slackened to their fullest extent to allow the valves to be released.

(2) When fitting the camshafts to the cylinder head ensure that the keyway in the front bearing flange of each camshaft is perpendicular (at 90°)

to the adjacent camshaft cover face before tightening down the camshaft bearing cap nuts. If this operation is being carried out with the cylinder head fitted to the engine, rotate the engine until No. 6 (front) piston is on Top Dead Centre in the firing position, that is with the distributor rotor opposite No. 6 cylinder segment, before fitting the camshafts.

Note : As the valves in the fully open position protrude below the cylinder head joint face, the cylinder head must not be placed joint face downwards directly on a flat surface ; support the cylinder head on wooden blocks, one at each end.

REMOVAL

Drain the cooling system by turning the radiator drain tap remote control and opening the cylinder block drain tap. Conserve water if anti-freeze is in use.

Remove the bonnet by unscrewing the four setscrews, having previously marked the position of the hinges to facilitate adjustment on re-assembly.

Remove the battery and battery platform.

Remove the air cleaner and air intake pipe.

Disconnect the accelerator linkage at the throttle spindle and at the attachment to the inlet manifold.

Disconnect the distributor vacuum advance pipe from the front carburetter.

Disconnect the petrol feed pipe at the float chamber unions.

On the 2.4 litre models disconnect the mixture control wire from the carburetters. Remove the carburetters.

On the 3.4 and 3.8 litre models disconnect the leads from auxiliary starting carburetter solenoid. Remove the pipe between the auxiliary starting carburetter and the inlet manifold.

Disconnect the revolution counter lead from the generator.

Disconnect the top water hose and by-pass hose from the front of the inlet manifold water jacket.

Remove the high tension leads from the sparking plug and the lead carrier from the cylinder head studs.

Remove the clutch flexible pipe bracket from the rear of the cylinder head.

Disconnect the wires from the ignition coil and remove the coil.

Remove the sparking plugs.

Disconnect the engine breather pipe from the front of the cylinder head.

Disconnect the exhaust manifolds from the engine.

On the 2.4 litre models disconnect the exhaust down pipe bracket from the rear of the engine.

Disconnect the two camshaft oil feed pipe unions from the rear of the cylinder head.

Disconnect the heater hose from the rear of the inlet manifold water jacket.

Disconnect the heater pipe clips from the inlet manifold lower securing nuts.

Unscrew the water temperature gauge bulb from the water outlet pipe.

Slacken the clip and disconnect the metal vacuum servo pipe from the rubber hose connection to the inlet manifold.

Remove the eleven dome nuts from each camshaft cover and lift off the covers.

Remove the four nuts securing the breather housing to the front of the cylinder head and withdraw housing observing the position of the baffle plate with the two holes vertical.

Release the tension on the top timing chain by slackening the nut on the eccentric idler sprocket shaft, depressing the spring-loaded stop peg and rotating serrated adjuster plate clockwise.

Break the locking wire on the two setscrews, securing camshaft sprockets to respective camshafts.

Remove one setscrew only from each of the camshaft sprockets ; rotate the engine until the two remaining setscrews are accessible and remove these screws.

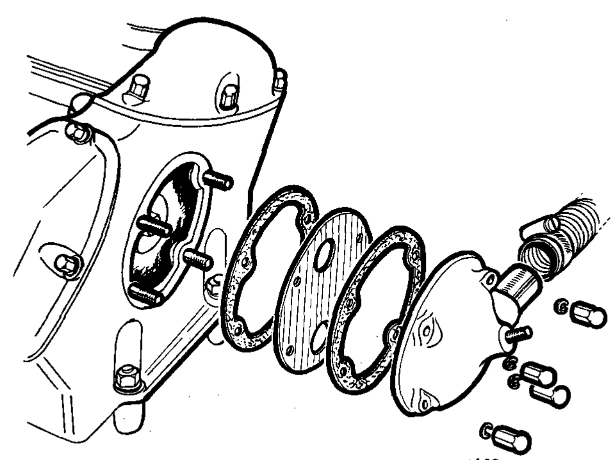


Fig. 23. Removal of the engine breather (Early Cars).

Do NOT rotate the engine or the camshaft after having disconnected the sprockets.

The two camshaft sprockets may now be slid up the support brackets.

Slacken the fourteen cylinder head dome nuts a part of a turn at a time in the order shown in Fig. 11 until the nuts become free. Remove the six nuts securing the front of the cylinder head.

Lift off the cylinder head complete with the inlet manifolds. Remove and scrap the cylinder head gasket.

OVERHAUL

As the cylinder head is of aluminium alloy, great care should be exercised when carrying out overhaul work, not to damage or score the machined surfaces. When removing carbon do not use scrapers or sharply pointed tools—use worn emery cloth and paraffin only.

Check the bottom face of the cylinder head for truth.

Remove all traces of carbon and deposits from the combustion chambers and the inlet and exhaust ports and regrind the valves and seats if necessary, as described under " Decarbonising and Grinding Valves " on page 29.

If it is required to replace the valve guides, valve seat inserts or tappet guides, only the special replacement parts must be used. The replacement parts must be shrunk into the cylinder head in accordance with the instructions given under the appropriate headings in this section.

REFITTING

Fit Cylinder Head

Before refitting the cylinder head it is important to observe that if the camshafts are out of phase with piston position fouling may take place between the valves and pistons. It is, therefore, essential to adhere to the following procedure before fitting the cylinder head :—

(a) Check that the keyways in the front flanges of the camshafts are vertical to the camshaft housing face and accurately position by engaging the valve timing gauge. If it is found necessary to rotate one of the camshafts the other camshaft must either be removed or the bearing cap nuts slackened to their fullest extent to allow the valves to be released.

(b) Turn No. 6 (front) piston to the Top Dead Centre position with the distributor rotor arm opposite No. 6 cylinder segment.

(c) Do NOT rotate the engine or camshafts until the camshaft sprockets have been connected to the camshafts.

(d) Fit the cylinder head gasket, taking care that the side marked "Top" is uppermost. Fit the cylinder head complete with manifolds to the cylinder block. Note that the second cylinder head stud from the front on the left-hand side is a dowel stud.

(e) Fit the sparking plug lead carrier to the 3rd and 6th stud from the front on the right-hand side. Fit plain washers to these and the two front stud positions. Fit the clutch flexible pipe bracket to the two studs at the rear of the cylinder head. Fit 'D' washers to the remaining studs.

(f) Tighten the fourteen large cylinder head dome nuts a part of a turn at a time to a torque of 54 lb. ft. (7.5 kgm.) in the order shown in Fig. 11. Also tighten the six nuts securing the front end of the cylinder head.

Valve Timing

Check that No. 6 (front) piston is exactly in the T.D.C. position.

Through the breather aperture in the front of the cylinder head slacken the locknut securing the serrated plate.

With the camshaft sprocket on the flanges of the camshafts, tension chain by pressing locking plunger inwards and rotating serrated plate by two holes in an anti-clockwise direction.

When correctly tensioned there should be slight flexibility on both outer sides of the chain below the camshaft sprockets, that is, the chain must not be dead tight. Release the locking plunger and securely tighten the locknut. Tap the camshaft sprockets off the flanges of the camshafts.

Accurately position the camshafts with the valve timing gauge and check that the T.D.C. marks are in exact alignment.

Withdraw the circlips retaining the adjusting plates to the camshaft sprockets and pull the adjusting plates forward until the serrations disengage. Replace the sprockets on to the flanges of camshafts and align the two holes in the adjuster plate with the two tapped holes in each camshaft flange. Engage the serrations of the adjuster plates with the serrations in the sprockets.

Note : It is most important that the holes are in exact alignment, otherwise when the setscrews are fitted the camshafts will be moved out of position. If difficulty is experienced in aligning the holes exactly, the adjuster plates should be turned through 180°, which, due to the construction of the plate, will facilitate alignment.

Fit the circlips to the sprockets and one setscrew to the accessible hole in each adjuster plate. Turn the engine until the other two holes are accessible and fit the two remaining setscrews.

Finally, recheck the timing chain tension and valve timing in this order. Secure the four setscrews for camshaft sprockets with new locking wire.

Fit Cylinder Head Oil feed Pipe

Fit the cylinder head oil feed pipe from the tapped hole in the main oil gallery to the two tapped holes in the rear of the cylinder head. Secure the pipe with the three banjo bolts with a copper washer fitted to both sides of each banjo.

Fit Camshaft Covers

Fit each camshaft cover to the cylinder head using a new gasket. Fit the eleven copper washers and dome nuts to the cover retaining studs but do not tighten fully.

Fit the revolution counter generator and flanged plug to the rear of left-hand and right-hand camshaft covers respectively with the rubber sealing rings seated in the recesses provided and secure with the setscrews and copper washers. Tighten fully the dome nuts securing the camshaft covers.

The remainder of the re-assembly is the reverse of the removal procedure.

THE EXHAUST MANIFOLDS

REMOVAL

Remove the eight brass nuts and spring washers securing the exhaust pipe flanges to the exhaust manifolds.

On 2.4 litre cars remove the nut, shakeproof and plain washers securing the exhaust pipe retaining strap to the clutch housing.

Remove the sixteen brass nuts and spring washers securing the exhaust manifolds to the cylinder head when the manifolds can be detached.

REFITTING

Refitting is the reverse of the removal procedure. Use new gaskets between the manifolds and the cylinder head and new sealing rings between the exhaust pipe and manifold flanges.

THE FLYWHEEL

The flywheel is a steel forging and has integral starter gear teeth. The flywheel is located to the crankshaft by two mushroom-headed dowels and is secured by ten setscrews retained by a circular locking plate.

REMOVAL

Remove the engine as described on page 19. Unscrew the four setscrews and remove the cover plate from the front face of the clutch housing.

Remove the bolts and nuts securing the clutch housing to the engine and withdraw the gearbox unit.

Unscrew the six setscrews securing the flange of clutch cover to the flywheel and remove clutch assembly. Note the balance marks ' B ' stamped on the clutch cover and on the periphery of the flywheel.

Knock back the tabs of locking plate securing the ten flywheel bolts. Unscrew the flywheel bolts and remove the locking plate. Remove flywheel from the crankshaft flange by gently tapping with a rawhide mallet.

OVERHAUL

If the starter gear is badly worn a new flywheel should be used, since the starter gear teeth are integral with the flywheel, and in this case it will be necessary to balance the flywheel and clutch as an assembly.

If a new flywheel is being fitted, check the flywheel and clutch balance as an assembly by mounting on a mandrel and setting up on parallel knife edges. Mark the relative position of clutch and flywheel. If necessary, remove the clutch and drill $\frac{3}{8}''$ (9.5 mm.) balance holes not more than $\frac{1}{2}''$ (12.7 mm.) deep at a distance of $\frac{3}{8}''$ (9.5 mm.) from the edge of the flywheel.

REFITTING

Turn the engine upright.

Check that the crankshaft flange and the holes for the flywheel bolts and dowels are free from burrs.

Turn the engine until Nos. 1 and 6 pistons are on T.D.C. and fit the flywheel to the crankshaft flange so that the ' B ' stamped on the edge of the flywheel is at approximately the B.D.C. position. (This will ensure that the balance mark ' B ' on the flywheel is in line with the balance mark on the crankshaft which is a group of letters stamped on the crank throw just forward of the rear main journal).

Tap the two mushroom-headed dowels into position, fit the locking plate and flywheel securing setscrews. Tighten the setscrews to a torque of 67 lb ft. (9.2 kgm.) and secure with the locking plate tabs. Assemble the clutch driven plate to the flywheel, noting that one side of the plate is marked " Flywheel Side ". Centralise the driven plate by means of a dummy shaft which fits the splined bore of the driven plate and the spigot bush in the crankshaft. (A constant pinion shaft may be used for this purpose). Fit clutch cover assembly so that the ' B ' stamped adjacent to one of the dowel holes coincides with the ' B ' stamped on the periphery of the flywheel. Secure the clutch assembly with the six setscrews and spring washers, tightening the screws a turn at a time by diagonal selection. Remove the dummy shaft.

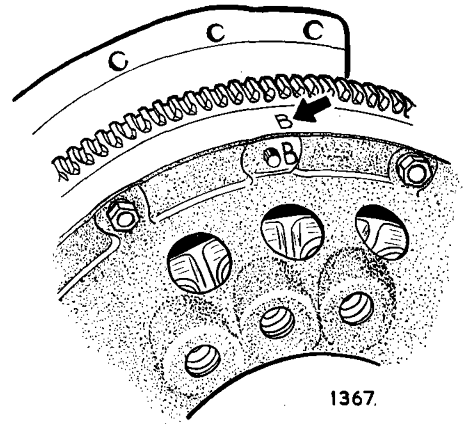


Fig. 24. Showing the balance marks "B" on the clutch and flywheel.

IGNITION TIMING

Set the micrometer adjustment in the centre of the scale.

Rotate the engine until the rotor-arm approaches the No. 6 (front) cylinder segment in the distributor cap.

Slowly rotate the engine until the ignition timing scale on the crankshaft damper is the appropriate number of degrees before the pointer on the sump.

Ignition Settings

Connect a 12 volt test lamp with one lead to the distributor terminal (or the CB terminal of the ignition coil) and the other to a good earth.

Slacken the distributor plate pinch bolt.

Switch on the ignition.

Slowly rotate the distributor body until the points are just breaking, that is, when the lamp lights up with the fibre heel leading the appropriate cam lobe in the normal direction of rotation.

Tighten the distributor plate pinch bolt.

A maximum of six clicks on the vernier adjustment from this setting, to either advance or retard, is allowed.

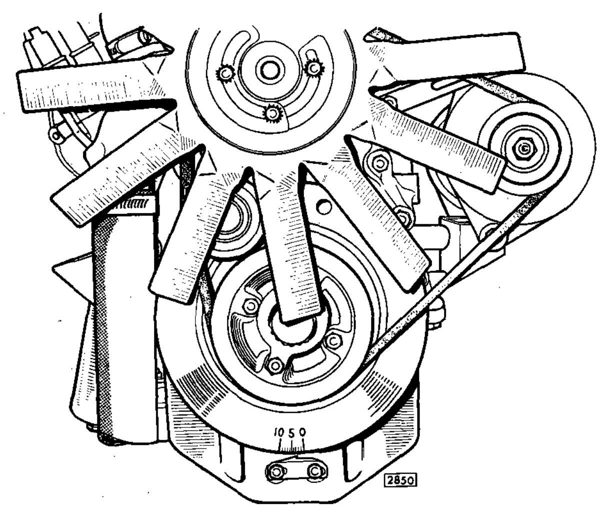


Fig. 25. Showing the timing scale marked on the crankshaft damper. The scale is marked in crankshaft degrees from 0° (top dead centre) to 10° advance (before top dead centre).

Static Ignition Timing

	2.4 litre	3.4 litre		3.8 litre	
Type of air cleaner	Oil bath	Oil bath	Paper element	Oil bath	Paper element
7 : 1 compression ratio	6° BTDC	TDC	TDC	TDC	TDC
8 : 1 compression ratio	8° BTDC	2° BTDC	7° BTDC	4° BTDC	7° BTDC
9 : 1 compression ratio	—	TDC	5° BTDC	10° BTDC	5° BTDC

THE INLET MANIFOLD

The inlet manifold is an aluminium casting and is heated by the coolant from the cylinder head through cast-in passages. A water outlet pipe attached to the inlet manifold houses the thermostat and has the top water hose and by-pass hose connected at the front end.

REMOVAL

Drain the radiator.

Remove the carburetters as described in Section C. Slacken the clips and disconnect the top water hose and by-pass hoses from the inlet manifold water outlet pipe.

Unscrew the water temperature gauge indicator unit situated beneath or in the side of the water outlet pipe for the 2.4 litre or 3.4 and 3.8 litre models respectively.

On the 3.4 and 3.8 litre models disconnect the cable from the auxiliary starting carburetter switch. Detach the flexible rubber vacuum hose from the rigid pipe beneath the inlet manifold adjacent to the ignition distributor vacuum unit.

On the 2.4 litre model, detach the petrol feed line filter and tie up out of the way. Disconnect the heater hose from the connection at the rear of the manifold. Remove the split pin and detach the accelerator linkage from the pin in the manifold.

Remove the eighteen nuts and spring washers, detach the heater pipe clips from the lower studs when the inlet manifold can be withdrawn.

REFITTING

Refitting is the reverse of the removal procedure.

THE OIL FILTER

The oil filter is of the full flow type and has a renewable felt or paper element. The oil filter can be one of two types, the main difference being an upwards or downward pointing filter canister, however the function of both is the same.

The oil from the oil pressure relief valve is returned to the engine sump by an external rubber hose. In the case of the upward pointing oil filter, the oil pressure relief valve is covered by a domed shaped nut and this should not be confused with the flat headed drain plug which is situated nearer the outside face of the filter head. In the later production downward pointing filter the oil pressure relief valve is retained by the outlet adaptor to which the hose to the sump is secured.

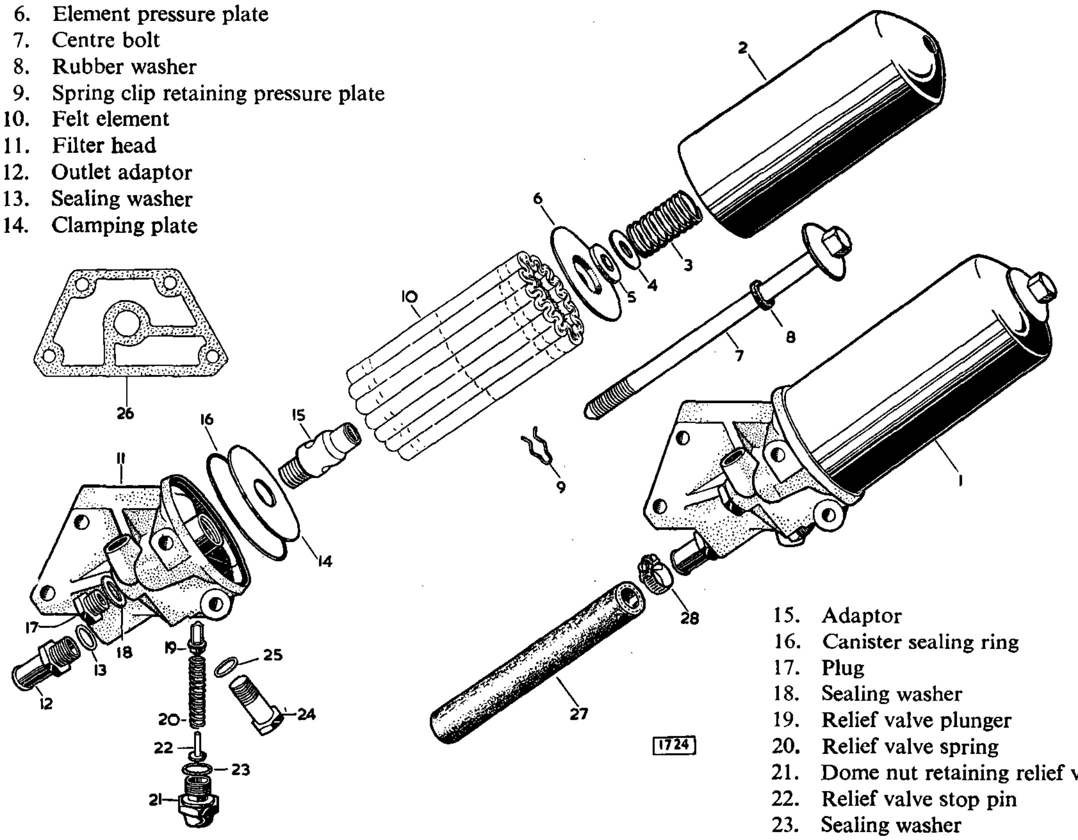
A balance valve fitted in the filter head which opens at a pressure differential of 10 to 15 lb. per sq. in. (0.703 to 1.055 kg/cm^2.) provides a safeguard against the possibility of the filter element becoming so choked that oil is prevented from reaching the bearings.

REMOVAL OF OIL FILTER

In the case of the upward pointing oil filter, drain the element by with drawing the flat headed drain plug from the bottom of the unit but when removing the downward pointing oil filter this is not necessary although it is advisable to catch any escaping oil in a drip-tray. Detach the oil pressure gauge indicator leads from the oil pressure unit situated in the head of the oil filter and in the instance of the 2.4 litre model the throttle return spring from the anchor bracket. Remove the rubber hose from below the filter head by slackening the hose clip. Detach the oil filter assembly from the side face of the cylinder block by withdrawing the four bolts.

Collect the gasket fitted between the filter head and the cylinder block.

1. Oil filter assembly
2. Element canister
3. Element pressure spring
4. Metal washer
5. Felt washer
6. Element pressure plate
7. Centre bolt
8. Rubber washer
9. Spring clip retaining pressure plate
10. Felt element
11. Filter head
12. Outlet adaptor
13. Sealing washer
14. Clamping plate



15. Adaptor
16. Canister sealing ring
17. Plug
18. Sealing washer
19. Relief valve plunger
20. Relief valve spring
21. Dome nut retaining relief valve
22. Relief valve stop pin
23. Sealing washer
24. Drain plug
25. Sealing washer
26. Gasket
27. Flexible hose to engine sump
28. Hose clip

Fig. 26. Exploded view of oil filter (first type).

REFITTING THE OIL FILTER

Refitting is the reversal of the removal procedure, but a new gasket must be fitted between the oil filter head and cylinder block.

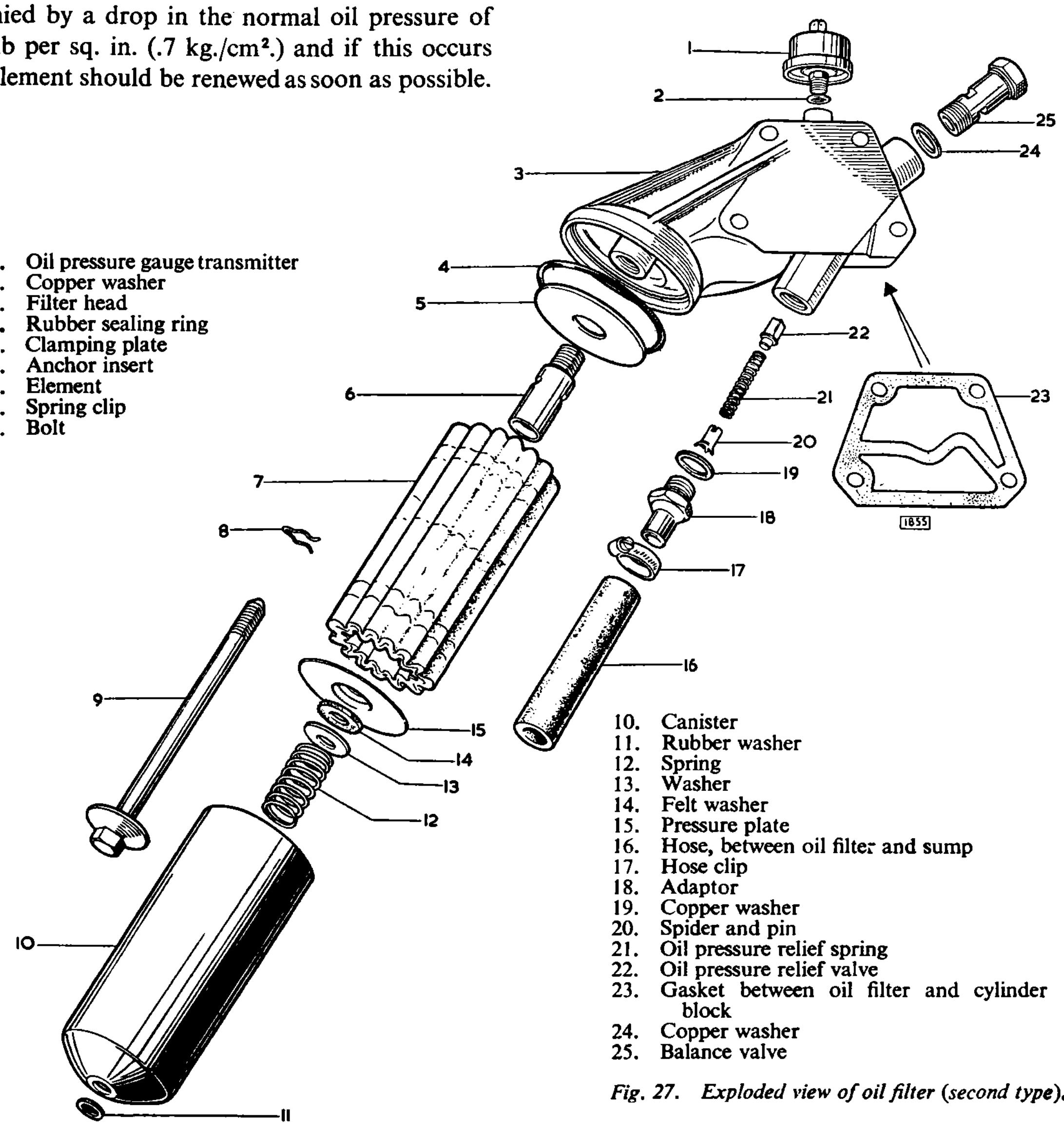
ELEMENT REPLACEMENT

It is most important to renew the oil filter element at the recommended periods as after this mileage it will have become choked with impurities.

To guard against the possibility of the filter being neglected to the extent where the element becomes completely choked, a balance valve is incorporated in the filter head which allows unfiltered oil to by-pass the element and reach the bearings. This will be accompanied by a drop in the normal oil pressure of some 10 lb per sq. in. (.7 kg./cm^2.) and if this occurs the filter element should be renewed as soon as possible.

The oil filter is situated on the right-hand side of the engine and in the instance of the upward pointing oil filter drain the element by withdrawing the flat headed drain plug from the bottom of the unit, but with the downward pointing oil filter this is not necessary although it is advisable to catch any escaping oil in a drip-tray. To gain access to the element, unscrew the centre bolt when the canister and element can be removed. Empty out the oil, thoroughly wash out the canister with petrol and allow to dry before inserting the new element.

When refitting the canister, renew the circular rubber seal in the filter head.



1. Oil pressure gauge transmitter
2. Copper washer
3. Filter head
4. Rubber sealing ring
5. Clamping plate
6. Anchor insert
7. Element
8. Spring clip
9. Bolt
10. Canister
11. Rubber washer
12. Spring
13. Washer
14. Felt washer
15. Pressure plate
16. Hose, between oil filter and sump
17. Hose clip
18. Adaptor
19. Copper washer
20. Spider and pin
21. Oil pressure relief spring
22. Oil pressure relief valve
23. Gasket between oil filter and cylinder block
24. Copper washer
25. Balance valve

Fig. 27. Exploded view of oil filter (second type).

Commencing Engine Nos. BG.5891 (2.4 litre)
KG.4675 (3.4 litre)
LA.7450 (3.8 litre)

THE OIL PUMP

The oil pump is of the eccentric rotor type and consists of five main parts :— the body, the driving spindle with the inner rotor pinned to it, the outer rotor and the cover, which is secured to the main body by four bolts, finally being secured to the engine with additional dowel bolts. The inner rotor has one lobe less than the number of internal segments in the outer rotor. The spindle centre is eccentric to that of the bore in which the outer rotor is located, thus the inner rotor is able to rotate within the outer, and causes the outer rotor to revolve. The inlet connection is positioned in the pump cover, and the outlet connection in the body. These are both connected to the ports in the pump.

Consider the oil flow with the lobes of the inner rotor lying along the line of eccentricity. In this position oil is free to flow from the port into the space (dotted portion) between the rotors, and on the other side of the lobe (shaded portion) the oil is free to flow into the delivery port (see Fig. 28).

In the second position, the inner and outer rotors have rotated and caused the oil that was flowing from the inlet port into the space between them to be cut off from the port and transferred to the enclosed space between the ports. Similarly, the space which enclosed oil free to flow to the delivery port in the first position has decreased in size in the second position, and thus caused this oil to flow into the delivery port. The action of the pump is then a repetition of the above, oil flowing into the space between the rotors from the inlet port under atmospheric pressure and being discharged into the delivery port by reason of the space in which it is contained decreasing in size as it passes over the port.

REMOVAL

Remove the sump as described on page 51.

Detach the suction and delivery pipe brackets and withdraw the pipes from the oil pump.

Tap back the tab washers and remove the three bolts which secure the oil pump to the front main bearing cap.

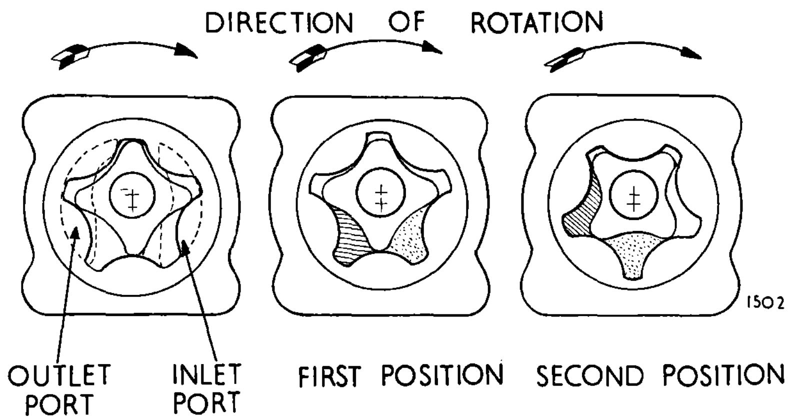


Fig. 28. Operation of eccentric rotor type oil pump.

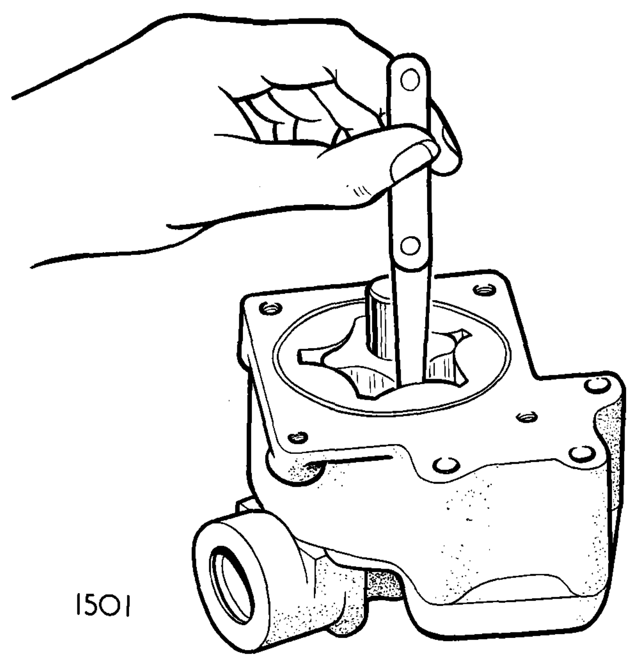


Fig. 29. Measuring the clearance between the inner and outer rotors.

Withdraw the oil pump and collect the coupling sleeve at the top of the drive shaft.

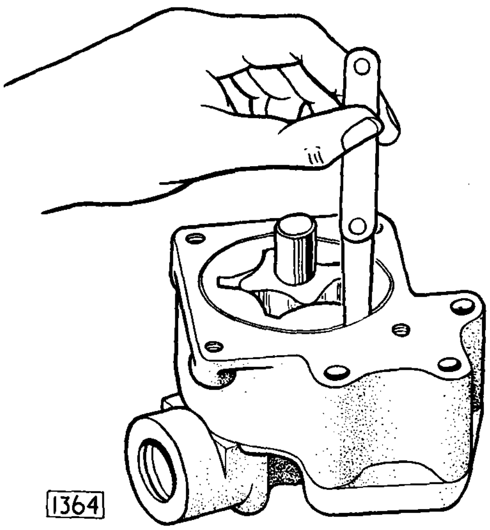


Fig. 30. Measuring the clearance between the outer rotor and the pump body

DISMANTLING

Unscrew the four bolts and detach the bottom cover from the oil pump.

Withdraw the inner and outer rotors from the oil pump body. The inner rotor is pinned to the drive shaft and must not be dismantled.

OVERHAUL

Check the clearance between lobes of the inner and outer rotors which should be .006″ (.15 mm.) maximum (see Fig. 29).

Check the clearance between the outer rotor and the pump body (see Fig. 30) which should not exceed .010″ (.25 mm.).

Check the end-float of the rotors by placing a straight edge across the joint face of the body and measuring the clearance between the rotors and straight edge (see Fig. 32). This clearance should be .0025″ (.06 mm.) and in an emergency can be restored by lapping the pump body and outer rotor on a surface plate to suit the inner rotor.

1. Body
2. Rotor Assembly
3. Cover
4. Setscrew
5. Setscrew
6. Spring washer
7. 'O' ring
8. Drive shaft
9. Bush
10. Washer
11. Helical gear
12. Key
13. Nut
14. Locking washer
15. Shaft
16. Dowel bolt
17. Tab washer
18. Oil delivery pipe
19. Gasket
20. Oil suction pipe
21. Clip
22. Suction pipe supporting strut
23. Suction pipe supporting strut
24. Hood
25. Spring
26. Split pin.

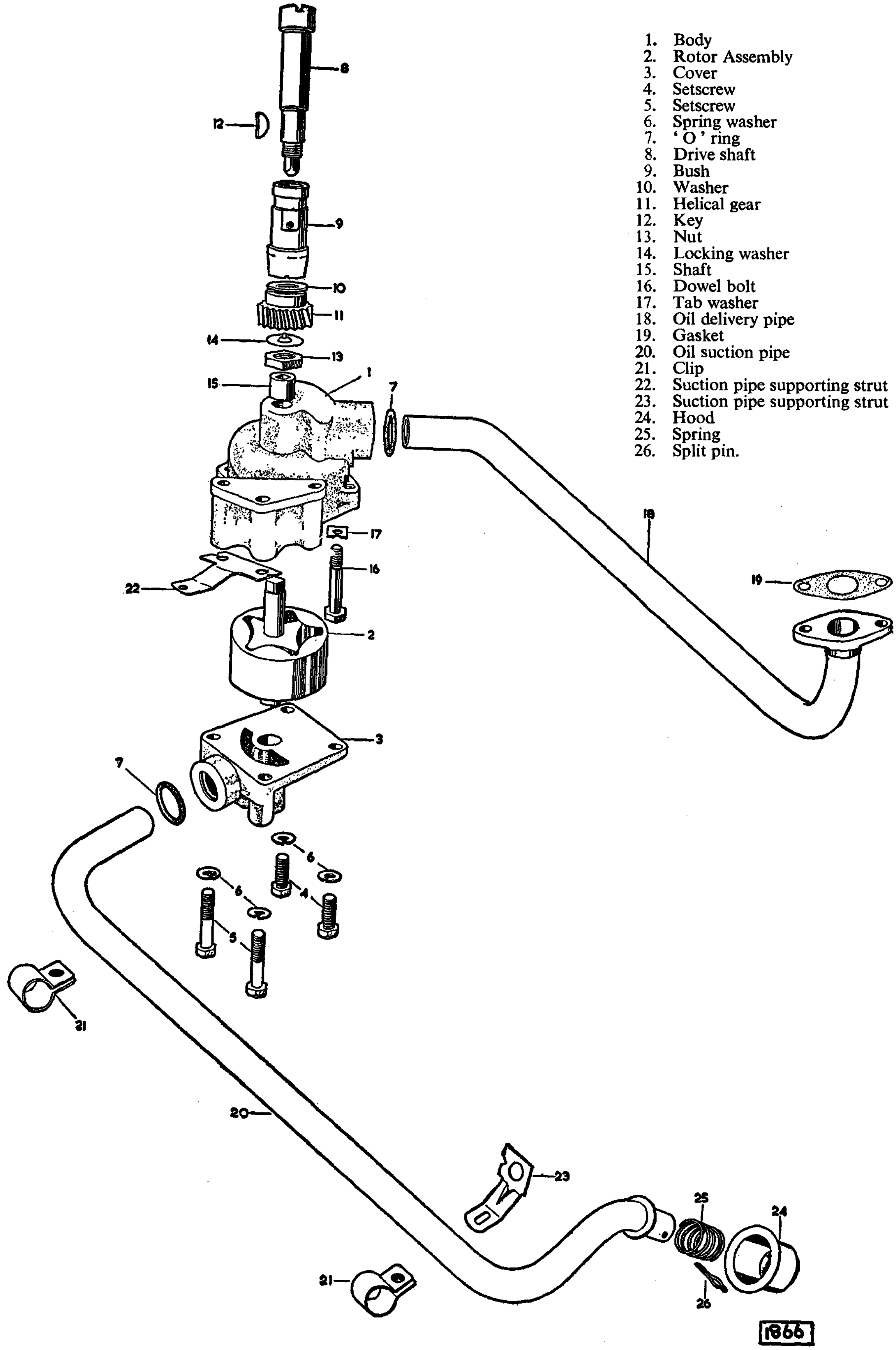


Fig. 31. Exploded view of the oil pump.

Examine the pump body and bottom cover for signs of scoring and the drive shaft bores for signs of wear; fit new parts as necessary.

Place the drive shaft in a vice fitted with soft jaws and check that the inner rotor is tight on the securing pin.

Note that the drive shaft, inner and outer rotors are supplied only as an assembly.

RE-ASSEMBLING

Re-assembly is the reverse of the dismantling procedure but it is important when fitting the outer rotor to the pump body to insert the chamfered end of the rotor foremost.

Always fit new ' O ' rings to t'ie suction and delivery pipe bores.

REFITTING

Refitting is the reverse of the removal procedure.

Do not omit to fit the coupling sleeve to the squared end of the drive shaft before offering up the oil pump.

After fitting of the oil pump, check that there is appreciable end-float of the coupling sleeve.

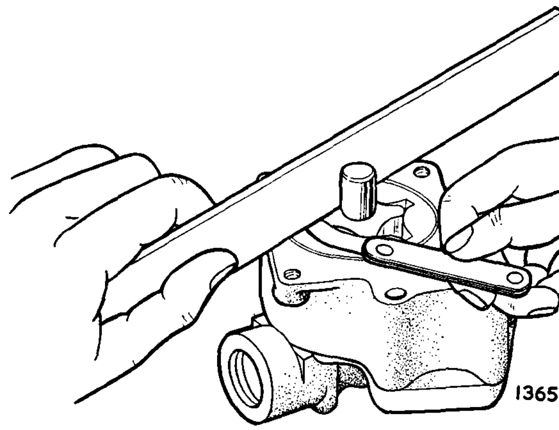


Fig. 32. Measuring the end float of the rotors.

THE OIL SUMP

All engine units are fitted with pressed steel sumps which have an external connection for a rubber hose, the second end of which is attached to the oil filter.

A gauze bowl-type strainer fitted to the bottom of the sump is accessible through a circular cover plate. At the recommended periods the strainer should be removed and washed with petrol. (Early cars only).

REMOVAL

Drain the oil sump.

Remove the front suspension unit as described in Section ' J '.

Unscrew the twenty-six setscrews and four nuts and detach the sump from the cylinder block, noting that a short setscrew is fitted at the right-hand front corner of the sump.

REFITTING

Scrape off all traces of the old gaskets or sealing compound from the joint faces of the sump and crankcase.

Always fit new gasket(s) and a rear oil seal when refitting the sump. If time permits, roll the rear oil seal into a coil and retain with string for a few hours. This will facilitate the fitting of the seal to its semi-circular recess.

Ensure that the short setscrew is fitted to the right-hand front corner of the sump.

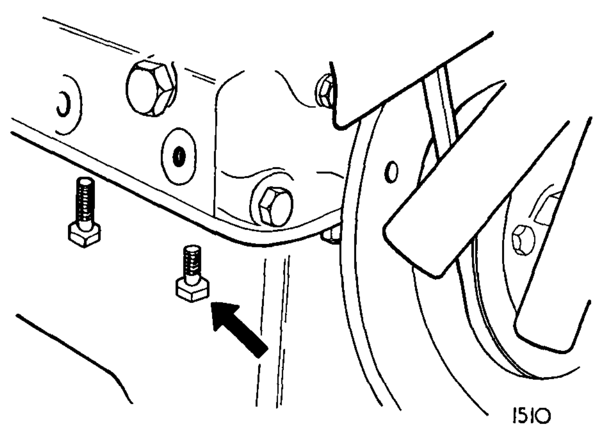


Fig. 33. Showing the location of the short setscrew.

PISTONS AND GUDGEON PINS

The pistons are made from low expansion aluminium alloy and are of the semi-split skirt type.

The pistons of the 2.4 litre engine unit have four rings each, three compression and one oil control. The top compression ring only is chromium plated ; the second and third compression rings have a tapered periphery. In the case of the 3.4 and 3.8 litre engine units, the pistons have three rings each, two compression and one oil control. The top compression ring only is chromium plated ; both the top and second compression rings have a tapered periphery.

The fully floating gudgeon pin is retained in the piston by a circlip at each end.

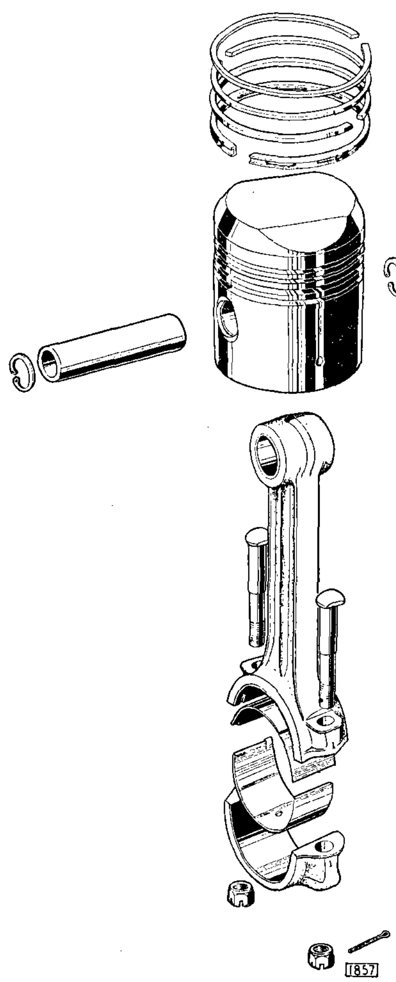


Fig. 34. Exploded view of piston and connecting rod (2.4 litre illustrated).

REMOVAL

As the pistons will not pass the crankshaft it will be necessary to withdraw the pistons and connecting rods from the top. The connecting rod bolts should, however, be removed to allow the big end to pass easily through the bore. Proceed as follows :—

Remove Cylinder Head

Remove cylinder head as described on page 41.

Remove Sump

Remove the sump as described on page 51.

Remove Piston and Connecting Rod

Remove the split pins from the connecting rod bolt nuts and unscrew nuts. Remove the connecting rod cap, noting the corresponding cylinder numbers on the connecting rod and cap. Remove the connecting rod bolts and withdraw the piston and connecting rod from the top of cylinder block.

OVERHAUL

Pistons are supplied complete with gudgeon pins which have been selectively assembled and are, therefore, not interchangeable one with another.

The pistons fitted to an engine should not vary one with another by more than 2 drams (3.5 grammes).

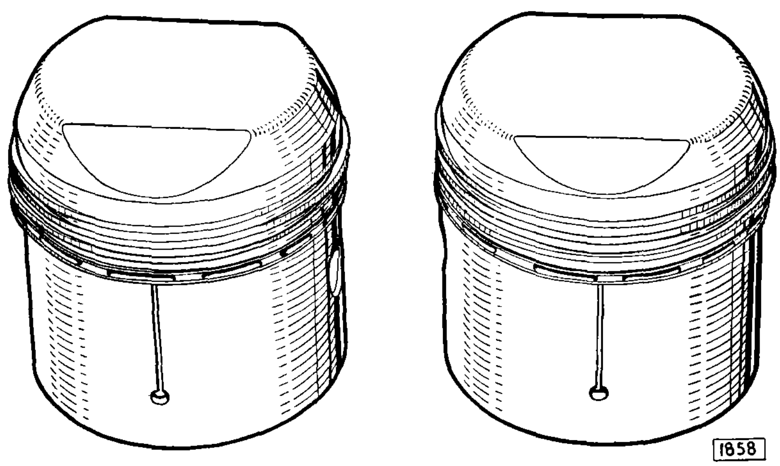


Fig. 35. 2.4 litre pistons.

Gudgeon Pin Fitting

Gudgeon pins are a finger push fit in the piston at normal room temperature 68°F (20°C).

When actually removing or refitting the gudgeon pin, the operation should be effected by immersing the piston, gudgeon pin and connecting rod little end in a bath of hot oil. When the piston and little end have reached a sufficient temperature (230°F. 110°C.) the gudgeon pin can be moved into position. Always use new circlips on assembly.

When assembling the engine, centralise the small end of the connecting rod between the gudgeon pin bosses in the piston and ensure that the connecting rod mates up with the crankshaft journal without any pressure being exerted on the rod.

Piston Grades

The following selective grades are available in standard size pistons only. When ordering standard size pistons the identification letter of the selective grade should be clearly stated. Pistons are stamped on the crown with the letter identification and the cylinder block is also stamped on the top face adjacent to the bores.

Grade Identification Letter	Cylinder bore size for 2.4 and 3.4 litre engine units.
F	3.2673″ to 3.2676″ (82.990 to 82.997 mm.)
G	3.2677″ to 3.2680″ (83.000 to 83.007 mm.)
H	3.2681″ to 3.2684″ (83.010 to 83.017 mm.)
J	3.2685″ to 3.2688″ (83.020 to 83.027 mm.)
K	3.2689″ to 3.2692″ (83.030 to 83.037 mm.)

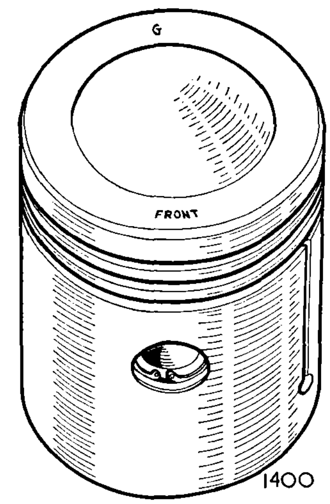


Fig. 36. Showing the markings on the piston crown.

Grade Identification Letter	Cylinder bore size for 3.8 litre engine units
F	3.4248″ to 3.4251″ (86.990 to 86.997 mm.)
G	3.4252″ to 3.4255″ (87.000 to 87.007 mm.)
H	3.4256″ to 3.4259″ (87.010 to 87.017 mm.)
J	3.4260″ to 3.4263″ (87.020 to 87.027 mm.)
K	3.4264″ to 3.4267″ (87.030 to 87.037 mm.)

Oversize Pistons

Oversize pistons are available in the following sizes :- +.010″ (.25mm.) +.020″ (.51 mm.) +.030″ (.76 mm.)

There are no selective grades in oversize pistons as grading is necessarily purely for factory production methods.

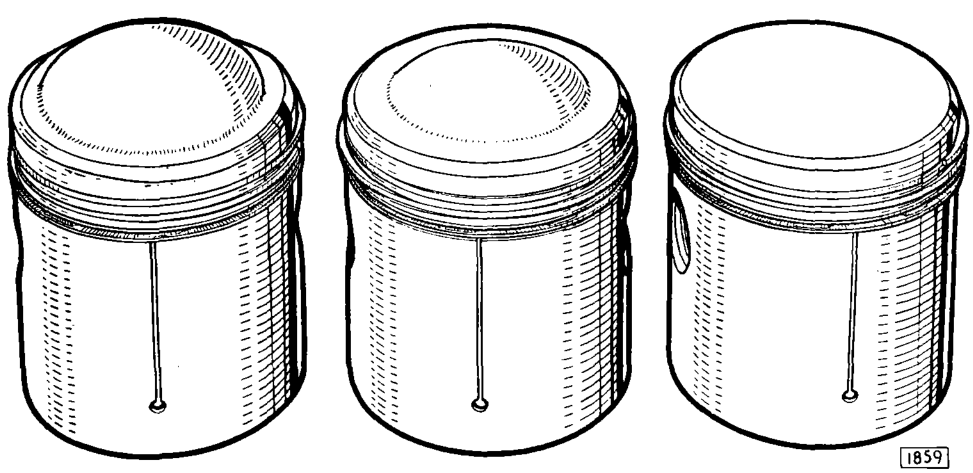


Fig. 37 3.4 litre pistons.

Piston Rings

Check the piston ring gap with the ring as far down the cylinder bore as possible. Push the ring down the bore with a piston to ensure that it is square and measure the gap with a feeler gauge. The correct gaps are as follows :—

Compression rings .015″ to .020″ (.38 to .51 mm.)

Oil control rings .011″ to .016″ (.28 to .41 mm.)

With the rings fitted to the piston check the side clearance in the grooves which should be .001″ to .003″ (.025 to .076 mm.).

One of the compression rings is hard chrome plated and this ring must be fitted to the top groove in the piston.

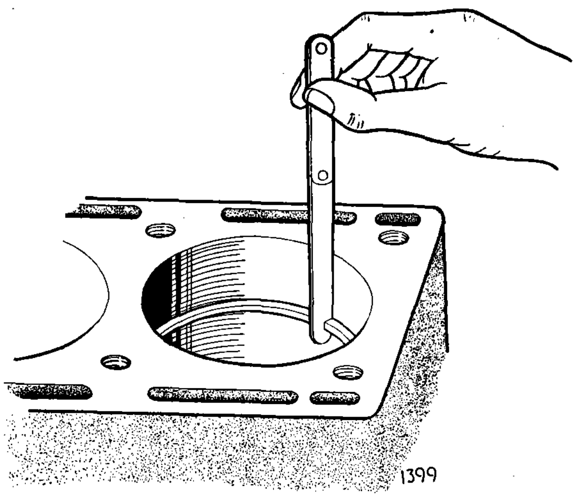


Fig. 38. Checking the piston ring gap.

Tapered Periphery Rings

All engine units are fitted with tapered periphery piston rings in at least one position and these must be fitted the correct way up.

The narrowest part of the ring must be fitted uppermost ; to assist in identifying the narrowest face a letter ' T ' or ' Top ' is marked on the side of the ring to be fitted uppermost.

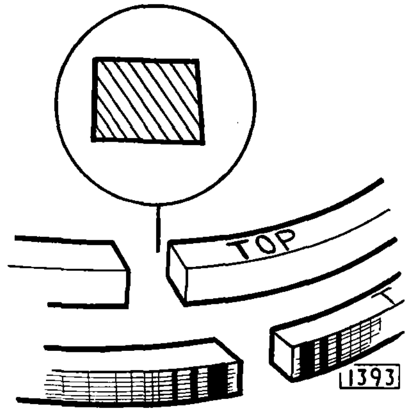


Fig. 39. Showing the identification marks on tapered periphery compression rings.

The oil control ring is not tapered and can be fitted either way up.

REFITTING

Pistons and connecting rods must be fitted to their respective cylinders (piston and connecting rods are stamped with their cylinder number, No. 1 being at the rear) and the same way round in the bore.

The pistons must be fitted with split on the left-hand or exhaust side of the engine. To facilitate correct fitting the piston crowns are marked " Front ", see Fig. 36.

In the case of the connecting rods for the 2.4 litre engine unit the oil drilling, situated well up one unpolished face, must be positioned toward the front of the engine.

Use a piston ring clamp when entering the rings into the cylinder bore.

The cap must be fitted to the connecting rod so that the cylinder numbers stamped on each part are on the same side.

Tighten the connecting rod nuts to a torque of 37 lb ft. (5.1 kgm.).

SPARKING PLUGS

SERVICE PROCEDURE

To maintain peak sparking plug performance, plugs should be inspected, cleaned and re-gapped at regular intervals of 2,500 miles. Under certain fuel and operating conditions, particularly extended slow speed town driving, sparking plugs may have to be serviced at shorter intervals.

Disconnect the ignition cables from all sparking plugs.

Loosen the sparking plugs about two turns anti-clockwise using the proper sized deep-socket wrench.

Blow away the dirt from around the base of each plug.

Remove the sparking plugs and place them in a suitable holder, preferably in the order they were in the engine.

ANALYSING SERVICE CONDITIONS

Examine the gaskets to see if the sparking plugs were properly installed. If the gaskets were excessively compressed, installed on dirty seats or distorted, leakage has probably occurred during service which would tend to cause overheating of the sparking plugs. Gaskets properly installed will have flat clean surfaces. Gaskets which are approximately one-half their original thickness will be satisfactory but thinner ones should be renewed.

Examine the firing ends of the sparking plugs, noting the type of the deposits and the degree of electrode erosion. The typical conditions illustrated may indicate the use of a sparking plug with an incorrect heat range or faulty engine and ignition system operation. Remember that if sufficient voltage is not delivered to the sparking plug, no type of plug can fire the mixture in the cylinder properly.

Normal Condition

Look for powdery deposits ranging from brown to greyish tan. Electrodes may be worn slightly. These are signs of a sparking plug of the correct heat range used under **normal** conditions, that is mixed periods of high speed and low speed driving. Cleaning and re-gapping of the sparking plugs is all that is required.

Normal Condition

Watch for white to yellowish powdery deposits. This usually indicates long periods of constant speed driving or a lot of slow speed city driving. These deposits have no effect on performance if the sparking plugs are cleaned **thoroughly** at approximately 2,500 miles intervals. Remember to " wobble " the plug during abrasive blasting in the Champion Service Unit. Then file the sparking surfaces vigorously to expose bright clean metal.

Fig. 40. Normal condition.

Oil Fouling

This is usually indicated by wet, sludgy deposits traceable to excessive oil entering the combustion chamber through worn cylinders, rings and pistons, excessive clearances between intake valve guides and stems, or worn and loose bearings, etc. Hotter sparking plugs may alleviate oil fouling temporarily, but in severe cases engine overhaul is called for.

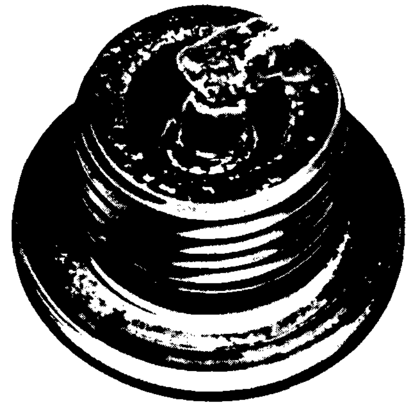


Fig. 41. Oil fouling.

Petrol Fouling

This is usually indicated by dry, fluffy black deposits which result from incomplete combustion. Too rich an air-fuel mixture, excessive use of the mixture

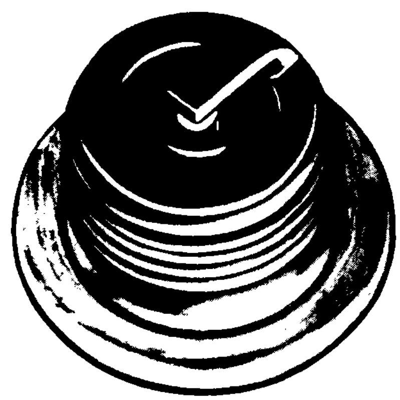


Fig. 42. Petrol fouling.

control or a faulty automatic choke can cause incomplete burning. In addition, a defective coil, contact breaker points, or ignition cable, can reduce the voltage supplied to the sparking plug and cause misfiring. If fouling is evident in only a few cylinders, sticking valves may be the cause. Excessive idling, slow speeds, or stop-and-go driving, can also keep the plug temperatures so low that normal combustion deposits are not burned off. In the latter case, hotter plugs may be installed.

Burned or Overheated Condition

This condition is usually identified by a white, burned or blistered insulator nose and badly eroded electrodes. Inefficient engine cooling and improper ignition timing can cause general overheating. Severe service, such as sustained high speed and heavy loads, can also produce abnormally high temperatures in the combustion chamber which necessitate the use of colder sparking plugs.

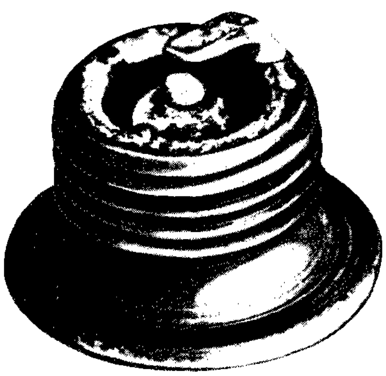


Fig. 43. Badly burned sparking plug.

File the sparking surfaces of the electrodes by means of a point file. If necessary, open the gaps slightly and file vigorously enough to obtain bright, clean, parallel surfaces. For best results, hold the plug in a vice.

Reset the gaps using the bending fixture of the Champion Gap Tool. Do not apply pressure on the centre electrode as insulator fractures may result. Use the bending fixture to obtain parallel sparking surfaces for maximum gap life.

Visually inspect all sparking plugs for cracked or chipped insulators. Discard all plugs with insulator fractures.

Test the sparking ability of a used sparking plug on a comparator.

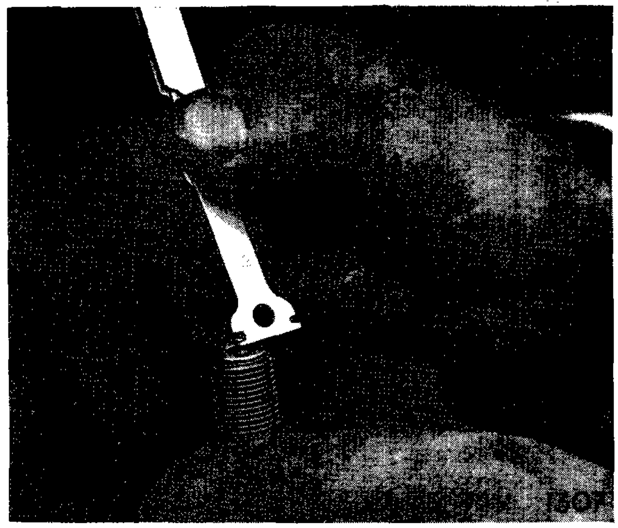


Fig. 44. Setting the gap with the special tool.

Clean the threads by means of wire hand or power-driven brush. If the latter type is used, wire size should not exceed .005″ (.013 mm.) diameter. Do not wire brush the insulator nor the electrodes.

Clean gasket seats on the cylinder head before installing sparking plugs to assure proper seating of the sparking plug gasket. Then, using a new gasket, screw in the plug by hand finger-tight.

Note: If the sparking plug cannot be seated on its gasket by hand, clean out the cylinder head threads with a clean-out tap or with another used sparking plug having three or four vertical flutes filed in its threads.
Tighten the sparking plugs to a torque of 27 lb. ft. (3.73 kg.m.).

STANDARD GAP SETTING

The sparking plug gap settings recommended in this Service Manual have been found to give the best overall performance under all service conditions. They are based on extensive dynamometer testing and experience on the road, and are generally a compromise between the wide gaps necessary for best idling performance and the small gaps required for the best high speed performance.

All plugs should be reset to the specified gap by bending the side electrode only, using the special tool available from the Champion Sparking Plug Company.

TAPPETS, TAPPET GUIDES AND ADJUSTING PADS

The chilled cast iron tappets are of cylindrical form and run in guides made of austenitic iron which are shrunk into the cylinder head. A steel pad for adjustment of the valve clearance is sandwiched between the underside of the tappet and top of the valve stem. The pads are available in a range of thicknesses, rising in .001″ (.025 mm.) steps, from .085″ to .110″ (2.16 to 2.79 mm.) and are etched on the surface with the letter ' A ' to ' Z ', each letter indicating an increase in size of .001″ (.025 mm.).

REMOVAL OF TAPPETS AND ADJUSTING PADS

Remove the camshafts as described on page 33. The tappets can now be withdrawn with a suction valve grinding tool.

Remove the adjusting pads. If valve clearance adjustment is not being carried out the adjusting pads must be refitted to their original positions.

OVERHAUL

Examine the tappets and tappet guides for signs of wear. The diametrical clearance between the tappet and tappet guide should be .0008″ to .0019″ (.02 to .05 mm.).

Examine the adjusting pads for signs of indentation. Renew if necessary with the appropriate size when making valve clearance adjustment on re-assembly.

Tappet Guide Replacement

If it is found necessary to replace the tappet guides they must be fitted in accordance with the following instructions and only genuine factory replacement parts used.

(1) Remove the old tappet guide by boring out until the guide collapses. Take care not to damage the bore for the guide in the cylinder head.

(2) Carefully measure the diameter of the tappet guide bore in the cylinder head at room temperature—68°F (20°C).

(3) Grind down the 1.643″ (41.73 mm.) outside diameter of tappet guide to a diameter of .003″ (.08 mm.) larger than the tappet guide bore dimension, that is to give an interference fit of .003″ (.08 mm.).

(4) Also grind off the same amount from the " lead-in " at the bottom of tappet guide. The reduction in diameter from the adjacent diameter should be .0032″ to .0057″ (.08 to .14 mm.).

(5) Heat the cylinder head in an oven for half an hour from cold at a temperature of 300°F (150°C).

(6) Fit the tappet guide, ensuring that the lip at top of guide beds evenly in the recess.

(7) After fitting, ream tappet guide bore to a diameter of $1\frac{3}{8}'' \begin{smallmatrix} +.0007'' \\ -.0000'' \end{smallmatrix}$ (34.925 $\begin{smallmatrix} +.018 \text{ mm.}) \\ -.000 \text{ mm.}) \end{smallmatrix}$.

Note : It is essential that, when reamed, the tappet guide bore is concentric with the bore of the valve guide.

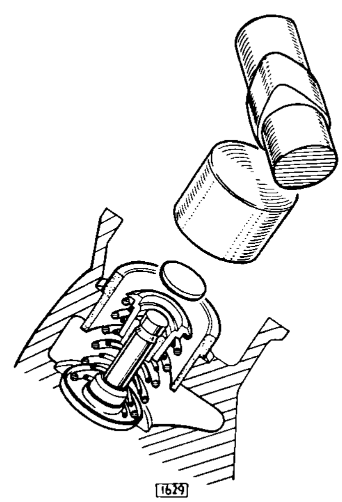


Fig. 45. Showing the tappet and adjusting pad.

THE TIMING GEAR

The camshafts are driven by Duplex endless roller chains in two stages.

The first stage or bottom timing chain drives the larger wheel of a double intermediate sprocket; the second stage or top timing chain passes round the smaller wheel of the intermediate sprocket, both camshaft sprockets and is looped below an idler sprocket.

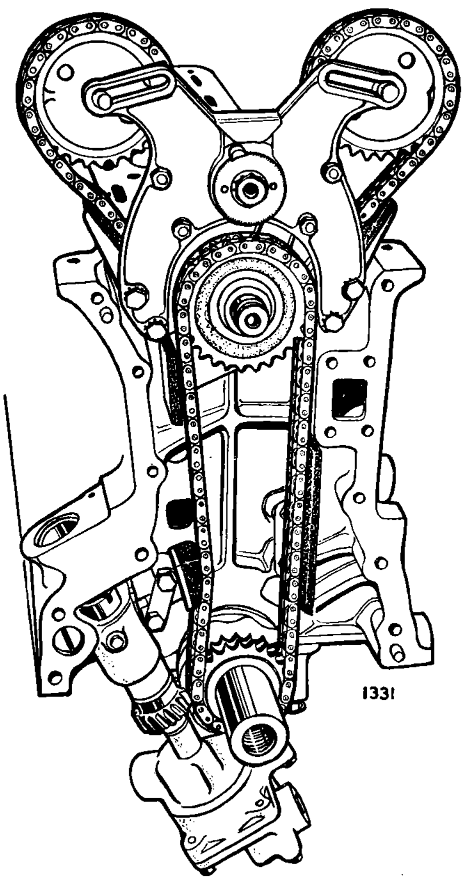


Fig. 46. Timing gear arrangement of 3.4/3.8 litre engines.

In the case of the 2.4 litre, the bottom timing chain is shorter and the intermediate timing chain damper, situated adjacent to the top sprocket, is no longer necessary.

The idler sprocket has an eccentric shaft for top timing chain tension adjustment and the bottom chain is automatically tensioned by an hydraulic tensioner bolted to the cylinder block. Nylon or rubber vibration dampers are located at convenient points around the chains.

REMOVAL

Unscrew the four set bolts and remove the bonnet. Care should be taken to mark the original position of the bonnet to facilitate replacement.

Remove the battery, battery tray and drain tube. Remove the windscreen washer bottle from the wing valance.

Drain the water from the radiator and cylinder block.

Disconnect the top and bottom water hoses from the radiator.

Remove the two set bolts securing the sides of the radiator to the body.

Remove the two bottom radiator mounting nuts, washers and rubber mountings.

On the 3.4 and 3.8 litre models remove the nuts and washers securing the fan cowl and servo air cleaner to the radiator. Place the cowl over the fan and withdraw the radiator.

On later models a twelve-bladed fan is fitted and a guard bolted to the top of the radiator. Remove the servo air cleaner secured to the fan guard on the right-hand side of the radiator. Unscrew the two nuts, serrated and plain washers securing the coil to the front of the cylinder head. Withdraw the radiator.

Remove the cylinder head as described on page 41.

Remove the front suspension as described in Section J.

Remove the damper as described on page 35.

Withdraw the split cone.

Remove the sump as described on page 51.

Unscrew the set bolts and nuts, and remove the water pump from the timing cover.

Note the gasket between the pump and the timing cover.

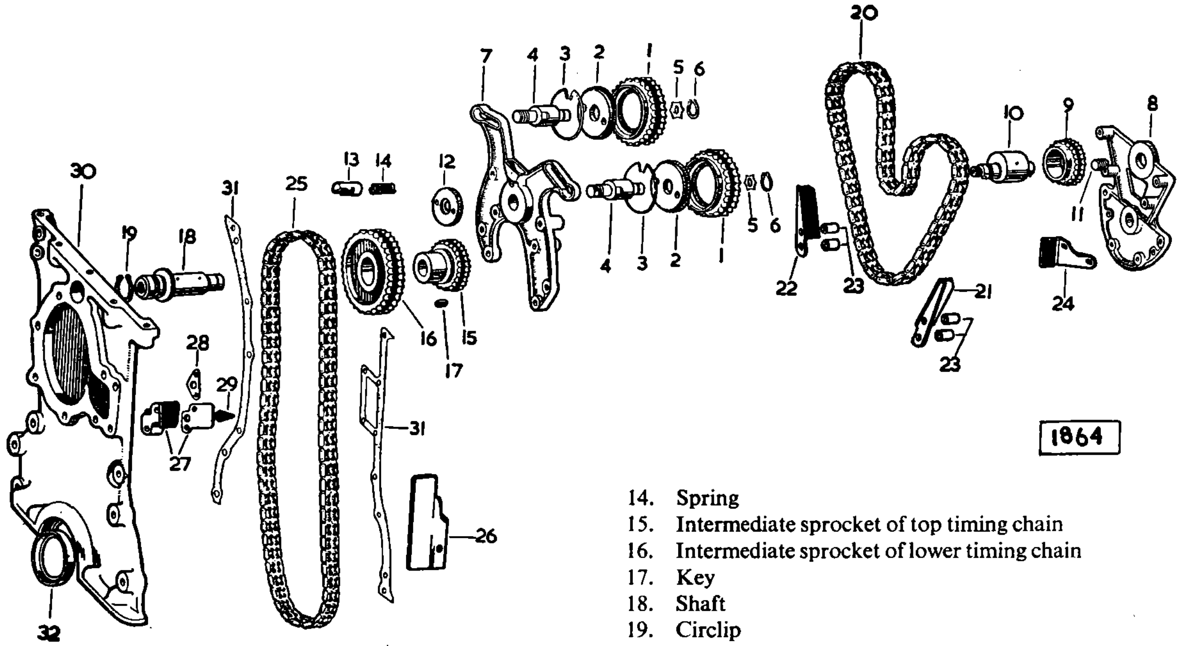
Remove the front cover as described on page 22.

Remove the bottom timing chain tensioner as described on page 61.

Unscrew the four setscrews securing the front mounting bracket to the cylinder block.

Remove the two screwdriver slotted setscrews securing the rear mounting bracket; on the 3.4 litre model these setscrews secure the intermediate damper bracket.

The timing gear assembly can now be removed.



1. Camshaft sprocket
2. Adjusting plate
3. Circlip
4. Guide pin
5. Star washer
6. Circlip
7. Timing gear front mounting bracket
8. Timing gear rear mounting bracket
9. Idler sprocket
10. Eccentric shaft
11. Plug
12. Adjustment plate
13. Plunger pin
14. Spring
15. Intermediate sprocket of top timing chain
16. Intermediate sprocket of lower timing chain
17. Key
18. Shaft
19. Circlip
20. Top timing chain
21. Damper for top timing chain (left hand)
22. Damper for top timing chain (right hand)
23. Distance piece
24. Intermediate damper (3.4 and 3.8 litre models only)
25. Bottom timing chain
26. Vibration damper
27. Hydraulic chain tensioner
28. Shim
29. Filter gauze
30. Front timing cover
31. Gasket
32. Oil seal

Fig. 47. Exploded view of the timing gear.

DISMANTLING

Remove the nut and serrated washer from the front end of the idler shaft, and withdraw the plunger and spring.

Remove the four nuts securing the front mounting bracket to the rear bracket. Withdraw the front bracket from the studs.

Remove the bottom timing chain from the large intermediate sprocket.

To remove the intermediate sprockets, remove the circlip from the end of the shaft in the mounting bracket. Press the shaft out of the bracket, and withdraw the sprockets from the shaft.

To separate the two intermediate sprockets, press the boss of the small sprocket from the bore of the large sprocket, noting that they are keyed together.

OVERHAUL

If the chain shows signs of stretching or wear, new ones should be fitted. Replace any sprockets and dampers that show signs of wear.

ASSEMBLING

Fit the eccentric shaft to the hole in front mounting bracket. Insert the spring and locking plunger for the serrated plate to the hole in the front mounting bracket. Fit the serrated plate and secure with the shakeproof washer and nut. Fit the idler sprocket (21 teeth) to the eccentric shaft.

Fit the two intermediate sprockets (20 and 28 teeth) to their shaft with the larger sprocket forward and press the shaft through lower central hole in rear mounting bracket. Secure with the circlip at the rear of bracket.

Fit the top timing chain (longer chain) to the small intermediate sprocket and the bottom timing chain (shorter chain) to the large intermediate sprocket.

Loop the upper timing chain under the idler sprocket and offer up the front mounting bracket to the rear mounting bracket with the two chain dampers interposed between the brackets.

On the 3.4 litre model fit the intermediate damper to the bottom of the rear mounting bracket with two screwdriver slotted setscrews and shakeproof washer.

Pass the four securing bolts through the holes in the brackets, chain dampers and spacers noting that shakeproof washers are fitted under the bolt heads. Secure the two mounting brackets together with four stud nuts and shakeproof washers.

REFITTING

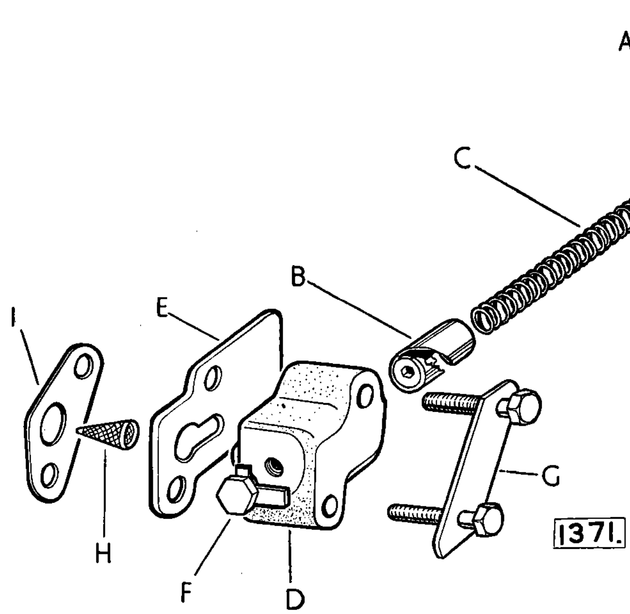
Refitting the remainder of the assembly is the reverse of the removal procedure.

When refitting the timing chain tensioner refer to page 61.

THE BOTTOM CHAIN TENSIONER

The bottom timing chain tensioner is of hydraulic type and consists of an oil resistant rubber slipper mounted on a plunger (A, Fig. 48) which bears on the outside of the chain. The light spring (C) cased by the restraint cylinder (B) and the plunger, in combination with oil pressure holds the slipper head against the chain keeping it in correct tension.

Return movement of the slipper head is prevented by the limit peg at the bottom end of the plunger bore engaging the nearest tooth in the helical slot of the restraint cylinder. The oil is introduced into the adjuster body (D) via a small drilling in the locating spigot and passing through a hole in the slipper head lubricates the chain. The backing plate (E) provides a suitable face along which the slipper head can work.



A.	Plunger	F.	End plug and tap washer
B.	Restraint cylinder	G.	Body securing bolts and tab washer
C.	Spring	H.	Gauze filter
D.	Adjuster body	I.	Shim
E.	Backing plate		

Fig. 48. Exploded view of the bottom timing chain tensioner.

REMOVAL

Proceed as described under "Timing Gear—Removal" on page 58 until the chain tensioner is accessible.

Remove the bottom plug which provides access to the hexagonal hole in the end of the restraint cylinder. Insert an Allen key (.125"A/F) into this and turn the key in a *clockwise* direction until the slipper head remains in the retracted position. Remove the securing bolts and detach the adjuster. If a conical filter is fitted in the oil feed hole in the cylinder block this should be removed and cleaned in petrol.

REFITTING

Fit the conical filter to oil feed hole in the cylinder block.

Fit shims as necessary, between the backing plate and cylinder block so that the timing chain runs centrally along the rubber slipper.

Fit the tab washer and two securing bolts. Tighten the bolts and tap the tab washers against the bolt heads.

It is important that no attempt is made to release the locking mechanism until the adjuster has been finally mounted in the engine WITH THE TIMING CHAIN IN POSITION.

Remove the hexagon head plug and tab washer from the end of the body. Insert the Allen key into the hole until it registers in the end of the restraint cylinder. Turn the key clockwise until the tensioner head moves forward under spring pressure against the chain. Do not attempt to turn the key anti-clockwise, nor force the tensioner head into the chain by external pressure.

Refit the plug and secure with the tab washer.

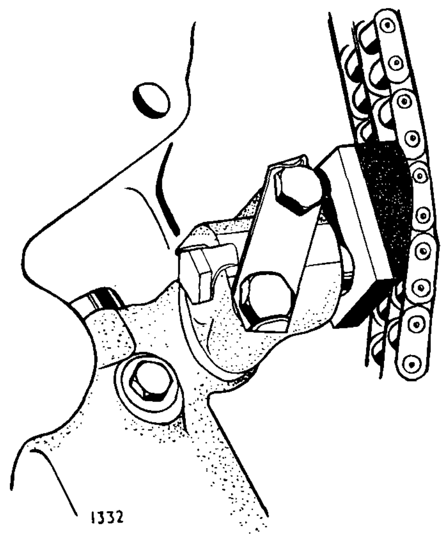


Fig. 49. Showing the bottom timing chain tensioner in position.

THE VALVES AND SPRINGS

The inlet valves are of silicon chrome steel and the exhaust valves are of austenitic steel. Double coil valve springs are fitted and are retained by a valve collar with split cotters.

Warning : As the valves in the fully open position protrude below the cylinder head joint face, the cylinder head must not be placed joint face downwards directly on a flat surface ; support the cylinder head on wooden blocks, one at each end.

REMOVAL

Remove the cylinder head as described on page 41.

Remove Valves

With the cylinder head on the bench remove the inlet manifold, and the revolution counter generator.

Remove the four bearing caps from each camshaft and lift out the camshafts (note mating marks on each bearing cap).

Remove the twelve tappets and adjusting pads situated between tappets and valve stems. Lay out the tappets and pads in order, to ensure that they can be replaced in their original guides.

Obtain a block of wood the approximate size of the combustion chambers and place this under the valve heads in No. 1 cylinder combustion chamber. Press down the valve collars and extract the split cotters. Remove the collars, valve springs and spring seats. Repeat for the remaining five cylinders. Valves are numbered and must be replaced in the original locations, No. 1 cylinder being at the rear, that is the flywheel end.

OVERHAUL

Valves

Examine the valves for pitting, burning or distortion and reface or renew the valves as necessary. Also reface the valve seats in the cylinder head and grind the valves to their seats using a suction valve tool. When refacing the valves or seat inserts do not remove more metal than is necessary to clean up the facings.

The valve seat angles are as follows :— inlet and exhaust, 45°.

Renew valves where the stem wear exceeds .003" (.08 mm.). The clearance of the valve stem in the guide when new is .001" to .004" (.025 to .10 mm.).

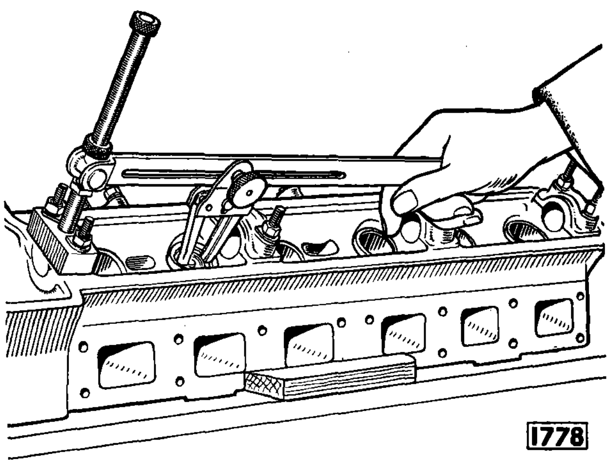


Fig. 50. Fitting the valve springs utilising the valve spring compressing tool, Churchill tool No. J.6118.

Valve Springs

Test the valve springs for pressure, either by comparison with the figures given in the " Valve Spring Data " or by comparison with a new valve spring.

To test against a new valve spring, insert both valve springs end to end between the jaws of a vice or under a press with a flat metal plate interposed between the two springs. Apply a load partly to compress the springs and measure their comparative lengths.

When fitting valve springs to the cylinder head compress the springs using Churchill tool No. J.6118.

VALVE CLEARANCE ADJUSTMENT

When checking the valve clearances, the camshafts must be fitted one at a time as if one camshaft is rotated when the other camshaft is in position, fouling is likely to take place between the inlet and exhaust valves. Obtain and record all valve clearances by using a feeler gauge between the back of each cam and the appropriate valve tappet.

Correct valve clearances are :—

Inlet	.004" (.10 mm.)
Exhaust	.006" (.15 mm.)

Adjusting pads are available rising in .001" (.03 mm.) sizes from .085" to .110" (2.16 to .279 mm.) and are etched on the surface with the letter ' A ' to ' Z ', each letter indicating an increase in size of .001" (.03 mm.). Should any valve clearance require correction, remove the camshaft, tappet and adjusting pad. Observe the letter etched on the existing adjusting pad and should the recorded clearance for this valve have shown say .002" (.05 mm.) excessive clearance select a new adjusting pad bearing a letter two lower than the original pad.

As an example, assume that No. 1 inlet valve clearance is tested and recorded as .006" (.15 mm.). On removal of the adjusting pad, if this is etched with the letter ' D ' then substitution with a pad bearing the letter ' F ' will correct the clearance for No. 1 inlet valve.

When fitting the camshafts prior to fitting the cylinder head to the engine it is most important that the keyway in the front bearing flange of each camshaft is perpendicular (at 90°) to the adjacent camshaft cover face before tightening down the camshaft bearing cap nuts.

Tighten the camshaft bearing cap nuts to a torque of 9 lb. ft. (1.24 kg.m.).

REFITTING

Before attempting to refit the cylinder head refer to the instructions given on page 42.

THE VALVE GUIDES

The valve guides are of cast iron and are chamfered at the upper ends. The outside diameter of the guide is reduced at the upper end to provide a "lead-in" when fitting the guide to the cylinder head. The inlet and exhaust guides are of different lengths the inlet being the shorter of the two.

REPLACEMENT

Examine the valve guides for evidence of wear in the bore. The clearance between the valve stem and the guide when new is .001″ to .004″ (.025 to .10 mm.).

If it is found necessary to replace worn valve guides they must be fitted in accordance with the following instructions and only genuine factory replacement parts used.

(1) Press out, or drive out with a piloted drift, the old valve guide from the top of the cylinder head.

(2) Ream the valve guide bore in the cylinder head to a diameter of

$$.505'' \begin{matrix} +.0005'' \\ -.0002'' \end{matrix} \quad (12.83 \text{ mm.} \begin{matrix} +.012 \text{ mm.)} \\ -.005 \text{ mm.)} \end{matrix}$$

(3) Heat the cylinder head by immersing in boiling water for 30 minutes.

(4) Coat the valve guide with graphite grease and press in, or drive in with a piloted drift, from the combustion chamber end. The correct fitted position for both inlet and exhaust guides is with the top of the guide (chamfered end) $\frac{5}{16}$″ (8 mm.) above the spot facing for the valve spring seat. (See Fig. 51).

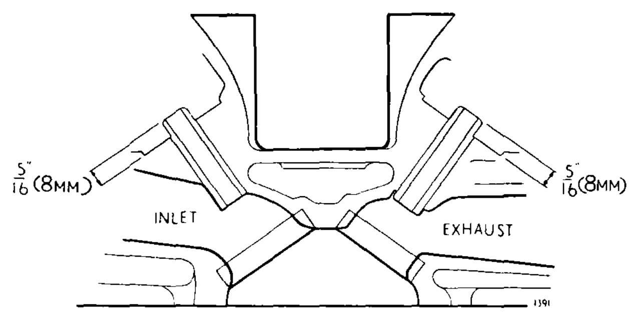


Fig. 51. Showing the fitted position of the valve guides.

THE VALVE SEAT INSERTS

The valve seat inserts are centrifugally cast iron and are shrunk into the cylinder head.

REPLACEMENT

If it is found necessary to replace the valve seat inserts they must be fitted in accordance with the following instructions and only genuine factory replacement parts used.

(1) Remove the old valve seat insert by boring out until the insert collapses. Take care not to damage the recess for insert in the cylinder head.

(2) Carefully measure diameter of insert recess in cylinder head at room temperature 68°F. (20°C).

(3) Grind down outside of insert to a diameter of .003″ (.08 mm.) larger than recess dimension, that is, to give an interference fit of .003″ (.08 mm.).

(4) Heat the cylinder head in an oven for one hour from cold at a temperature of 300°F. (150°C).

(5) Fit insert, ensuring that it beds evenly in its recess.

(6) After the valve seat insert has been fitted the following instructions should be carried out to ensure that the valve clearance can be obtained within the range of the adjusting pads, that is, .085″ to .110″ (2.16 to 2.79 mm.).

(a) Assemble the camshafts to the cylinder head. Fit the appropriate valve to the insert in question and, with the valve seat faces touching, check the distance between the top of valve stem and the **back** of the cam. This should be .320″ (8.13 mm.) **plus** the appropriate valve clearance. (The figure of .320″ (8.13 mm.) includes an allowance for an adjusting pad thickness of .095″ (2.41 mm.) to .097″ (2.46 mm.) which will, if necessary, permit the fitting of thicker or thinner adjusting pads when making the final valve clearance adjustment).

(b) If the distance is greater than the figure of .320″ (8.13 mm.), plus the appropriate valve clearance, grind the valve seat of the insert with suitable valve grinding equipment until the correct distance is obtained.

Example: Assume that the valve insert in question is an exhaust and the distance between the top of the valve stem and the back of the cam is found to be .344″ (8.74 mm.).

Adding the exhaust valve clearance of .006″ (.15 mm.) to .320″ (8.13 mm.) equals .326″ (8.28 mm.). In this case the valve seat of the insert will have to be ground down to reduce the distance between the top of valve stem and the back of the cam by .018″ (.46 mm.) that is, .344″ minus .326″ (8.74 minus 8.28 mm.).

(c) After assembling the cylinder head, check and adjust the valve clearances in the normal manner.

VALVE TIMING

Turn the engine so that No. 6 (front) piston is exactly in the T.D.C. position on compression stroke (firing position) that is, with the distributor rotor arm opposite No. 6 cylinder segment.

See Figs. 25, 55 or 56 for location of T.D.C. marks.

It is important to tension the top timing chain before attempting to check or set the valve timing. Proceed as follows :—

Through the breather aperture in the front of the cylinder head slacken the locknut securing the serrated plate (Fig. 52).

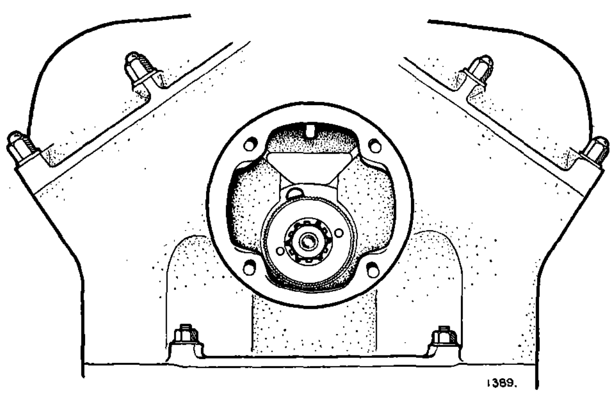


Fig. 52. Showing the serrated plate for adjustment of the top timing chain tension.

Tension the chain by pressing locking plunger inwards and rotating serrated plate by the two holes in an anti-clockwise direction. Turn the engine each way slightly and recheck the chain tension. When correctly tensioned there should be slight flexibility on both outer sides below the camshaft sprockets, that is, the chain must not be dead tight. Release the locking plunger and securely tighten the locknut.

Remove the locking wire from the setscrews securing the camshaft sprockets. Note the positions of the **inaccessible** setscrews and rotate the engine until they can be removed. Remove the setscrew from each sprocket and turn the engine back to the T.D.C. position with the No. 6 firing and remove the remaining screws. Tap the camshaft sprockets off the flanges of the camshafts.

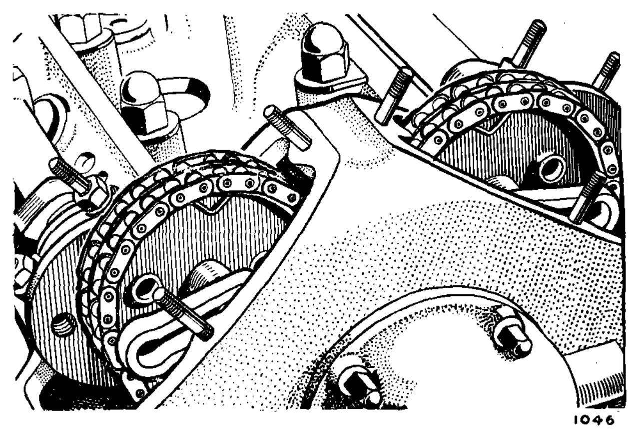


Fig. 53. Showing the camshaft sprockets disconnected from the camshafts.

Accurately position the camshafts with the valve timing gauge, and check that the T.D.C. marks are in exact alignment.

Withdraw the circlips retaining the adjusting plates to the camshaft sprockets and press the adjusting plates forward until the serrations disengage. Replace the sprockets on the flanges of camshafts and align the two holes in the adjuster plate with the two tapped

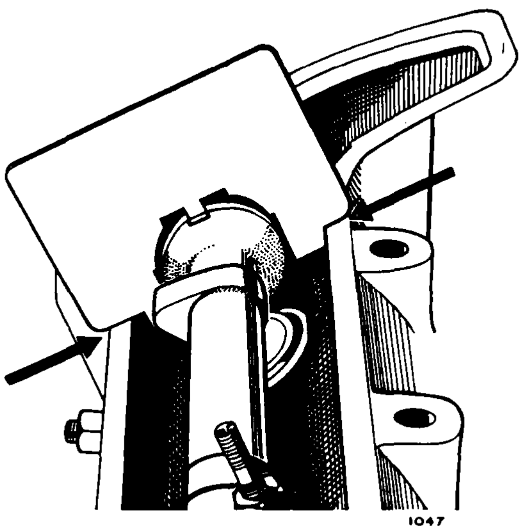


Fig. 54. The valve timing gauge in position. Ensure that the gauge is seated at the points indicated by the arrows.

holes in each camshaft flange. Engage the serrations of the adjuster plates with the serrations in the sprockets.

Note : It is most important that the holes are in exact alignment, otherwise when the set-screws are fitted, the camshafts will be moved out of position. If difficulty is experienced in aligning the holes exactly the adjuster plates should be turned through 180°, which due to the construction of the plate will facilitate alignment.

Fit the circlips to the sprockets and one setscrew to the accessible holes in each adjuster plate. Turn the engine until the other two holes are accessible and fit the two remaining setscrews.

Finally, recheck the timing chain tension and valve timing in this order. Secure the four setscrews for camshaft sprockets with new locking wire.

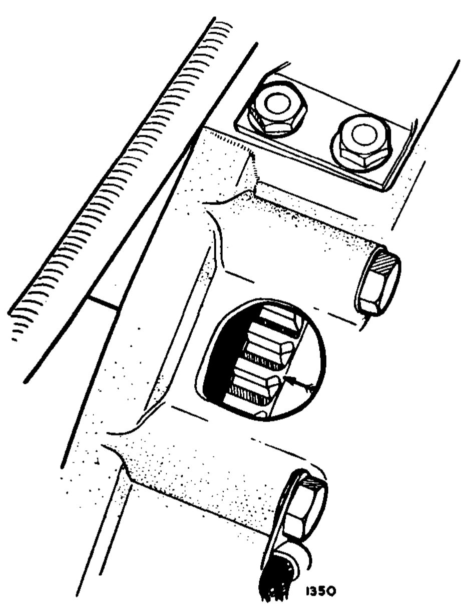


Fig. 55. Showing the location of the Top Dead Centre marks on automatic transmission cars as viewed from the left-hand side of the combined engine and transmission unit. (Early cars).

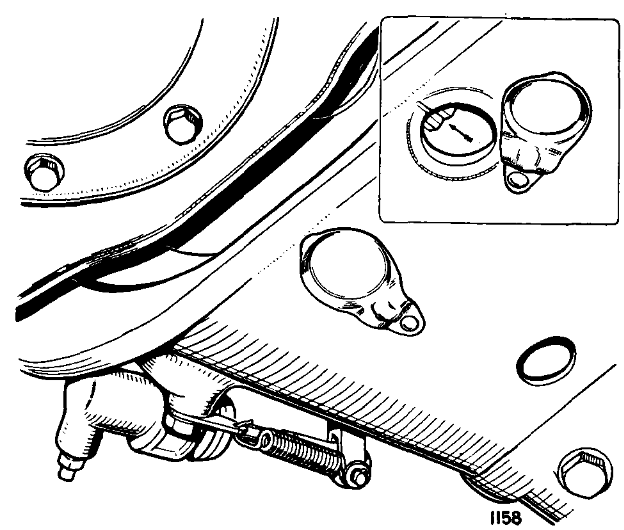


Fig. 56. Showing the location of the Top Dead Centre marks on standard transmission cars as viewed from below with the dust cover moved to one side. (Early cars).

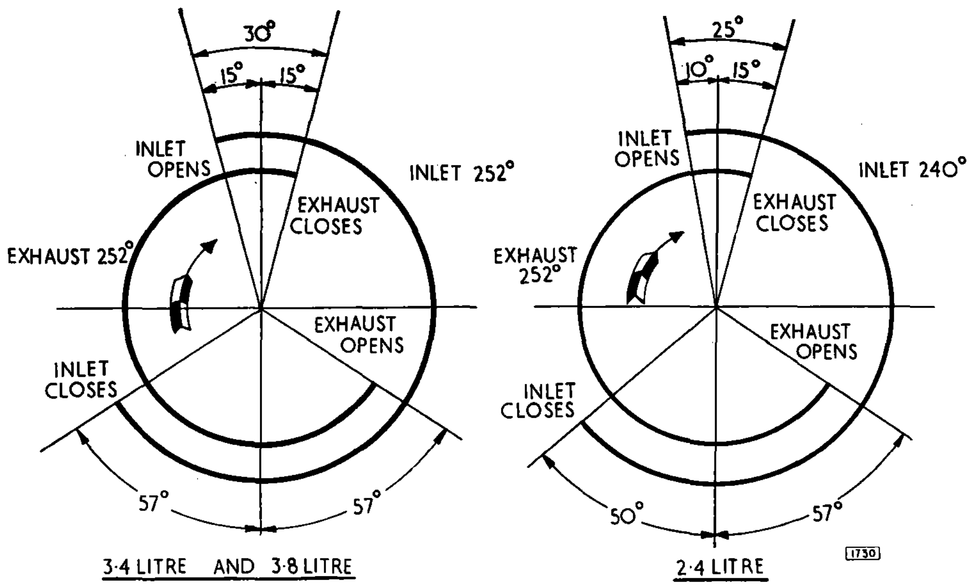


Fig. 57. Valve timing diagrams.

ENGINE MOUNTINGS

The engine is supported at the front on two rubber mountings which are attached to brackets on the body underframe.

On standard transmission and overdrive cars the rear of the power unit is supported on a coil spring, mounted in a channel support which is bolted to the body floor. An extension of the spring retainer passes through a rubber bush in the channel support.

On automatic transmission cars the rear of the power unit is supported on two rubber mountings fitted between the rear extension case and a mounting bracket bolted to the body floor.

FRONT ENGINE MOUNTINGS

Removal

Either place a sling round the front of the engine or attach a lifting plate to the cylinder head. Unscrew the large set bolt, spring washer and plain washer securing the front engine mounting bracket to the mounting rubber. Repeat for the other side.

Raise the engine so that the front mounting brackets are just clear of the mounting rubbers.

Remove the two nuts, washers and bolts securing the front engine mounting rubber to the support bracket to the body underframe. Repeat for the other side.

Refitting

Refitting is the reverse of the removal procedure.

REAR ENGINE MOUNTING

(Standard Transmission and Overdrive Models)

The rear mounting coil springs fitted to standard transmission and overdrive models are of different lengths and must be fitted to their respective models ; the free lengths are as follows :

	Standard transmission models	Overdrive models
Free length	$3\frac{5}{32}''$ (80 mm.)	$3\frac{17}{32}''$ (90 mm.)

Removal

Place a jack under the gearbox to take the weight of the engine.

Place a large washer over the stem of the spring retainer protruding through the bottom of the channel support. Secure the large washer by inserting an $\frac{1}{8}$" (3 mm.) diameter rod through the hole in the stem of the spring retainer.

Unscrew the eight bolts securing the channel support to the body. Remove the bolts, washers, stiffening plates and packing blocks. Remove the two bolts, nuts and washers securing the rear engine mounting plate to the gearbox.

Dismantling

Turn the assembly upside down and place on a press.

Compress the spring and remove the rod from the hole in the stem of the spring retainer.

Slowly release the pressure on the spring and remove the large washer.

Withdraw the spring retainer, spring, rubber spring seat and centre bush from the support channel bracket.

Re-assembling

When re-assembling the unit it is important that the correct type of spring is fitted in relation to the type of transmission.

Press the centre bush into the hole in the bottom of the channel support.

Apply adhesive to the recess in the channel support and press the rubber spring seat into position.

Place the spring in the rubber spring seat.

Place the spring retainer into position so that the stem protrudes through the centre of the spring and the washers welded to the two large lugs on the spring retainer are facing the side of the channel support, which has an extra cut-away portion in the flange.

Compress the spring until the stem of the spring retainer protrudes far enough through the bottom of the channel support to allow a large washer to be placed over the stem and an $\frac{1}{8}$" (3 mm.) rod to be inserted through the hole in the stem.

Refitting

Offer up the rear engine mounting assembly to the rear of the two lugs on the gearbox casing. There is an extra cut-away in one of the channel support flanges and this should be facing towards the front of the car.

Secure the spring retainer to the gearbox with two bolts, nuts and washers.

Jack up the gearbox until the channel support bracket holes line up with the holes in the body.

Insert the packing blocks between the body floor and the channel support bracket and secure with the four stiffening plates, eight set bolts and washers.

Remove the rod and the washer from the stem of the retainer.

Release the jack.

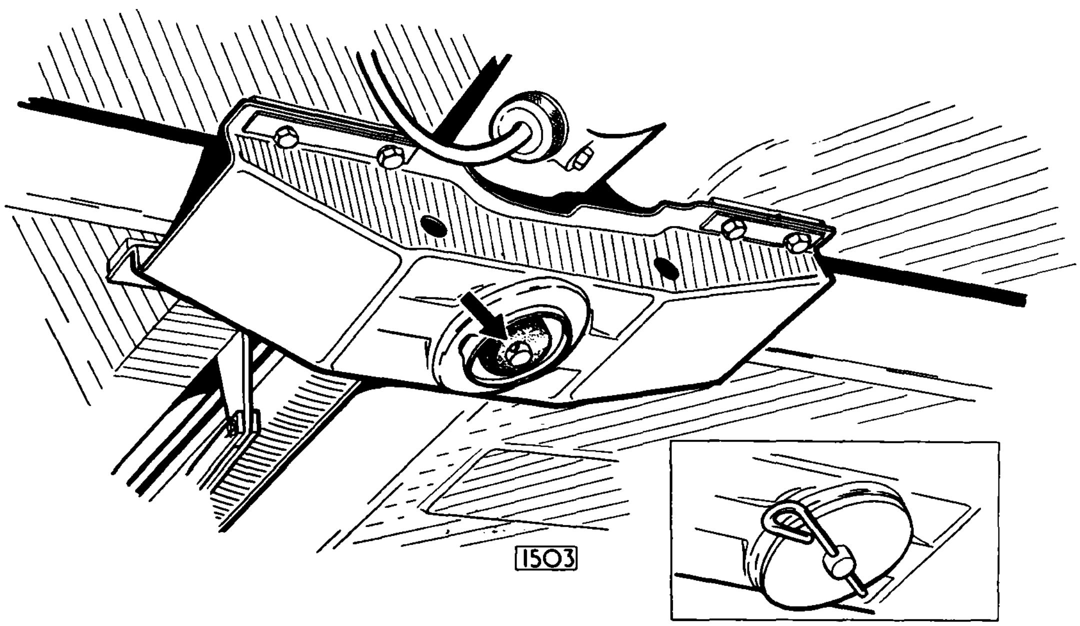


Fig. 58. The hole at the bottom of the spring retainer stem is for assembly purposes only. The inset shows the large washer and rod in position prior to removal of the rear mounting.

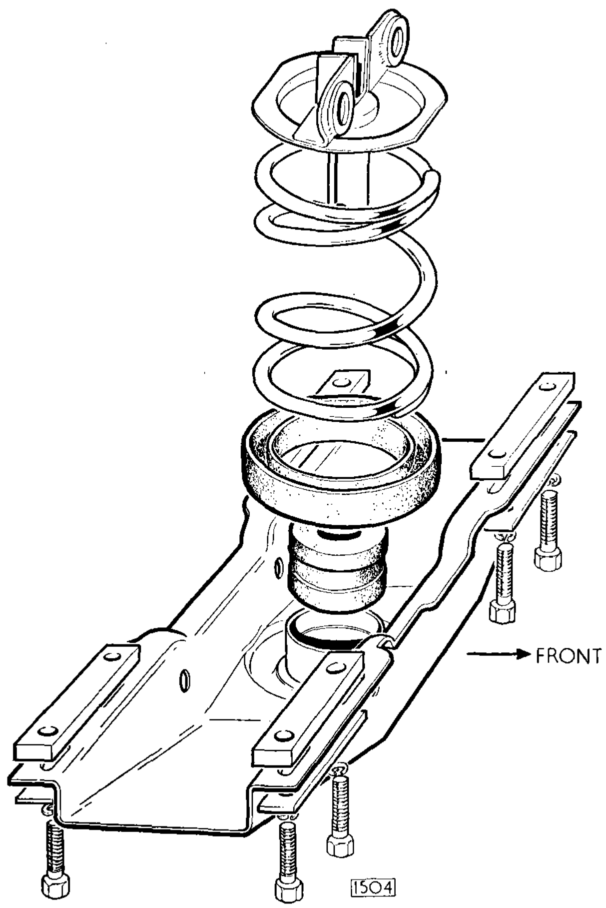


Fig. 59. Exploded view of the rear mounting assembly (standard transmission and overdrive models).

REAR ENGINE MOUNTING

(Automatic Transmission Models)

Removal

Unscrew the six set bolts securing the ventilated cover plate to the bottom of the torque converter housing and remove cover plate. Place a piece of wood under the torque converter housing, taking care that it does not foul the torque converter.

Jack up under the piece of wood until the jack takes the weight of the engine.

Unscrew the self-locking nut A Fig. 60 on the engine stabilizer and remove the upper flanged washer B.

Mark the positions of the rear engine mounting bracket relative to the body floor so that the bracket can be refitted in its original position.

Remove the six bolts and packing washers from the rear engine support bracket, care being taken to note the number and positions of the various packing washers fitted between the bracket and the body floor.

Remove the two nuts and shakeproof washers attaching the rear engine support bracket to the two mounting rubbers.

Lower the jack slightly to facilitate the removal of the nuts and shakeproof washers securing the two mounting rubbers to the bracket attached to the transmission unit.

Refitting

After refitting the rubbers and rear mounting plate adjust the engine stabilizer as follows :

1. Screw the lower flanged washer up the stabilizer pin until the flange contacts the bottom of the stabilizer mounting. The washer is slotted on its upper face and can be screwed up the pin by engaging a thin bladed screwdriver in the slot through the centre hole of the rubber mounting.
2. Fit the upper flanged washer and tighten down with the self-locking nut.

Failure to observe the above procedure may cause engine vibration and/or fouling of the transmission unit in its cowl due to the engine being pulled up on its mounting.

THE ENGINE STABILISER

The engine stabiliser is situated at the rear of the engine and consists of a rubber/steel mounting attached to the body which is connected to brackets on the clutch housing via a rubber bushed link pin. The link pin is threaded at its upper end and is connected to the rubber mounting by means of flanged washers and a self-locking nut.

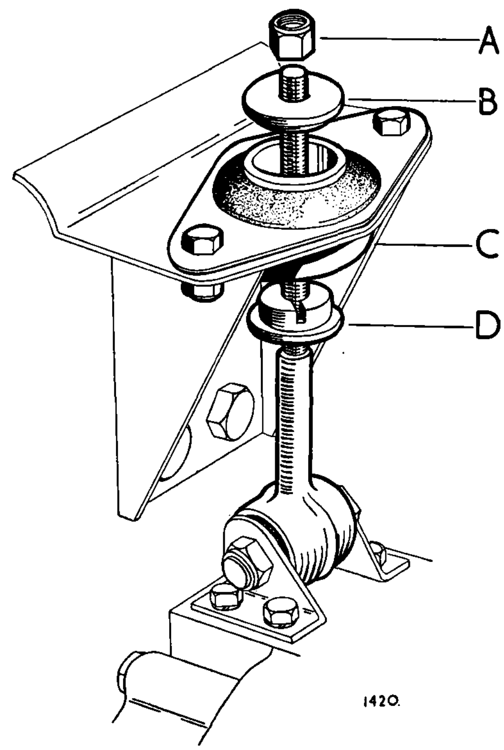


Fig. 60. The engine stabiliser.

ADJUSTMENT

It is MOST IMPORTANT that the stabiliser is assembled in the following manner as failure to observe this procedure may cause engine vibration and/or fouling of the gearbox in its cowl due to the engine having been pulled up on its mountings.

1. Screw the lower flanged washer (D, Fig. 60) up the stabiliser pin until the flange contacts the bottom of the stabiliser rubber mounting (C). The washer is slotted on its upper face and can be screwed up the pin by engaging a thin bladed screwdriver in the slot through the centre hole of the rubber mounting.
2. Fit the upper flanged washer (B) and tighten down with the self-locking nut (A).

AIR CLEANERS

2.4 LITRE MODEL

A single oil bath type air cleaner mounted on top of the cylinder head connects with the dual carburetter air intake and servicing instructions are given in " Routine Maintenance " on page 15.

OIL BATH AIR CLEANER—Removal

Open the engine compartment and remove the cover from the rubber connection and top of oil bath assembly by detaching the winged nut. Remove the element and oil container out of the silencer assembly by releasing the three toggle clips and exhaust manifold and cylinder head brackets by withdrawing three bolts.

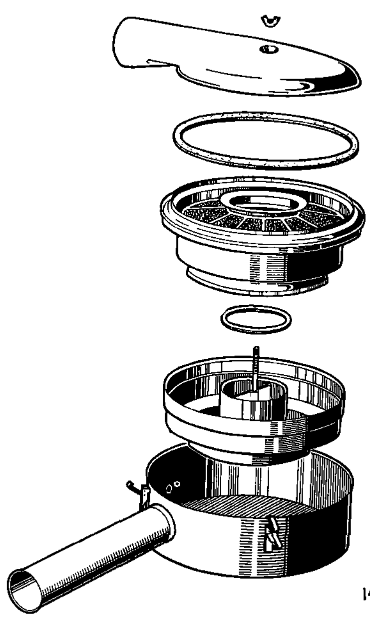


Fig. 61. Oil bath air cleaner (2.4 litre model).

Refitting

Refitting is the reverse of the removal procedure.

3.4 AND 3.8 LITRE MODELS

Early 3.4 and 3.8 litre models were equipped with an oil bath air cleaner situated in the front portion of the left-hand front roadwheel arch and air is ducted from the cleaner to the carburetters through large diameter flexible hoses, wing valance and the air silencer mounted across the cylinder head.

On later production models a paper element air cleaner is fitted and is situated on top of the engine unit.

Servicing instructions for both types of air cleaner are given in " Routine Maintenance " on page 15.

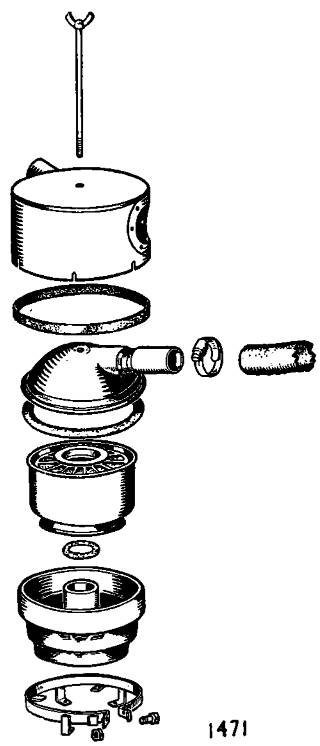


Fig. 62. Oil bath air cleaner

OIL BATH AIR CLEANER—Removal

Open the engine compartment, firmly apply the handbrake, jack up the front of the car and remove the left-hand front roadwheel. Detach the hose from the snout on the side of the air filter, situated in front of the front road-wheel arch by slackening the hose clip. Identify the circumferential position of the air cleaner in the mounting bracket.

Lift the air cleaner unit out of the mounting bracket after slackening the pinch bolt, the cleaner mounting bracket can be detached from the chassis frame when necessary by removing three nuts and bolts. Clean the road dirt from the outside of the air cleaner and identify the circumferential position of the air cleaner cover to the oil container and move the rubber sealing clear of the oil container and remove the air cleaner cover by withdrawing the top centre fly nut. When the rubber seal in the cylindrical side wall is seen to be well worn it can be detached together with the plate by removing six nuts and bolts. The filter cover followed by the filter element can now be lifted from the oil container.

Detach the hose from the left-hand side of the air silencer, mounted on top of the engine, by slackening the hose clip. Remove the air silencer from the bracket on top of the cylinder head by slackening two winged nuts situated beneath and moving the assembly to the left.

The two flexible hoses can be detached from the transfer port through the left-hand wing valance by slackening the hose clips.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :—

i. That the air cleaner cover is so positioned that the inlet and outlet ports will align with the front of the radiator unit and the hose beneath the front road-wheel arch before the wing nut is fully tightened.

ii. That the air cleaner is positioned in the mounting bracket so the inlet and outlet ports will align as detailed in the previous paragraph.

PAPER AIR CLEANER—Removal

Models affected: Commencing Numbers.

	R.H. Drive	**L.H. Drive**
3.4 litre	151512	175692
3.8 litre	201112	212674

Open the engine compartment, remove winged nut and washer in centre of the element container. Lift element container off the centre stud, detach bottom plate and remove element ; in some instances the top cover only may lift off leaving the bottom plate behind with the paper element laying on top. Roll the rubber connection pipe onto the carburetter air intake and lift air filter base from centre stud. The mounting

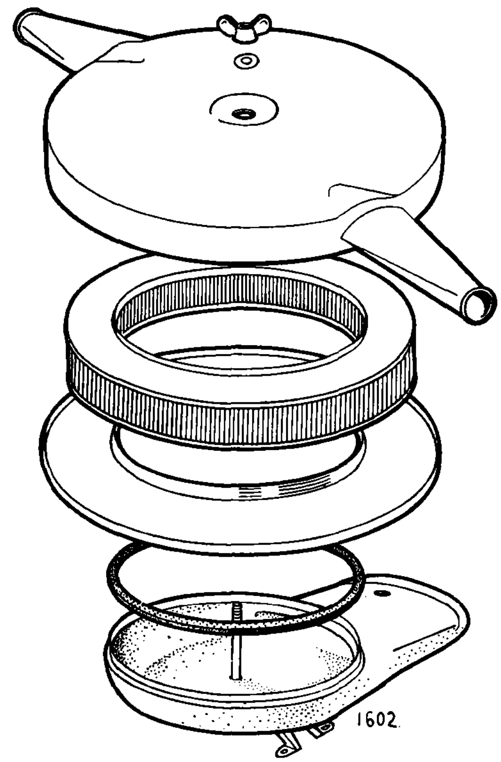


Fig. 63. Paper element type air cleaner

bracket can be detached from the cylinder head by removing the four nuts but it should not be effected unless absolutely necessary.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :—

i. That the rolling back of the rubber connection pipe is delayed until the winged nut is fully tightened.

ii. That the rubber sealing ring beneath the bottom plate is correctly seated otherwise air will by-pass the filter.

iii. That the element is correctly seated in the bottom plate otherwise difficulty will be experienced in fitting the cover.

SUPPLEMENTARY INFORMATION TO SECTION B "ENGINE"

AUTOMATIC FAN BELT TENSIONER

Models affected:	Commencing Engine Numbers
3.4 litre (Power assisted steering)	KH.1862
3.8 litre (Power assisted steering)	LB.7222
3.4 litre (Manual steering)	KH.3116
3.8 litre (Manual steering)	LB.8868

On cars with the above engine numbers and onwards, a spring-loaded jockey pulley is fitted on the right-hand side of the engine. This pulley maintains the correct fan belt tension without any periodic adjustment being required.

FAN BELT

Removal

Slacken the two bolts securing the dynamo to the mounting bracket. Remove the nut and unscrew the bolt securing the top dynamo link to the dynamo Slacken the bolt securing the dynamo link to the engine and press the dynamo in towards the cylinder block.

Remove the fan belt by pressing the jockey pulley inwards.

Refitting

Place the new fan belt in position on the water pump, jockey and crankshaft pulleys.

Press the jockey pulley inwards and pass the fan belt over the dynamo pulley.

Insert the top bolt through the dynamo adjusting link and screw into the lug on the dynamo.

Pull the dynamo away from the cylinder block as far as possible and tighten the top securing bolt.

Replace the locknut on the top bolt.

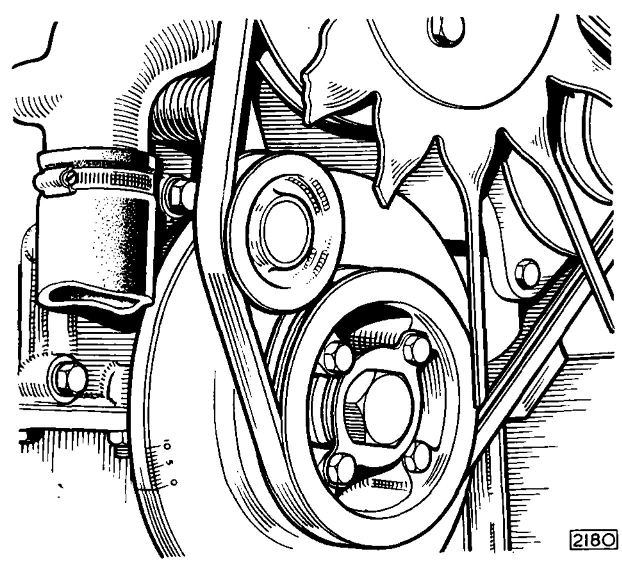


Fig. 64. The automatic fan belt tensioner.

Tighten the bolt securing the link to the engine and also the two bottom dynamo mounting bolts.

CRANKSHAFT REAR OIL SEAL

Models affected:	**Commencing Engine Numbers.**
2.4 litre	BH.4551
3.4 litre	KH.2794
3.8 litre	LB.8247

On cars with the above engine numbers and onwards, a modified rear end cover incorporating an asbestos rope oil eal in an annular groove is introduced. A modified crankshaft is also introduced in conjunction with the new seal.

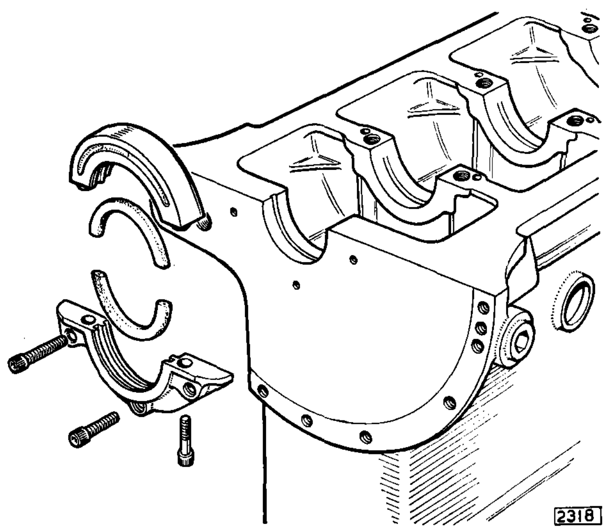


Fig. 65. Exploded view of the rear oil seal.

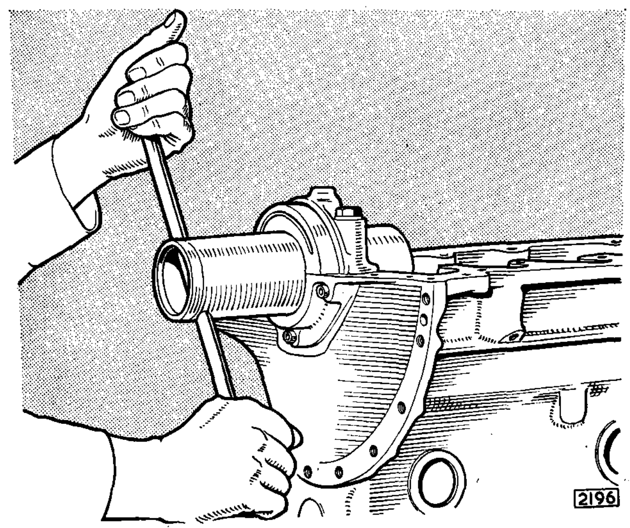


Fig. 66. Sizing the rear oil seal with the Churchill Tool No. J.17.

REMOVAL

Having removed the lower half of the oil seal and the crankshaft as described on page B.34. " Crankshaft Removal ", remove the three allen screws securing the upper half of the oil seal noting the hollow locating dowels at the two outer holes.

Prise out the asbestos seal from its groove and discard it.

REPLACING THE SEAL

Take the new asbestos seals and carefully tap them on the side face to narrow the section of the seal. Fit the seals to the housing and press into the groove using a hammer handle until the seal does not protrude from the ends of the housing. Do **NOT** cut the ends off the seal if they protrude from the housing but continue pressing the seal into the groove until both ends are flush. Using a knife or similar tool, press all loose ends of asbestos into the ends of the groove so that they will not be trapped between the two halves of the housing when assembled.

REFITTING

Assemble the two halves of the rear seal and secure with the two allen screws. Fit the rear main bearing cap to the block without the bearing shells and tighten to a torque of 83 lb. ft. (11.5 kg.m.). Fit the seal and housing to the cylinder block and secure with the three allen screws. Smear a small quantity of colloidal graphite around the inner surface of the asbestos seal and insert the sizing bar (Churchill Tool No. J.17). Ensure that the pilot end of the sizing bar enters the bore of the main bearing then press the bar inwards and rotate at the same time until the bar is fully home. Remove the bar by pulling and twisting at the same time. Remove the three allen screws securing the oil seal housing to the cylinder block and remove the allen screws securing the two halves of the seal. Separate the two halves of the seal and remove the rear main bearing. The crankshaft may now be refitted as described on page B.23.

REDUCED BIG END RUNNING CLEARANCES

Models affected:	Commencing Engine Numbers
2.4 litre	BH.5165
3.4 litre	KH.3229
3.8 litre	LB.9109

On cars with the above engine numbers and onwards new big end bearings, with reduced running clearances, are fitted. These bearings may be fitted in place of the previous type, provided that they are fitted in pairs.

The running clearance is reduced from .0023″—.0039″ (.06 mm.—.10 mm.) to .0015″—.0033″ (.04 mm.—.08 mm.).

GAUZE TYPE ENGINE BREATHER

Models affected:	Commencing Engine Numbers
2.4 litre	BH.1166
3.4 litre	KG.8272
3.8 litre	LB.3922

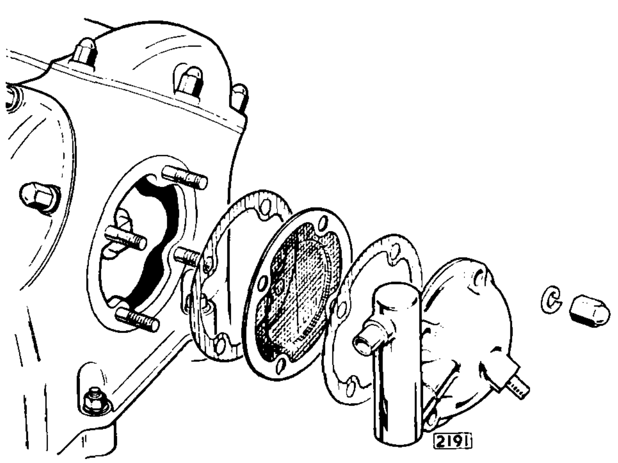


Fig. 67. Gauze type engine breather.

A gauze baffle replaces the baffle plate on the engine breather commencing at the above engine numbers.

The gauze baffle is interchangeable with the baffle plate fitted to earlier cars and the removal together with the refitting of the breather is unaltered.

CAST ALUMINIUM SUMP

Models affected	Commencing Engine Nos.
2.4 litre	BJ.2264
3.4 litre	KJ.2791
3.8 litre	LC.8068

Commencing at the above engine numbers, an aluminium engine sump is fitted together with revised oil pipes and pump.

TIMING GEAR

Models affected:	Commencing Engine Numbers
2.4 litre	BH.1453
3.4 litre	KG.8920
3.8 litre	LB.4885 to LB.9999, LC.1001

The intermediate sprocket for the top and bottom timing chains, with effect from the above engine numbers, is a one piece casting. This one piece sprocket is interchangeable with the two piece sprocket fitted to earlier cars.

Key to Fig. 68.

1. Camshaft sprocket
2. Adjusting plate
3. Circlip
4. Guide pin
5. Star washer
6. Circlip
7. Front mounting bracket
8. Rear mounting bracket
9. Idler sprocket
10. Eccentric shaft
11. Plug
12. Adjustment plate
13. Plunger pin
14. Spring
15. Intermediate sprocket
16. Shaft
17. Circlip
18. Top timing chain
19. L.H. damper
20. R.H. damper
21. Distance piece
22. Intermediate damper
23. Tab washer
24. Bottom timing chain
25. Vibration damper
26. Lockwasher
27. Hydraulic chain tensioner
28. Shim
29. Filter gauze
30. Front timing cover
31. Gasket
32. Oil seal
33. Dynamo adjusting link
34. Distance piece
35. Bracket assembly
36. Torsion spring
37. Jockey pulley carrier
38. Jockey pulley

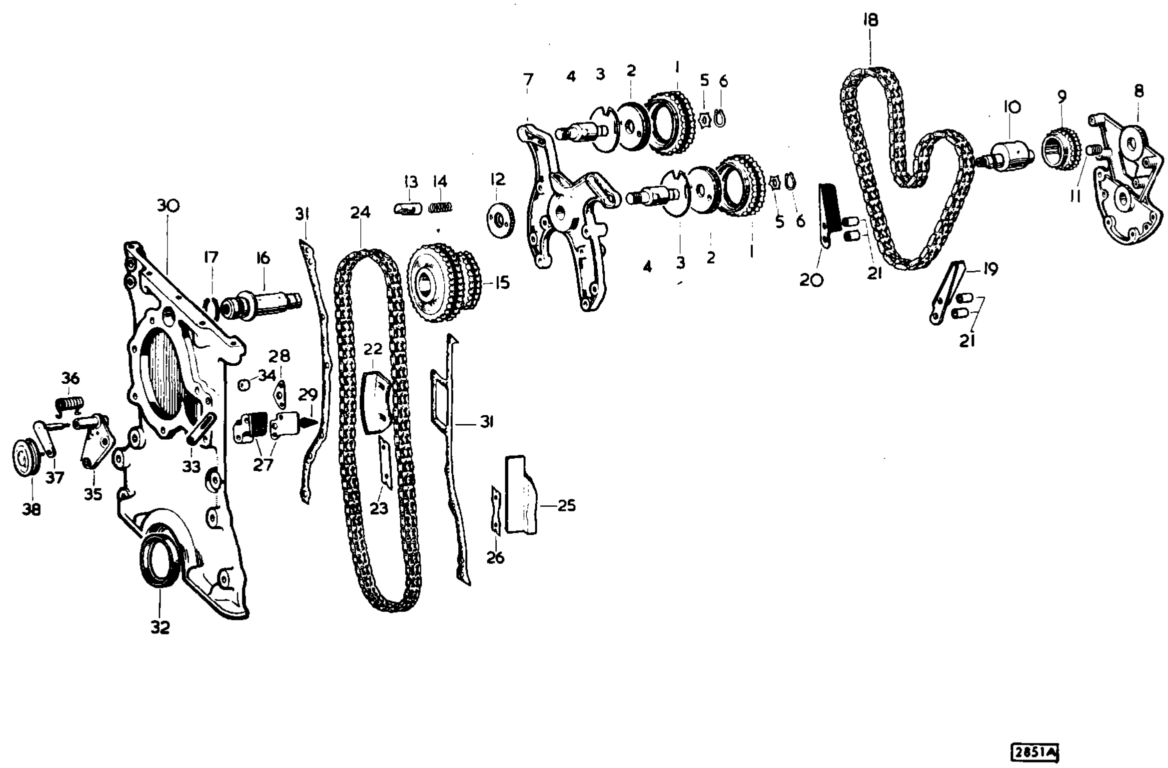


Fig. 68 Exploded view of the timing gear.

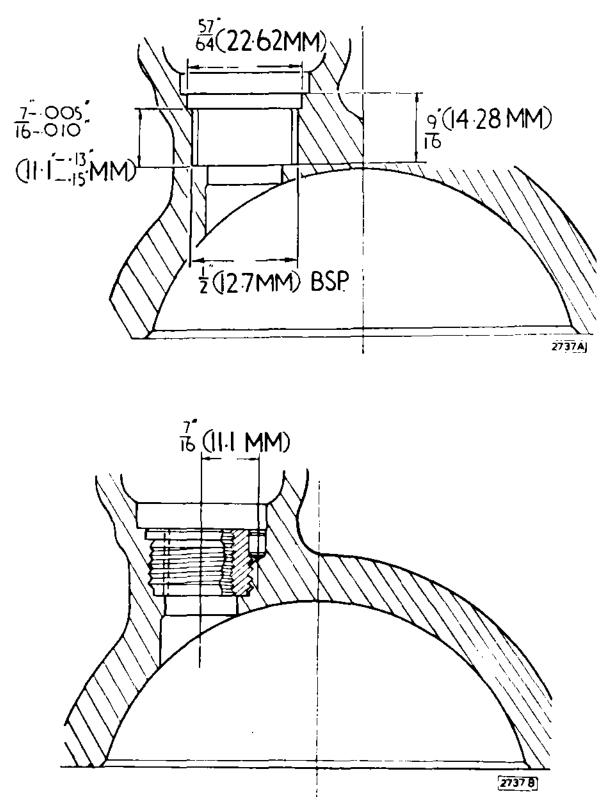


Fig. 69. Fitting dimensions for sparking plug inserts.

SPARKING PLUG INSERTS

When it becomes necessary to fit a sparking plug insert in the event of a stripped thread proceed as follows :—

(a) bore out the stripped thread to .75" (19.05 mm.) diameter and tap $\frac{1}{2}$" B.S.P.

(b) counterbore $\frac{57}{64}$" (22.82 mm.) diameter to accommodate the larger diameter of the insert.

(c) fit the screwed insert ensuring that it seats firmly at the bottom of the thread.

(d) drill and ream a $\frac{1}{8}$" (3.17 mm.) diameter hole $\frac{3}{16}$" (4.76 mm.) deep between the side of the insert and the cylinder head. Drive in the locking pin and peen over the insert and locking pin.

OIL CONTROL RINGS

Models affected:	Commencing Engine Numbers
2.4 litre	BH.8488
3.4 litre	KH.7999
3.8 litre	LC.3703

Commencing at the above engine numbers, "Maxiflex" oil control rings are fitted.

The "Maxiflex" oil control rings consist of two steel rails with a spacer between held together on assembly with an adhesive. The equaliser, which is fitted inside the oil control ring, should be assembled with the two ends butted together and positioned at 180° to the gap. It is most important that the two ends of the equaliser do not overlap. After fitting the rings they should be immediately compressed with a good piston clamp (such as Churchill Tool No. 38U2) and held compressed until entered into the cylinder bore.

The oil control ring gap, when fitted, is .015" to .038" (.38 to .83 mm.).

"Maxiflex" piston rings can be fitted to engines prior to the above numbers but 2.4 litre pistons will require an $\frac{1}{8}$" (3.17 mm.) hole drilled in the centre of the oil control ring groove in line with the gudgeon pin bore as shown in Fig. 8.

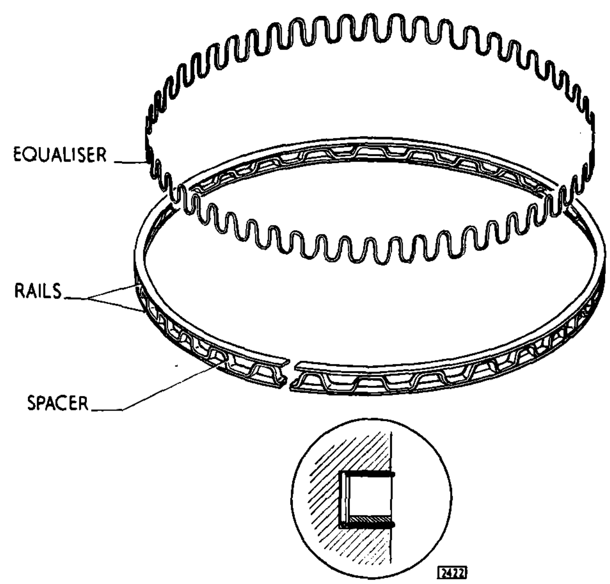


Fig. 70. The "Maxiflex" oil control ring.

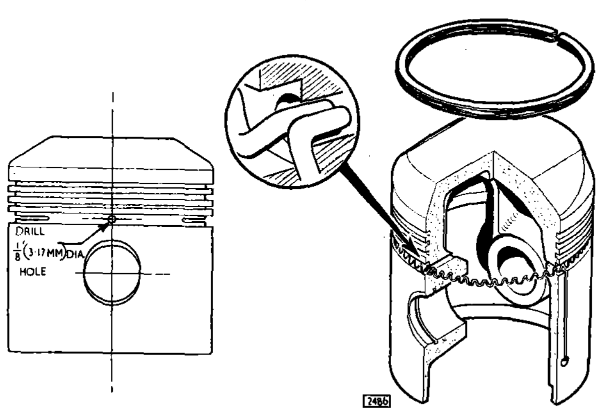
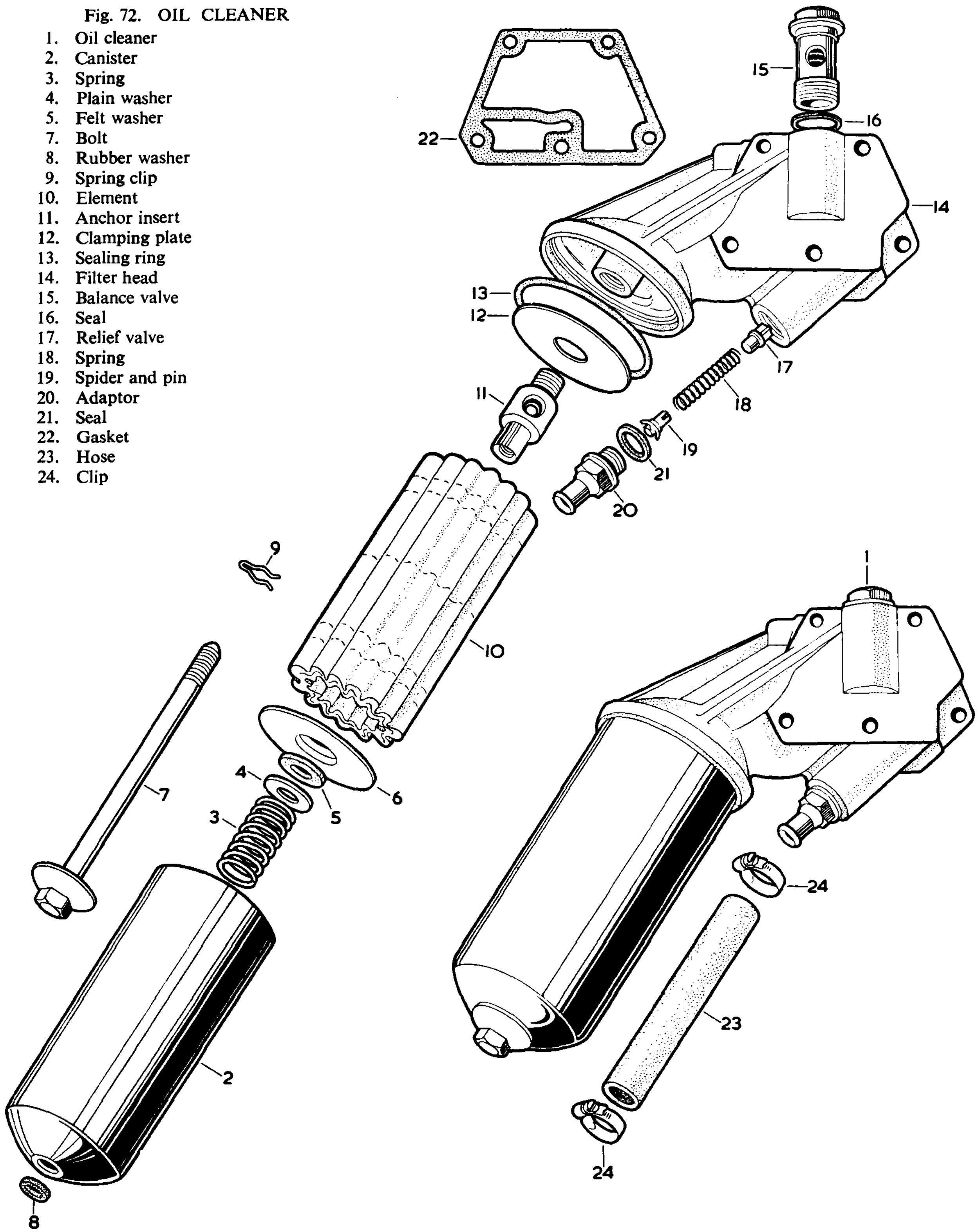


Fig. 71. Method of modifying the 2.4 litre piston.

Fig. 72. OIL CLEANER

1. Oil cleaner
2. Canister
3. Spring
4. Plain washer
5. Felt washer
7. Bolt
8. Rubber washer
9. Spring clip
10. Element
11. Anchor insert
12. Clamping plate
13. Sealing ring
14. Filter head
15. Balance valve
16. Seal
17. Relief valve
18. Spring
19. Spider and pin
20. Adaptor
21. Seal
22. Gasket
23. Hose
24. Clip



ENGINE

Valve Guides with Circlip Retainers

Engine Numbers	Models
BJ.5736	2.4 Litre Mk. 2
KJ.8772	3.4 Litre Mk. 2
LE.3443	3.8 Litre Mk. 2

Commencing at the above engine numbers, circlips are fitted to the valve guides to ensure positive location in the cylinder head. The circlip registers in a counterbore machined in the head.

The outside diameter of the guide is reduced at the lower end to provide a "lead in" when fitting the guide to the cylinder head. The inlet and exhaust guides are of different lengths, the inlet being the shorter of the two.

Service replacement guides are available in the following oversizes:-

Outside Diameter	Oversize
Inlet	
.506/.507ins. (12.85/12.87mm.)	+.005ins. (.13mm.)
.511/.512ins. (12.97/13.00mm.)	+.010ins. (.25mm.)
Exhaust	
.506/.507ins. (12.85/12.87mm.)	+.005ins. (.13mm.)
.511/.512ins. (12.97/13.00mm.)	+.010ins. (.25mm.)

Replacement

Heat the cylinder head by immersing in boiling water for 30 minutes.

With a piloted drift, after first removing the circlip, drive out the old valve guide from the head.

Ream the valve guide bores to the following dimensions depending on the oversize guides required.

1. $.505\text{ins.}^{+.0005\text{ins.}}_{-.0002\text{ins.}}$ $(12.83\text{mm.}^{+.012\text{mm.}}_{-.005\text{mm.}})$

2. $.510\text{ins.}^{+.0005\text{ins.}}_{-.0002\text{ins.}}$ $(12.95\text{mm.}^{+.012\text{mm.}}_{-.005\text{mm.}})$

Note: It is imperative to ream the valve guide bores to these dimensions as forcing oversize guides into unreamed bores is likely to crack the cylinder head castings.

Earlier cylinder heads can be modified by making circlip recesses by either:-

(i) Counterboring 0.593ins. + .04ins. deep (15.06mm. + 1.02mm.). This is the preferred method.

(ii) Chamfering at 45 degs. as shown in B, Fig. 74.

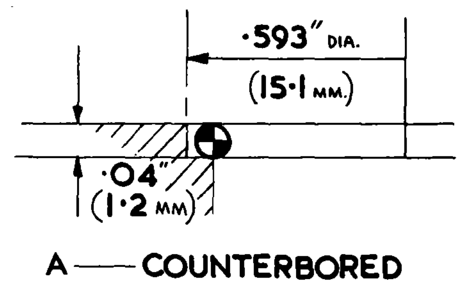


Fig. 73 Counterbored.

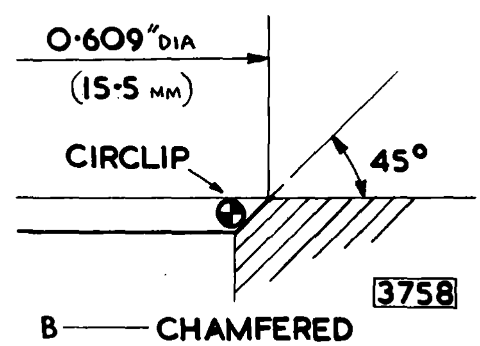


Fig. 74 Chamfering.

Coat the valve guides with graphite grease and fit the circlip. Re-heat the cylinder head.

With a piloted drift, drive in the valve guide from the top until the circlip registers in the counterbore (or seats on the chamfer) of the cylinder head. Visually check that the circlip has seated correctly.

SECTION C

CARBURETTERS AND FUEL SYSTEM

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

CARBURETTERS
(2·4 litre)

INDEX *(continued)*

CARBURETTERS
(3·4 litre)

THE FUEL SYSTEM

CARBURETTERS AND FUEL SYSTEM

The 2.4 litre model is equipped with twin Solex B.32 PBI-5 type carburetters ; the 3.4 and 3·8 litre model are equipped with twin S.U. H.D.6 type carburetters. Each type of carburetter is dealt with separately in the following section.

CARBURETTERS
(2·4 litre)

DESCRIPTION

The 2.4 litre model is fitted with twin Solex B.32 PBI-5 type carburetters. This type of carburetter is fully dust-proofed and has a progressive starting device with fast idle ; it also incorporates an anti-percolation device and accelerator pump.

Dust-proofing

The carburetters are fully dust-proof, all air to the engine (ventilating the float chambers, starting, slow-running and main spraying circuits) is drawn through the air cleaner. This ensures maintenance of a balanced mixture and complete filtration of all inducted air, even if the air cleaner gradually becomes clogged in service.

The Starting Device

The starting device, operated by the facia control, ensures immediate starting from cold and quick drive-away.

The control in the full rich position supplies a very rich mixture, to enable starting at low temperatures.

After starting, the mixture control should be placed in the intermediate position (half-way). This supplies a weaker mixture of greater volume, and enables the car to be driven away immediately. This position can also be used when the engine is not stone cold.

During the warming up period of the engine the control should be moved gradually towards the off position, thus progressively reducing richness until the starting device is out of action.

Idling

For idling, the mixture is supplied to the engine past the butterfly and from the pilot jet and the pilot jet air bleed. Engine speed can be varied by the slow-running adjustment screw which opens or closes the throttle as required, whilst adjustment of the volume control screw varies the mixture strength and volume from the pilot jet and the pilot air bleed.

Main Circuit

For normal running, petrol is supplied from the float chamber through the main jet ; it is mixed in the main well with air metered through the air correction jet, and carried into the well via the emulsion tube. The mixture is then discharged from the main spraying well into the air stream passing through the choke tube.

Accelerating Pump

The accelerating pump is mechanical in operation and consists mainly of a pump membrane, membrane return spring, lever and an actuating rod, the latter item being the connecting link between the throttle spindle and lever. An inlet valve permits petrol to pass from the float chamber into the pump chamber.

On depressing the accelerator pedal, the movement of the actuating rod and lever displaces the pump membrane and forces the petrol from the chamber through the pump jet and pump injector pipe into the main air stream, thereby ensuring a condition of rapid, smooth acceleration. During this operation a small ball in the inlet valve prevents the petrol from returning to the float chamber.

Since the injector pipe is positioned in the waist of the choke tube and there is no outlet valve within the pump circuit, petrol passes from the pump to the injector at both part and full throttle running conditions.

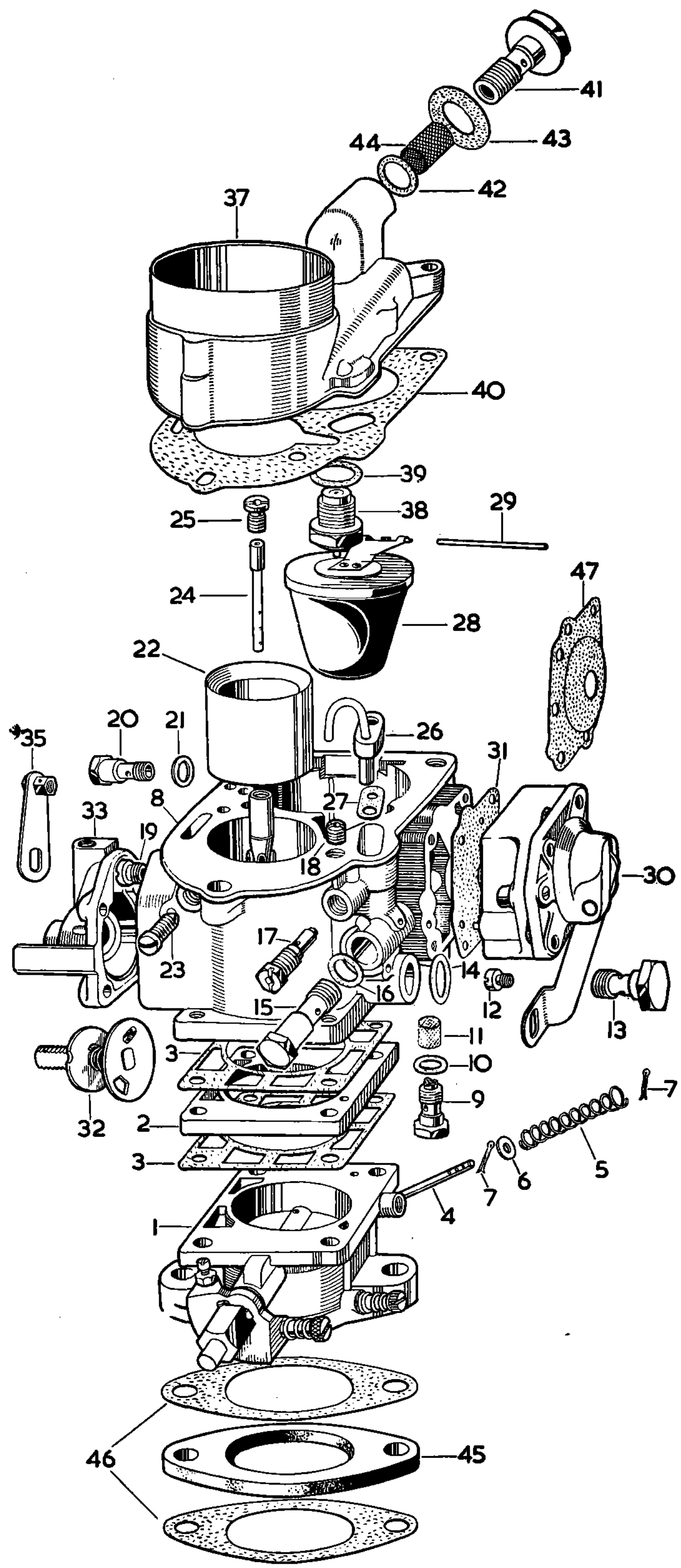
DATA

Type — Solex B.32 PBI-5 (twin)

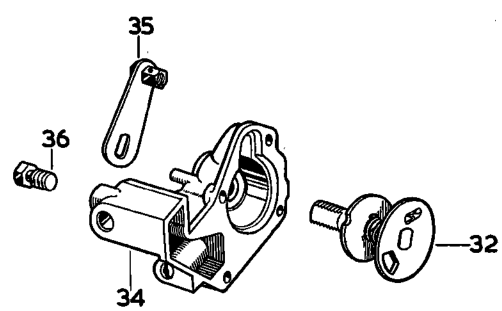
Choke and Jet Sizes	7 to 1 comp. ratio	8 to 1 comp. ratio.
Choke	23 mm.	24 mm.
Main jet	110	110
Air correction jet	200	180
Emulsion tube	14	14
Pump jet	55	55
Pilot jet	50	50
Pilot air bleed	1.2 mm.	1.2 mm.
Needle valve	1.5 mm.	1.5 mm.
Needle valve washer	1 mm.	1 mm.
Starter petrol jet	GS.105	GS.105
Starter air jet	GA.4.5	GA.4.5

Adjustments Required for Altitude

If the car is operated between 5,000 and 10,000 ft., it is recommended that the main jets are reduced by one size, that is, from 110 to 105. Above 10,000 ft. reduce the main jets to 100.



1. Throttle chamber.
2. Nylon insulating washer.
3. Gasket.
4. Control rod.
5. Spring.
6. Washer.
7. Split pin.
8. Float chamber.
9. Non-return valve.
10. Washer.
11. Filter.
12. Bolt.
13. Main jet.
14. Washer.
15. Pump jet.
16. Washer.
17. Pilot jet.
18. Air bleed.
19. Starter air jet.
20. Starter petrol jet.
21. Washer.
22. Choke tube.
23. Screw.
24. Emulsion tube.
25. Air correction jet.
26. Accelerator pump injector.
27. Gasket.
28. Float.
29. Float spindle.
30. Accelerator pump.
31. Gasket.
32. Starter valve.
33. Starter valve body (front carburetter).
34. Starter valve body (rear carburetter).
35. Starter valve lever.
36. Bolt.
37. Float chamber cover.



38. Needle valve.
39. Washer.
40. Gasket.
41. Banjo bolt.
42. Washer—small.
43. Washer—large.
44. Filter.
45. Insulating washer.
46. Gasket.
47. Diaphragm.

Fig. **1.** *Exploded view of the Solex carburetter.*

ROUTINE MAINTENANCE

EVERY 2,500 MILES (4,000 KM.)

Check the slow running and adjust if necessary, as described under "Slow Running—Adjustment".

EVERY 5,000 MILES (8,000 KM.)

Tune Carburetters

See instructions on page C.10.

Carburetter Filters

Remove the bolts securing the petrol pipe banjo unions to the float chambers ; withdraw the gauze filters from the banjo bolts. Clean the filters in petrol ; do not use a cloth as particles will stick to the gauze.

Fuel Feed Line Filter (Early Cars)

The filter is attached to the inlet manifold, and is of the glass bowl type with a flat filter gauze.

At the recommended intervals, or more frequently if the glass bowl shows signs of becoming full of sediment, slacken the locking nut, swing the retaining clip to one side and remove the bowl (4) (Fig. 2), sealing washer (3), and filter gauze (2).

Clean the filter gauze and bowl by washing in petrol. Examine the sealing washer and if necessary fit a new one.

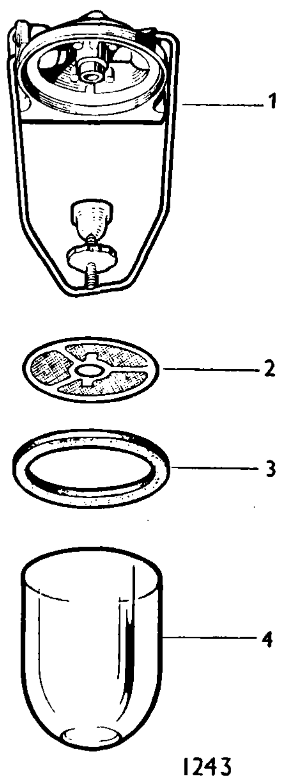


Fig. 2. Fuel feed line filter.

EVERY 10,000 MILES (16,000 KM.)

Petrol Pump Filter (Early Cars)

The petrol pump is situated behind the trim panel on the left-hand side of the luggage compartment.

To gain access to the filter remove the base plate by unscrewing the six cheese-headed screws. Thoroughly clean the filter in petrol ; do not use cloth as particles will stick to the gauze.

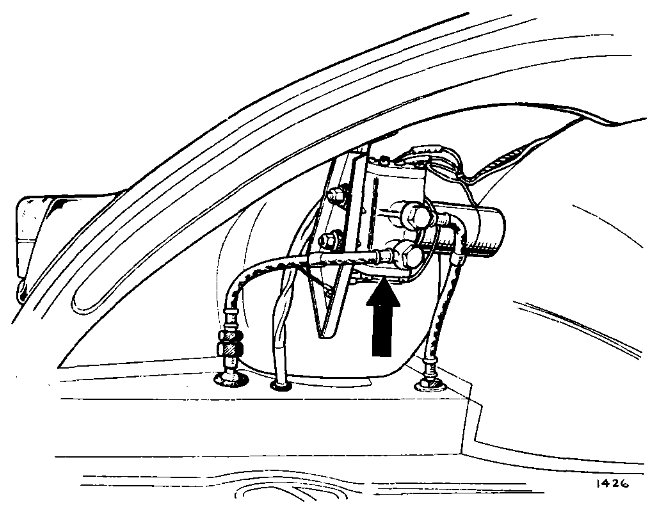


Fig. 3. Location of the petrol pump.

PERIODICALLY

Inlet Manifold Drain Tubes

Two drain tubes are fitted at the bottom of the inlet manifold and it is important that they are kept clear. Obstructions in the tubes will cause excess petrol to collect in the manifold which may result in difficult starting.

Periodically, the tubes and adaptors should, therefore, be removed and checked for being clear.

———oo———

STARTING

Starting from Cold

For starting from cold the mixture control (marked Start) should be moved up to the fully rich (Cold) position.

Switch on the ignition and press the starter switch button but do not touch the accelerator. Release the starter button as soon as the engine fires—this is important. If for any reason the engine does not start, do not operate the starter switch again until both the engine and the starter motor have come to rest.

As soon as the engine speed increases slide the mixture control to the intermediate (Hot) position ; this position will be felt as a marked resistance in the slide.

Drive off at a moderate speed, progressively moving the mixture control to the off (Run) position until the knob is at the bottom of the slide and the red warning light is extinguished.

Starting in Moderate Temperature

In warm weather or if the engine is not absolutely cold, it is usually possible to start the engine with the mixture control in the intermediate (Hot) position by adopting the procedure given above.

Starting when Hot

Do not use the mixture control. If the engine does not start immediately, slightly depress the accelerator pedal when making the next attempt.

Do NOT pump the accelerator pedal as owing to the action of an accelerating pump in the carburetter an excessively rich mixture will be admitted into the engine.

Difficult Starting (engine hot)

On extremely hot days or when the engine is stopped after a fast climb, occasional difficulty may be experienced in starting immediately.

This may be due to a temporary richness of mixture. On no account pump the accelerator, but slowly depress it to about one-third of its travel, maintaining this position until the engine fires.

Use of the Mixture Control—Important

Use of the mixture control (marked " Start ") brings into operation a starting device which provides the richer mixture necessary for starting. Do NOT permit the starting device to remain in operation longer than is necessary but return the control to the (Run) position as soon as the engine will allow. Unnecessary use of the mixture control will result in increased cylinder bore wear.

A reminder that the starting device is in operation is provided by a red warning light adjacent to the mixture control slide. When the control is returned to the (Run) position the starting device is taken out of action and the warning light is extinguished.

CARBURETTERS

Removal

Bend the rubber seal, joining the air intake pipe to the air cleaner, back on to the air cleaner flange. Disconnect the air intake pipe steady bracket. The air intake pipe can now be removed by applying a steady pressure under the centre, care being taken not to lose the two connecting sleeves from the top of the carburetters.

Disconnect the distributor vacuum feed pipe from front carburetter by unscrewing the union. Disconnect the petrol feed pipe by removing the banjo bolts. Disconnect the accelerator linkage from the throttle spindle. By removing the two retaining setscrews from the mixture control levers and also the outer cable retaining setscrew, the control cable can be withdrawn from the carburetters. Remove the four carburetter flange securing nuts and washers and lift off the carburetters.

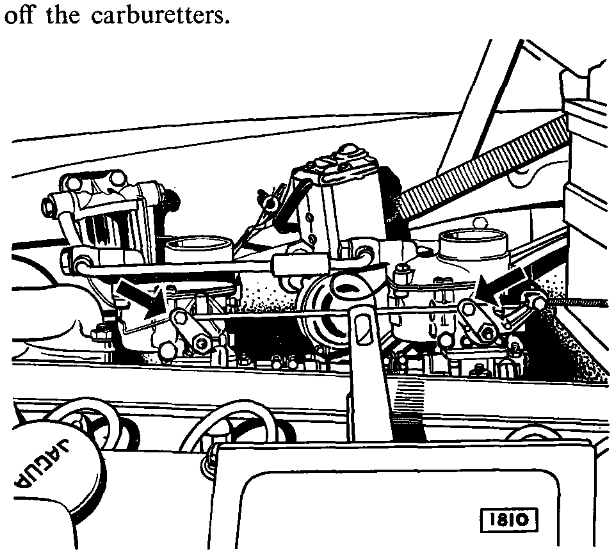


Fig. 4. The mixture control wire should be connected with the carburetter levers pushed fully forward and with the manual lever on the facia placed in the " Run " position.

Refitting

Refitting is the reverse of the removal procedure. Always fit two new joints to each flange on assembly, one on each side of the carburetter insulating distance piece. When refitting the mixture control ensure that the mixture lever inside the car is in the " Run " position and that the levers on the carburetters are as far forward as possible. Thread the control wire into position, remembering to replace the distance tube between the two choke levers (see Fig. 4).

DISMANTLING TO CLEAN

Remove the air cleaner. Unscrew banjo bolts (Bb) (Fig. 5) and remove filter gauzes.

Unscrew float chamber cover fixing screws and gently remove each cover (Fc). Needle valves (Nv) are now exposed for removal.

Lift and remove float toggles (Ft), spindles (Fs) and floats (F). Remove pilot (g), pump (Gp) and starter jets, the latter being situated at bottom left-hand side of starter box, then pump non-return valve and gauze, situated at base of pump chamber, plug (Gu) and main jets located in holders (T). The emulsion tubes may be lifted out with a matchstick after removing air correction jets (a) (before doing so, make sure that throttles are closed in case parts are accidently dropped).

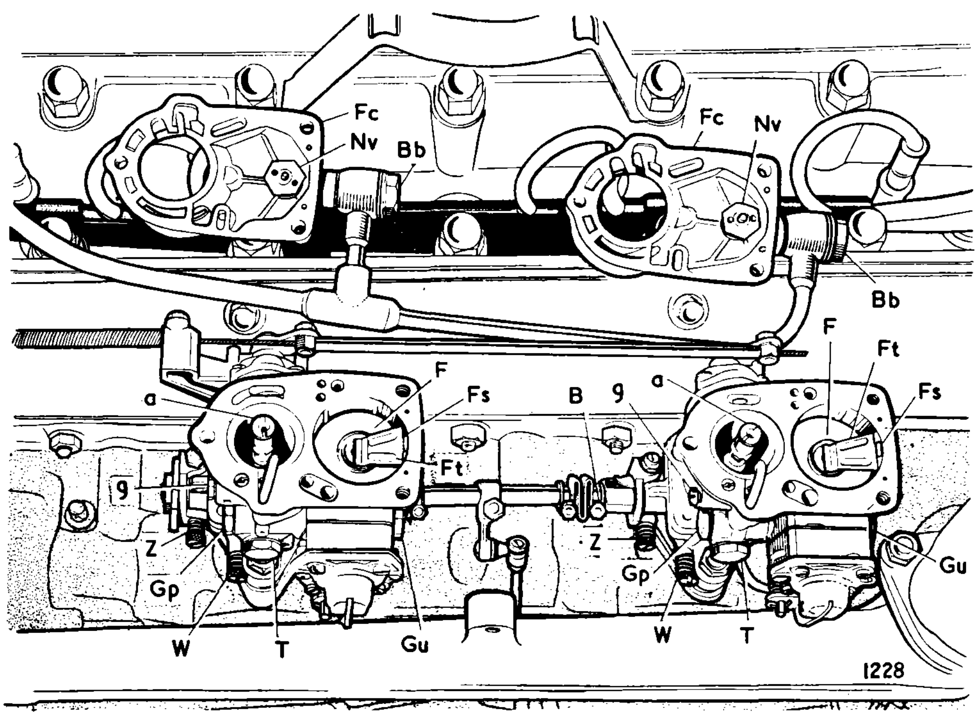
Cleaning and Inspection

Cleanliness during servicing is of the utmost importance, and rag should on no account be used for cleaning or drying the interior of the carburetters. A clean tray filled with petrol, a small stiff paint brush (no loose hairs) and compressed air for the dismantled instruments and parts, is desirable.

Sediment can be quickly removed by gentle brushing followed by swilling out with petrol.

The interior of the carburetters and exposed passages should be blown out, to ensure that all loose particles of foreign matter are cleared.

For cleaning jets use compressed air only ; never use wire as a probe, as this can easily result in increased petrol consumption, and a possible reduction in engine performance.



Bb	Banjo bolt.
Fc	Float chamber cover.
Nv	Needle valve.
F	Float.
Fs	Float spindle.
Ft	Float toggle.
g	Pilot jet.
Gp	Pump jet.
Gu	Plug.
T	Main jet holder.
a	Air correction jet.
B	Clamping bolt.
Z	Slow running adjustment screw.
W	Volume control screw.

Fig. 5. View of the carburetters with float chamber covers removed.

Floats

Inspect floats for leakage and dents. Leaking or dented floats should be renewed ; never repair except in cases of dire emergency, as the volume and weight of the floats are important.

Needle Valves

Thoroughly clean with petrol, blow out and check needles for quick drop and seal. Any tendency for a needle to stick can usually be cured by a short immersion in a degreasing tank, otherwise the unit should be renewed.

Should the occasion arise where the pump and starter units have to be dismantled, careful note should be made of the position of the various parts, as incorrect assembly will result in complete failure of either component.

It is stressed that the accelerating pump is specially set at the factory, therefore the unit should not needlessly be dismantled. However, should the membrane require replacing, they are not normally supplied separately but form part of an assembly.

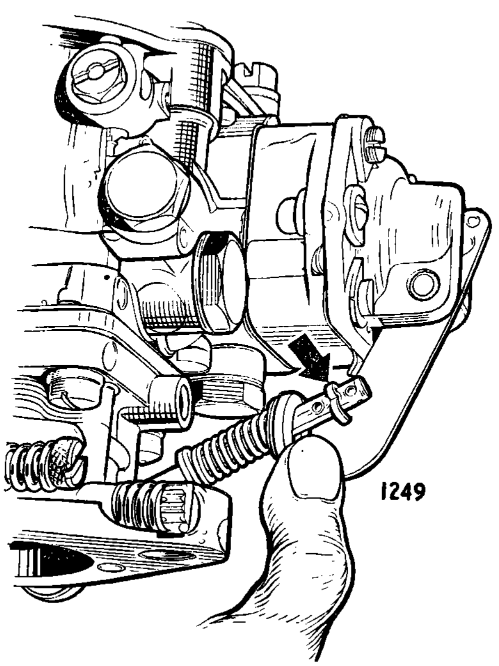


Fig. 6. Showing the position for the split pin in the accelerator pump control rod.

REASSEMBLING

Before reassembling, check all carburetter assembly screws and flange nuts for tightness ; do not use undue force.

When replacing petrol jets and needle valves, fit new fibre washers, using genuine parts only ; failure to do so may upset the calibration of the carburetter.

The nose of the pilot jet makes seating contact in the casting, therefore they should be screwed in tightly, but not with undue force or the seating will be damaged.

Refit toggles and spindles, taking care that toggles are fitted with the letters " TOP " uppermost and move freely on their spindles. Refit needle valves to float chamber covers, using the correct washers, as their thickness partly determine petrol level ; make a final check on needle stems for free movement.

Fit new gaskets to float chambers before replacing covers—the carburetters, being dustproof, require a seal at this joint. Refit petrol pipe and air cleaner.

Note :—If the carburetters have been lifted off the manifold, new flange joints must be used on reassembly. At the same time it is advisable to check the flatness of the face of the carburetter flanges before refitting them to the manifold, to eliminate any possibility of air leaks at this point.

SLOW RUNNING ADJUSTMENT

Adjustment and synchronisation of the carburetters is quite simple, but is dependent on cylinder compressions, valve clearances, the ignition setting, sparking plug gaps and contact breaker gap being set as laid down.

The idling must be set with a fully warmed up engine.

Each carburetter has two external adjustments, the slow-running adjustment screw (Z) (Fig. 5) and mixture volume control screw (W).

(1) Switch off the engine and loosen the clamping bolt (B) on the flexible link between the carburetters. Each instrument should now be separately adjusted. Starting with the front carburetter :—

(2) Unscrew the screw (Z), and ensure the throttle is closed by manual pressure on the slow running screw. Insert a .002" feeler (or strip of paper) between screw (Z) and the casting stop, screw in (Z) until feeler or paper is lightly nipped. Remove feeler and screw in (Z) one further complete turn from this point.

(3) Gently screw the volume control screw (W) clockwise until light contact is made with the casting seat, then unscrew three-quarters of a turn.

Repeat the above adjustments to the rear carburetter.

(4) Start the engine and, watching the Rev. counter, adjust each slow running screw (Z) equally, until the engine is turning at 650 r.p.m. Then screw out each volume control screw (W) a quarter of a turn at a time, until a drop in r.p.m. is registered indicating richness.

(5) Carefully screw in each volume control screw (W) by quarter turns until the engine reaches the highest and steadiest idling speed, taking care not to go beyond this point where erratic running will be evident due to weakness.

(6) Should the engine speed now be other than 650 r.p.m., adjust the slow running adjustment screws (Z) as required, repeating the adjustments in order to obtain the required idling speed and synchronisation.

(7) Throttle connecting linkage between the carburetters should now be securely tightened, care being taken that both throttles are against their stops during the process.

FAULT FINDING

Sudden break in performance

This may be due to tiny particles of foreign matter or water escaping the filters in the carburetters and fuel pump, and blocking one or more of the petrol metering jets.

Poor slow running

Sudden failure to idle smoothly may be due to one or both pilot jets becoming obstructed and failing to meter the quantity of petrol required by the engine.

Pilot jets should then be removed and the metering orifices cleared by blowing through.

When replacing jets, screw in securely but do not use undue force.

Heavy fuel consumption

In cases of heavy fuel consumption on 2.4 litre cars, the usual checks on choke levers, throttle synchronisation, timing, tuning, etc., should be carried out but in addition the accelerator pump discharge injector tube should be checked for correct positioning.

The position should be checked by placing a straight edge across the lower face of the mounting block and measuring the gap between the end of the tube and the straight edge as shown in Fig. 7. The correct gap should be .020″—.040″ (.50—1.00 mm.). If this dimension is not correct, remove the assembly and fit a replacement (Part No. 5032) taking care to refit the gasket under the base of the assembly and tighten the locating screw. The injector tube must not be bent as there is a danger of loosening the tube in the mounting block.

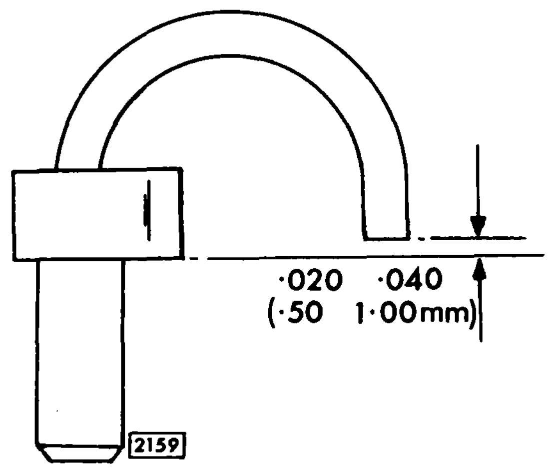


Fig. 7. Check the gap as illustrated.

Failure to respond to throttle opening (engine hot)

If the engine will idle but suddenly fails to respond to throttle opening, the main jets should be removed for cleaning. Main jets are assembled in holders, the heads of which are clearly marked " Main Jet Holder ". The latter are easily removed with an adjustable spanner, the jets then being exposed. Gripping the holder between the jaws of the spanner, the jets can be removed with a screwdriver and blown out. During this operation the float chamber will have drained, thereby carrying away impurities.

Important :—Do not probe the jet metering orifices with wire—disregard of this precaution may lead to increased petrol consumption and sub-standard performance.

Flat spot (engine hot)

Should the engine become reluctant to accelerate from slow to normal speeds the pump jets may be partly or completely obstructed and should be removed for cleaning. After replacing jets and priming the carburetters, pump action may be checked in the following manner. Remove air cleaner and open throttles.

A discharge should then occur from each pump injector, visible in the choke tubes of the carburetters.

Difficult starting (engine cold)

Provided the carburetters contain petrol and the ignition spark is good, the engine should start immediately.

If it does not and there is no smell of petrol after considerable cranking, the starter petrol jets may need blowing out to clear obstructions.

Note :—When refitting main, petrol and starter jets make certain that each fibre sealing washer is undamaged and that the jets are securely tightened.

Deterioration of performance

This is usually due to wear after long use, therefore, when the time arrives for a major overhaul, due consideration must also be given to the condition of the carburetters as they will also have suffered the effects of general wear and tear. It is therefore recommended that full advantage be taken of the manufacturer's reconditioned carburetter service by fitting replacement units.

CARBURETTERS

(3.4/3.8 litre)

DESCRIPTION

The 3.4 and 3.8 litre models are fitted with twin S.U. H.D.6 type carburetters. The enrichment device for starting is in the form of an auxiliary carburetter attached to the front carburetter.

The H.D. type carburetter differs from the earlier type in that the jet glands are replaced by a flexible diaphragm, and idling mixture is conducted along a passage way, in which is located a metering screw, instead of being controlled by a throttle disc.

The jet (18) (Fig. 11), which is fed through its lower end, is attached to a synthetic rubber diaphragm (10) by means of the jet cup (9) and jet return spring cup (13), the centre of the diaphragm being compressed between these two parts ; at its outer edge it is held between the diaphragm casing (14) and the float chamber arm. The jet is controlled by the jet return spring (12) and the jet actuating lever (15), the latter having an external adjusting screw which limits the upward travel of the jet and thus controls the mixture adjustment ; screwing it in (clockwise) enriches the mixture, and unscrewing it weakens the mixture.

Throttle spindle glands.

Provision is made for the use of throttle spindle glands consisting of the cork gland itself (25) (Fig. 11), a dished retaining washer (28), a spring (27) and a shroud (26). This assembly should not require servicing and can only be removed by dismantling the throttle spindle and disc.

Idling

The carburetter idles on the main jet and the mixture is conducted along the passage way (8) (Fig. 11) connecting the choke space to the other side of the throttle disc.

The quantity of mixture passing through the passage way and, therefore, the idling speed of the engine is controlled by the " slow-run " valve (5), the quality or relative richness of the mixture being determined by the jet adjusting screw. It follows that when idling, the throttle remains completely closed against the bore of the carburetter.

DATA

Type			S.U. H.D.6 (twin)
Size			1" (4.45 cm.)
Jet needle type—			
		Oil Bath Air Cleaner	Paper Element Air Cleaner
3.4 litre	7 to 1 comp. ratio	SC	TM
	8 to 1 comp. ratio	SC	CI*
	9 to 1 comp. ratio	SC	CI*
3.8 litre	7 to 1 comp. ratio	TX	TM
	8 to 1 comp. ratio	SC	CI*
	9 to 1 comp. ratio	SC	CI*
Jet size			.10" (2.54 mm.)
Auxiliary starting carburetter—needle type			425/8.

* Early cars fitted with TU needles.

Note : The jet needle type is stamped on the side or top face of the parallel portion of the needle.
The auxiliary starting carburetter needle is stamped with the large number (e.g. 425) on the shoulder at the top of the needle and with the small number on the parallel portion of the needle.

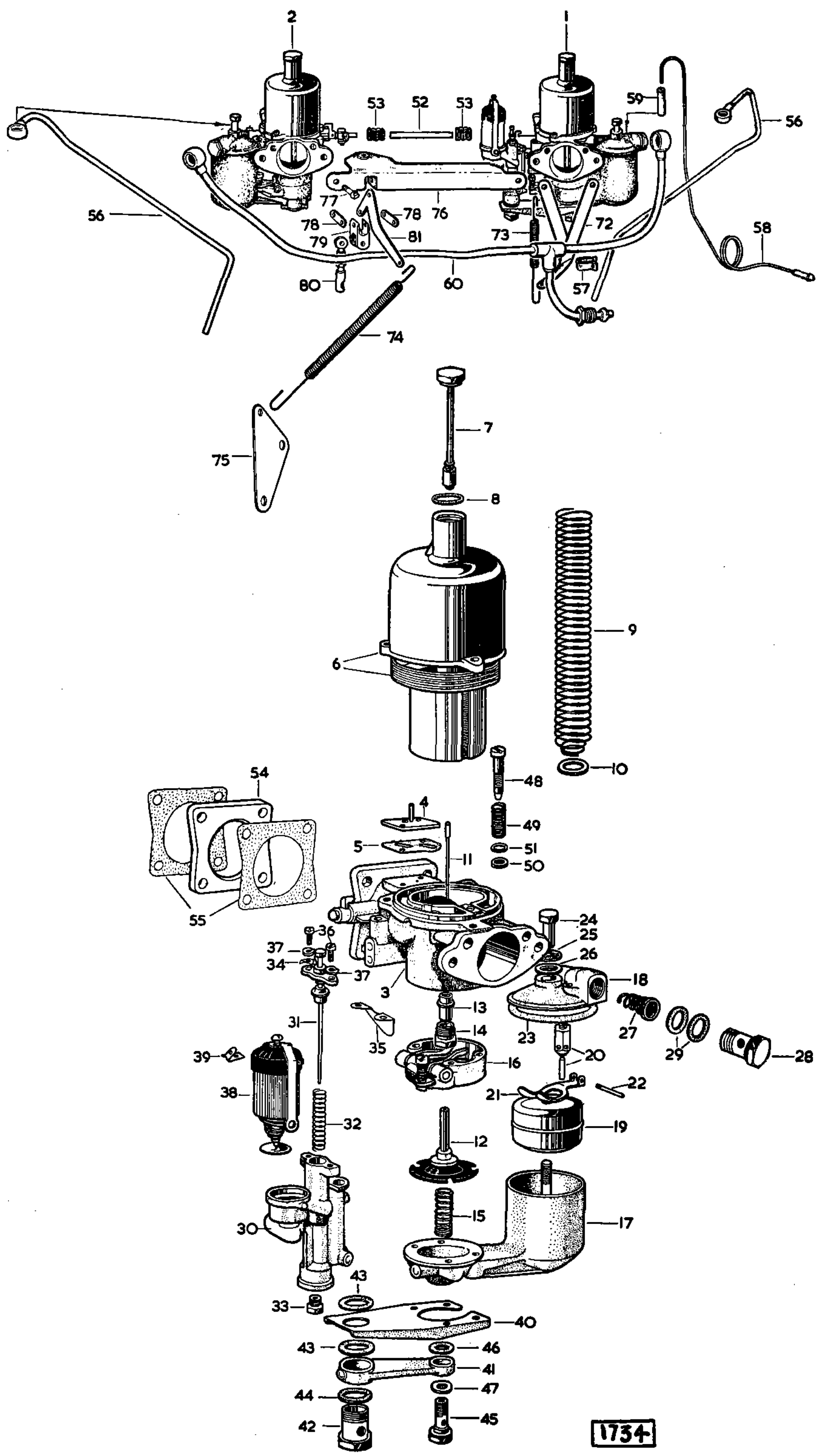


Fig. 8. *Exploded view of the S.U. carburetter.*

1. Front carburetter
2. Rear carburetter
3. Carburetter body
4. Ignition union adaptor
5. Gasket
6. Suction chamber and piston
7. Damper
8. Washer
9. Spring
10. Skid washer
11. Jet needle
12. Jet
13. Jet bearing
14. Nut—jet bearing
15. Spring
16. Jet unit housing
17. Float chamber
18. Float chamber cover
19. Float
20. Float needle and seat
21. Float needle lever
22. Knurled pin
23. Gasket
24. Cap nut
25. Fibre serrated washer
26. Aluminium washer
27. Filter
28. Banjo bolt
29. Fibre washer
30. Auxiliary starting carburetter body
31. Auxiliary starting carburetter needle
32. Spring
33. Jet
34. Spring clip
35. Dust shield
36. Screw
37. Double coil spring washer
38. Solenoid
39. Spring clip
40. Bracket
41. Connecting arm
42. Banjo bolt
43. Fibre washer
44. Fibre washer
45. Banjo bolt
46. Fibre washer
47. Aluminium washer
48. Slow running control valve
49. Spring
50. Neoprene washer
51. Brass washer
52. Connecting rod
53. Connecting rod coupling
54. Manifold insulator
55. Gasket
56. Overflow pipe
57. Overflow pipe clip
58. Distributor vacuum suction pipe
59. Neoprene coupling tube
60. Petrol feed pipe
72. Front carburetter spring bracket
73. Front carburetter throttle spring
74. Throttle return spring
75. Return spring bracket
76. Throttle stop bracket
77. Dowel bolt
78. Link
79. Trunnion
80. Link rod
81. Throttle lever

ROUTINE MAINTENANCE

Warning: If it is desired to clean out the float chamber, do not use compressed air as this may cause rupture of the rubber jet diaphragm.

EVERY 2,500 MILES (4,000 KM.)

Lubricate Carburetter Piston Damper

Each carburetter is fitted with an hydraulic piston damper which unless periodically replenished with oil, will cause poor acceleration and spitting back through the carburetter on rapid opening of the throttle.

To replenish with oil, unscrew the cap on top of suction chambers and lift out the damper valve which is attached to the cap. Fill the hollow piston spindle, which can be seen down inside the bore of the suction chamber, with S.A.E. 20 engine oil.

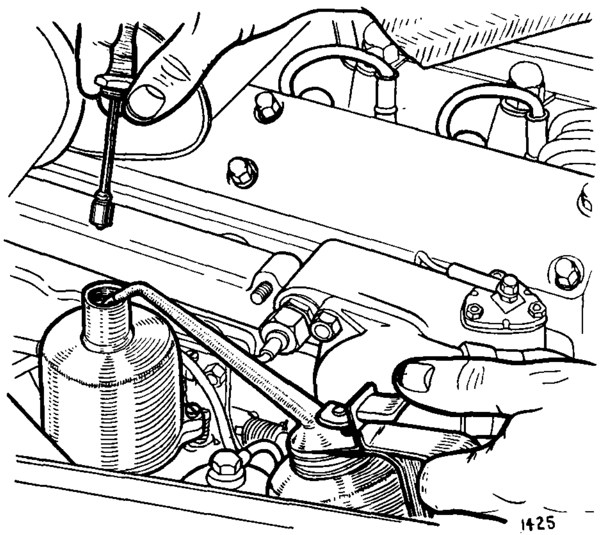


Fig. 9. Topping up a carburetter hydraulic piston damper.

Checking Carburetter Slow Running

The idling speed of the engine should be 500 r.p.m. on cars fitted with 3-speed synchromesh gearbox or automatic transmission, 700 r.p.m. for cars fitted with all-synchromesh gearbox when the engine is at normal working temperature.

If adjustment is required turn the two slow running volume screws (see Fig. 12) by exactly equal amounts until the idling speed, observed on the revolution counter instrument, is correct.

EVERY 5,000 MILES (8,000 KM.)

Cleaning Carburetter Filters

Removal of the bolt securing the petrol pipe banjo union to each float chamber will expose the filters. Remove the filters and clean in petrol; do not use a cloth as particles will stick to the gauze.

When refitting, insert the filter with the spring first and ensure that the fibre washers are replaced one to each side of the banjo union.

Fuel Feed Line Filter

The filter is attached to the right-hand wing valance and is of the glass bowl type with a flat filter gauze.

At the recommended intervals, or more frequently if the glass bowl shows signs of becoming full of sediment, slacken the locking nut, swing the retaining clip to one side and remove bowl (4) (Fig. 2) sealing washer (3), and filter gauze (2).

Clean the filter gauze and bowl by washing in petrol. Examine the sealing washer and if necessary fit a new one.

Tune Carburetters.

See instructions given on page C.17.

EVERY 10,000 MILES (16,000 KM.)

Petrol Pump Filter (Early Cars Only)

The petrol pump is situated behind the trim panel on the left-hand side of the luggage compartment.

To gain access to the filter remove the base plate by unscrewing the six cheese-headed screws. Thoroughly clean the filter in petrol; do not use cloth as particles will stick to the gauze.

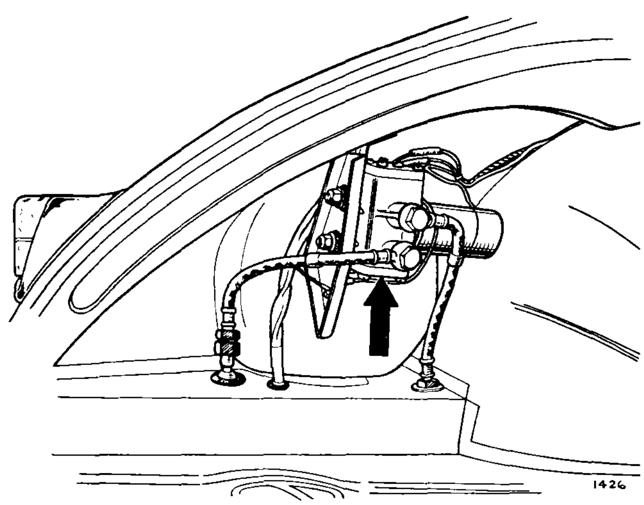


Fig. 10. Location of the petrol pump.

CARBURETTERS

Removal

Remove the air silencer or cleaner positioned across the cylinder head. Remove the air intake pipe by unscrewing the setscrews attaching the pipe to the carburetters. Remove both banjo bolts and the four fibre washers from the float chambers. Disconnect the two return springs and the distributor vacuum pipes from the front carburetter. Remove the cover on the auxiliary starting carburetter solenoid on the side of the front carburetter and disconnect the electrical cables. Remove the clip attaching the overflow pipes from the float chambers to the oil filter mounting screw and disconnect union connecting starter pipe to auxiliary starter carburetter.

Remove split pin, plain and spring washers from the connecting link pivot pin located on the manifold between front and rear carburetters and disconnect throttle link rod joint from ball pin on bell crank lever.

Remove the four nuts and washers securing each carburetter to the inlet manifold. The carburetters can now be removed from the inlet manifold.

Refitting

Refitting is the reverse of the removal procedure.

CLEANING THE SUCTION CHAMBER AND PISTON

This should be done at approximate intervals of every twelve months or if the carburetter is dismantled for any reason. After detaching, clean the main inside bore of the suction chamber and the two outside diameters of the piston with a rag moistened in petrol or thinners and then reassemble in a dry and clean condition with a few spots of thin oil on the piston rod only. Do NOT use metal polish to clean the suction chamber and piston.

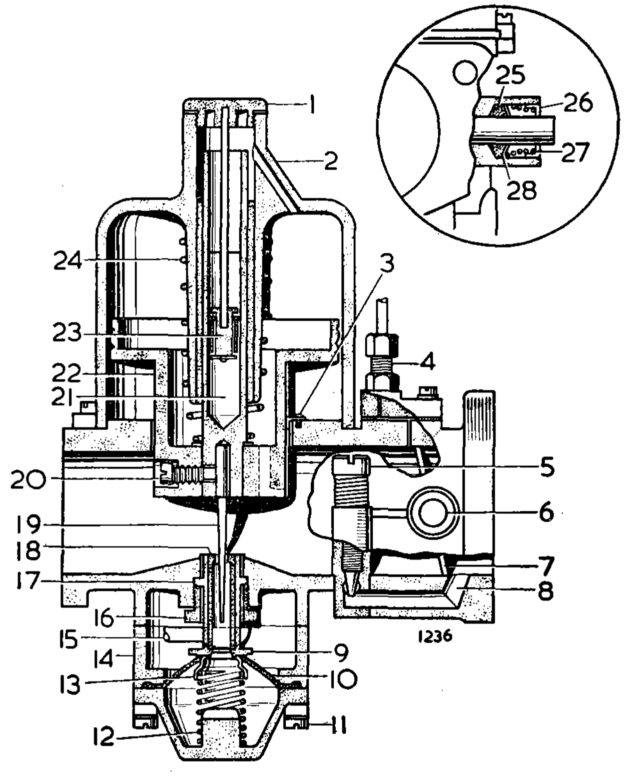


Fig. 11. *Sectioned view of the S.U. carburetter.*

1. Damper cap.
2. Suction chamber.
3. Piston guide.
4. Union for vacuum advance/retard.
5. Slow running volume screw.
6. Throttle spindle.
7. Throttle butterfly.
8. Slow run passage.
9. Jet cup.
10. Diaphragm.
11. Float chamber securing screw.
12. Jet return spring.
13. Return spring cup.
14. Jet unit housing.
15. Actuating lever.
16. Nut—jet bearing.
17. Jet bearing.
18. Jet.
19. Jet needle.
20. Needle retaining screw.
21. Oil reservoir.
22. Piston.
23. Damper.
24. Piston return spring.
25. Throttle spindle gland.
26. Shroud for spring.
27. Spring.
28. Washer.

CARBURETTER TUNING

It is useless to attempt carburetter tuning until the cylinder compressions, valve clearances, sparking plug gaps and contact breaker point gaps have been tested, checked and adjusted, if necessary. The distributor centrifugal advance mechanism and vacuum advance operation should be checked and ignition timing set to the correct figure. For final road test, adjustment of not more than six clicks of the micrometer adjustment at the distributor to either advance or retard is permitted. The ignition setting is important since if retarded or advanced too far the setting of the carburetters will be affected.

Only two adjustments are provided at the carburetters (i) The slow running volume screw (A) (Fig. 12) governing idling speed and (ii) the mixture adjusting screws (B) governing mixture strength. Correct setting of the mixture strength at idling speed ensures that the carburetters are correctly adjusted throughout their entire range.

Ensure that needles are correctly located in the pistons, that is, with the shoulder of the needles flush with the base of the pistons. Check over the carburetters and ensure that pistons are free in the suction chambers, petrol filters clean and hydraulic piston dampers topped up with the recommended grade of engine oil. Lubricate the throttle controls and check for free operation and full travel.

Before carrying out the instructions which follow it is desirable to ensure that the mixture strength of both carburetters is correct. To do this, screw out both mixture screws until the tops of the jets are flush with the jet bridge in each carburetter body ; this can be observed through the piston chamber after removal of the suction chamber and piston. Screw in the mixture screws until the jets start to move and then rotate screws a further $3\frac{1}{2}$ turns.

Slacken one clamp bolt on the coupling between the throttle spindles, check that both butterfly valves are fully closed by rotating both throttle spindles clockwise when viewed from the front. Tighten the coupling clamp bolt. Screw in (rotate clockwise) the slow running volume screws until they are down fully on their seatings. Unscrew each screw $2\frac{1}{2}$ turns.

Run the engine until the normal operating temperature is reached and check that both carburetters are sucking equally by placing one end of a length of rubber tube to the ear and the other end in the inside of each carburetter intake in turn. Rotate the slow running volume screws until the carburetters are synchronised, that is, are sucking equally and the engine is idling at approximately 500 r.p.m. on cars fitted with the 3-speed synchromesh gearbox or automatic transmission, 700 r.p.m. on cars fitted with the all synchromesh gearbox.

Recheck that both butterfly valves are fully closed by rotating the throttle spindles (in a clockwise direction looking from the front) and noting if any

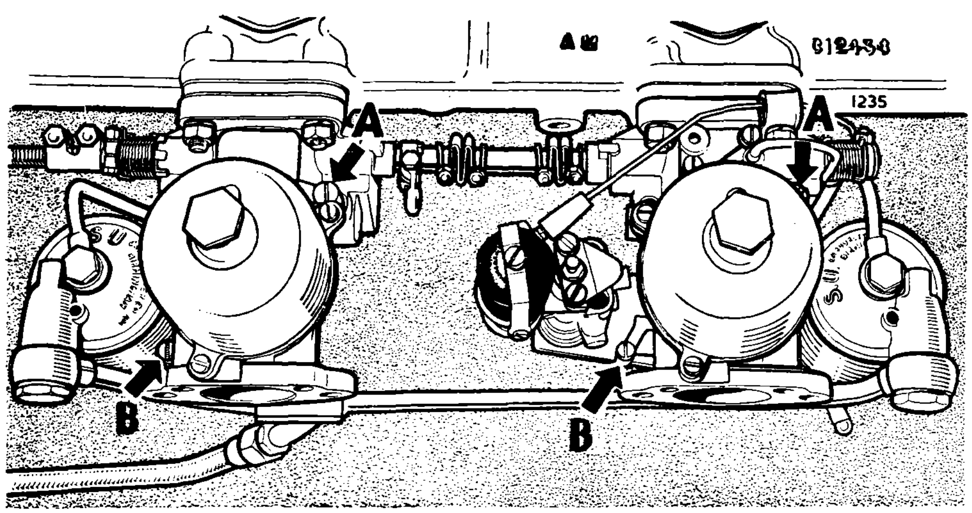


Fig. 12. "A"—Slow running volume screw. "B"—Mixture adjusting screw.

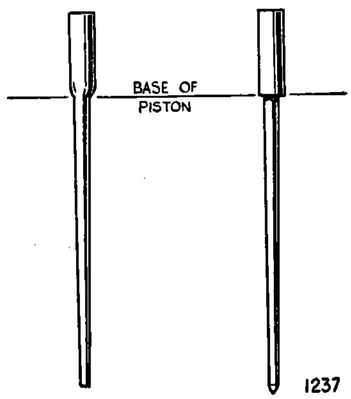


Fig. 13. The jet needle must be positioned with the shoulder flush with the bottom face of the piston.

change in engine speed results ; no change in engine speed or note should result if the butterfly valves are fully closed.

Next check the mixture strength by lifting the piston (by means of the lifting pin—see Fig. 14) of the front carburetter by approximately $\frac{1}{32}''$ (.8 mm.) when, if

(a) the engine speed increases, this indicates that the mixture strength of the front carburetter is too rich.
(b) the engine speed immediately decreases, this indicates that the mixture strength of the front carburetter is too weak.
(c) the engine continues to run without change of speed, then the mixture strength of the front carburetter is correct.

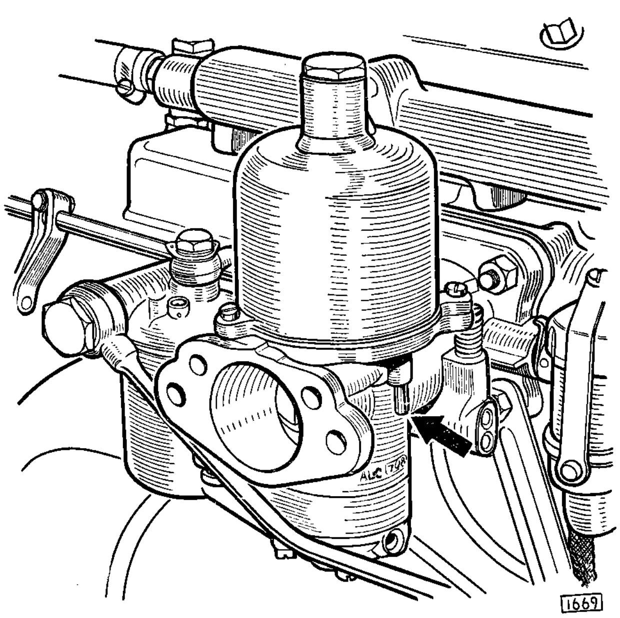


Fig. 14. The carburetter piston lifting pin ; the first part of the movement is spring loaded free travel.

Repeat the operation at the rear carburetter to test its mixture strength and after adjustment recheck the front carburetter since the two carburetters are interdependent.

To enrich the mixture, screw in the adjustment screw, that is, rotate clockwise ; to weaken the mixture unscrew the adjustment screw, that is, rotate anti-clockwise.

Some slight adjustment of the slow running to maintain this at 500 r.p.m. (or 700 r.p.m.) may now be necessary following alteration to the mixture strength, in which case ensure that the two slow running screws are rotated by an exactly equal amount or the adjustment previously made will be upset.

Float Chamber Fuel Level

When the fuel level setting is correct a $\frac{7}{16}''$ (11.1 mm.) test bar will just slide between the lid face and the inside curve of the float lever fork when the needle valve is in the " shut-off " position (see Fig. 15).

If the float lever fails to conform with this check figure, it must be carefully bent at the start of the fork section, in the necessary direction for correction. Take care to keep both prongs of the fork level with each other and maintain the straight portion of the lever dead flat.

It is not advisable to alter the fuel level unless there is trouble with flooding ; although too high a level can cause slow flooding, particularly when a car is left ticking over on a steep drive, it should be remembered that flooding can also be caused by grit in the fuel jamming open the needle valve, undue friction in the float gear, excessive engine vibration, or a porous float.

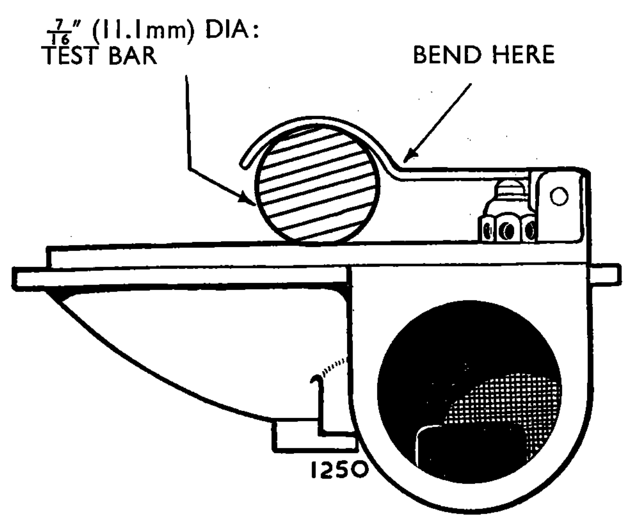


Fig. 15. Checking the float lever setting, which controls the fuel level in the float chamber.

CENTRING THE JET

Warning: Take care not to bend the carburetter needle when carrying out this operation

Remove the carburetter from the engine as described in this section.

Remove the four setscrews securing the float chamber to the carburetter body. Remove the float chamber, jet housing and jet. Remove the hydraulic damper.

With a ring spanner slacken the jet locking nut approximately half a turn. Replace the jet and diaphragm assembly.

The jet is correctly centred when the piston falls freely and hits the jet " bridge " with a metallic click. To centre the jet, push the jet and diaphragm assembly as high as possible with the hand and with a pencil or rod gently press the piston down on to the jet bridge ; centralisation will be facilitated if the side of the carburetter body is tapped lightly. Tighten the jet locking nut.

The actual centring must be carried out with the setscrews holes in the jet diaphragm and carburetter in alignment. After tightening the jet locking nut the jet diaphragm must be kept in the same position relative to the carburetter body ; the simplest way to do this is to mark one of the corresponding jet diaphragm and carburetter body setscrew holes with a soft pencil. Failure to do this may cause the centralisation to be upset.

Check that the centralisation is correct by noting if there is any difference in the sound of the piston hitting the jet bridge with the jet in its highest and lowest positions. If there is any difference in the sound, the procedure for centralising the jet will have to be repeated.

If difficulty in centring the jet is encountered after carrying out the above procedure, the jet needle can be lowered slightly in the piston to make the centralising effect more positive. The needle must, however, be restored to the normal position when checking the centralisation.

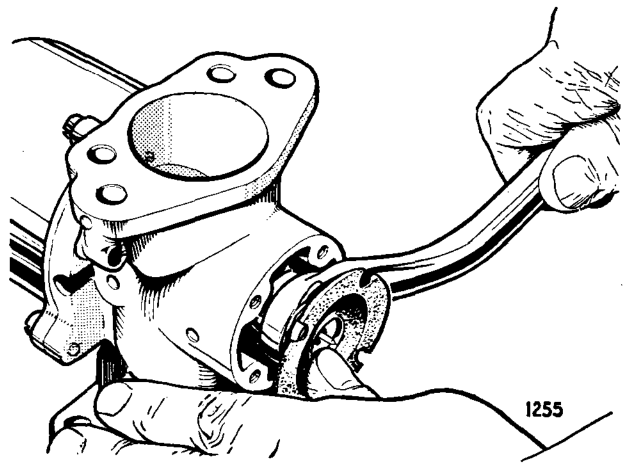


Fig. 16. *Centring the jet.*

THE AUXILIARY STARTING CARBURETTER

Description

The enrichment apparatus for starting is, in effect, an auxiliary carburetting system. The main body casting (1) containing a solenoid-operated valve and fuel metering system is illustrated as a separate unit attached by means of a ducted mounting arm to the base of the main carburetter fuel inlet.

The auxiliary carburetter forms, therefore, a separate unit additional to the normal float chamber retained by the hollow cross-drilled bolt.

Fuel is supplied to the base of the jet (9), which is obstructed to a greater or lesser degree by the tapered slidable needle (10).

When the device is in action air is drawn from atmosphere through the air intake (7) and thence through the passage (8), being carburetted with fuel as it passes the jet (9). The mixture is thence carried upwards past the shank of the needle (10) through the passage (14) and so past the aperture provided between the valve (3) and its seating (2). From here it passes directly to the inlet manifold through an external feed pipe.

The device is brought into action by energizing the winding of the solenoid (5) from the terminals (6). The centrally located iron core (4) is thus raised magnetically, carrying with it the ball-jointed disc valve (3) against the load of the small conical spring and thus uncovering the aperture provided by the seating (2).

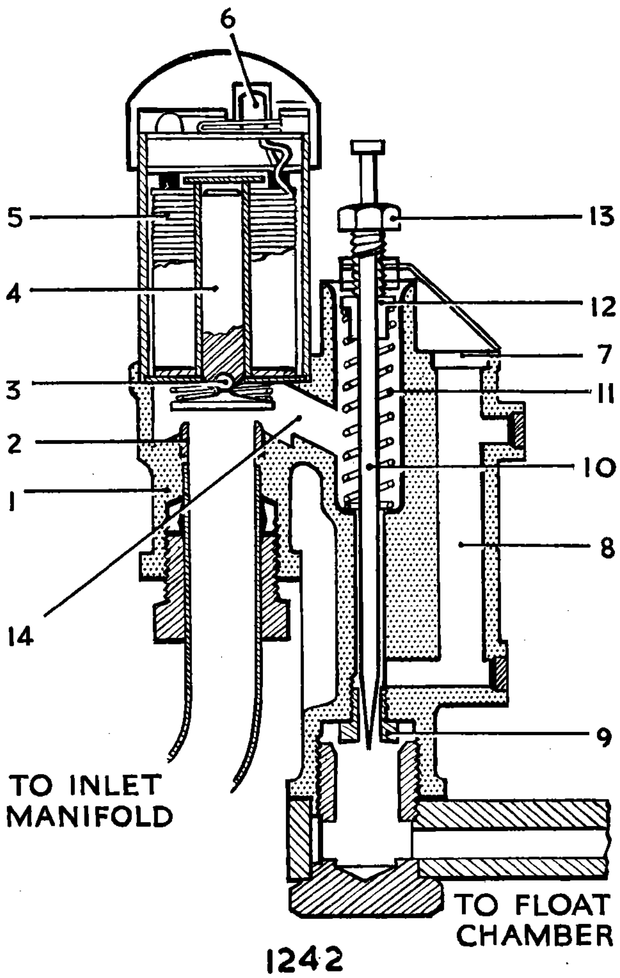


Fig. 17. Sectioned view of the auxiliary starting carburetter.

Considering the function of the slidable needle (10), it will be seen that this is loaded upwards in its open position by means of the light compression spring (11) which abuts against a disc (12) attached to the shank of the needle. The needle continues upwards through the vertically adjustable stop (13) in which it is slidable mounted and it finally terminates in an enlarged head.

Depression within the space surrounding the spring (11) is directly derived from that prevailing in the induction tract, and this exerts a downward force upon the disc (12), which is provided with an adequate clearance with its surrounding bore. This tends to overcome the load of the spring (11) and to move the needle downwards, thus increasing the obstruction afforded by the tapered section which enters the jet (9).

The purpose of this device is to provide two widely different degrees of enrichment, the one corresponding to idling or light cruising conditions and the other to conditions of open throttle or full-power operation. In effect, under the former conditions the high induction depression prevailing will cause the disc (12) to be drawn downwards, drawing the tapered needle into the jet (9), while under the latter, the lower depression existing in the induction tract will permit the collar to maintain its upward position with the needle withdrawn from the jet.

The tuning elements concerned in this device are the size and degree of taper of the lower end of the needle (10), the diameter of the disc (12), the load provided by the spring (11) and the degree of movement permitted to the needle assembly, as determined by the adjustment of the stop (13).

The solenoid (5) is energized by means of a thermostatically operated switch housed in the inlet manifold water jacket. This is arranged to bring the apparatus into action at temperatures below about 30—35°C. (86—95°F).

Adjustment

The engine must be at its normal running temperature before any attempt is made to tune the auxiliary enrichment device.

As it can generally be assumed that the tapered form of the needle (10), the strength of the spring (11), and the diameter of the disc (12) have already been appropriately chosen, tuning is generally confined to the adjustment of the stop screw (13). It will be appreciated that the main purpose of this adjustment is to limit the downward movement of the needle, the head of which abuts against the upper surface of the stop screw at the lower extremity of its travel. The final downward movement of this needle determines, as has been described, the degree of enrichment provided under idling conditions with the auxiliary carburetter in operation. An appropriate guide to its correct adjustment in this respect is provided by energizing the solenoid when the engine has already attained its normal temperature. The stop screw (13) should then be so adjusted that the mixture is distinctly although not excessively rich, that is to say, until the exhaust gases are seen to be discernibly black in colour, but just short of the point where the engine commences to run with noticeable irregularity.

Anti-clockwise rotation of the stop screw will, of course, raise the needle under these conditions and increase the mixture strength, while rotation in the opposite direction will have the opposite effect. In order to energize the solenoid under conditions when the thermostatic switch will normally have broken the circuit, it is merely necessary to short-circuit the terminal of the thermostatic switch directly to earth with a screwdriver and flick open the throttles when the starting device will be heard to come into operation with a pronounced hissing noise.

Thermostatic switch—Removal

The thermostatic switch which controls the operation of the auxiliary starting carburetter is situated at the front end of the inlet manifold water jacket.

Remove the electrical cable from the switch by removing the chrome plated domed nut.

If the radiator filler cap is securely tightened no appreciable amount of water will escape when the auxiliary starting carburetter switch is removed. Alternatively, a small amount of water can be drained from the radiator.

Remove the three securing setscrews and washers and withdraw the switch and the cork gasket.

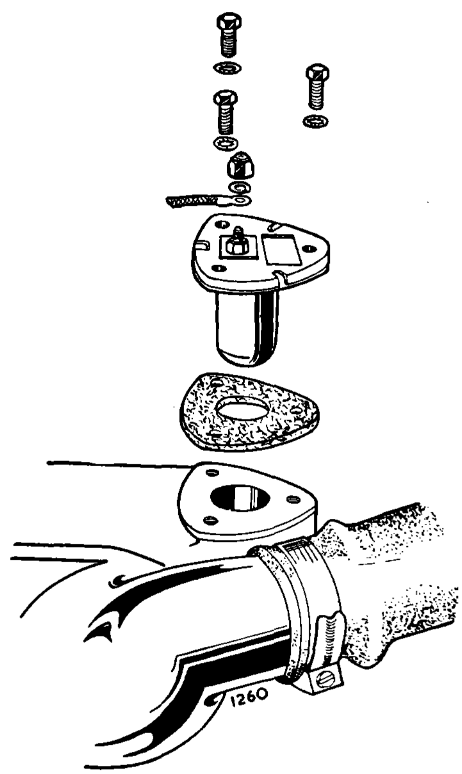


Fig. 18. Removal of the auxiliary starting carburetter thermostatic switch.

Refitting

Refitting is the reverse of the removal procedure. A new cork gasket must be fitted when the switch is replaced. If any water has been drained from the radiator or has escaped during the removal of the switch, the radiator should be topped up to the correct level.

THROTTLE CONTROL LINKAGE SETTING

If carburetters have been removed or throttle linkage has been disturbed particular attention must be paid to the setting adjustment of the control linkage.

To adjust proceed as follows :—

(i) Disconnect front carburetter coupling and rear carburetter throttle lever by releasing clamp bolts. Check that both butterflies are fully closed and that the rear carburetter coupling bolt is clearing manifold nut. With both carburetters fully closed retighten front coupling.

(ii) Unscrew intermediate throttle stop and push down on bell crank lever until centre " A " is $\frac{1}{16}$" (1.6 mm.) below a line from centre " B " to pivot centre (Fig. 19) When in this position screw down stop on to intermediate throttle lever and lock in position. Lock lever to carburetter spindle.

(iii) Ensure that when throttle is closed the intermediate lever does not foul petrol connection pipe. Open throttle fully and check that both carburetters are in the fully open position.

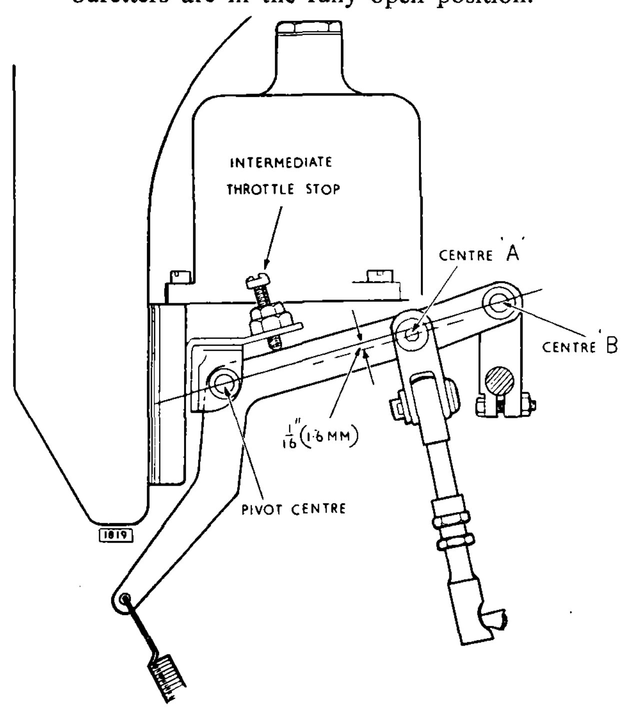


Fig. 19. Throttle control linkage setting.

THE FUEL SYSTEM

THE PETROL PUMP

Description

The pump consists of three main assemblies—the body, the magnet assembly (sometimes also referred to as the coil housing assembly), and the contact breaker.

The body (A) (Fig. 20) is an aluminium die-casting, to which is attached by 2 B.A. screws, two identical lids (" B " the top and " C " the lower), the lower one retaining the filter. The top lid gives access to the cage " D " for the outlet valve " E ", and, when the cage is unscrewed, to the inlet valve " F " also. These inlet and outlet valves are thin brass discs and should be assembled smooth side downwards—the outlet valve can be extracted (rarely necessary) after the spring circlip has been detached, and care should be taken not to distort this circlip or the valve lift may be affected. A hole connects the space between the valves to the pumping chamber, which is a shallow depression in one face of the body casting. This space contains the diaphragm unit " J " which is clamped on its rim between the iron coil housing " K " and the main body " A ".

A bronze rod " L " is screwed to the centre of the armature " M ", to which the diaphragm is also fastened and it passes through the magnet core " N " to the trunnion " O " in the contact breaker. An armature return spring " P " is interposed between the armature and the end of the magnet coil.

The magnet consists of a cast-iron housing " K ", having an iron magnet core " N " on which is wound a coil of copper wire " Q " which energizes the magnet. Between the magnet coil housing " K " and the armature " M " are fitted eleven spherical-edged rollers " R ". These locate the armature centrally within the magnet and allow absolute freedom of movement in a longitudinal direction.

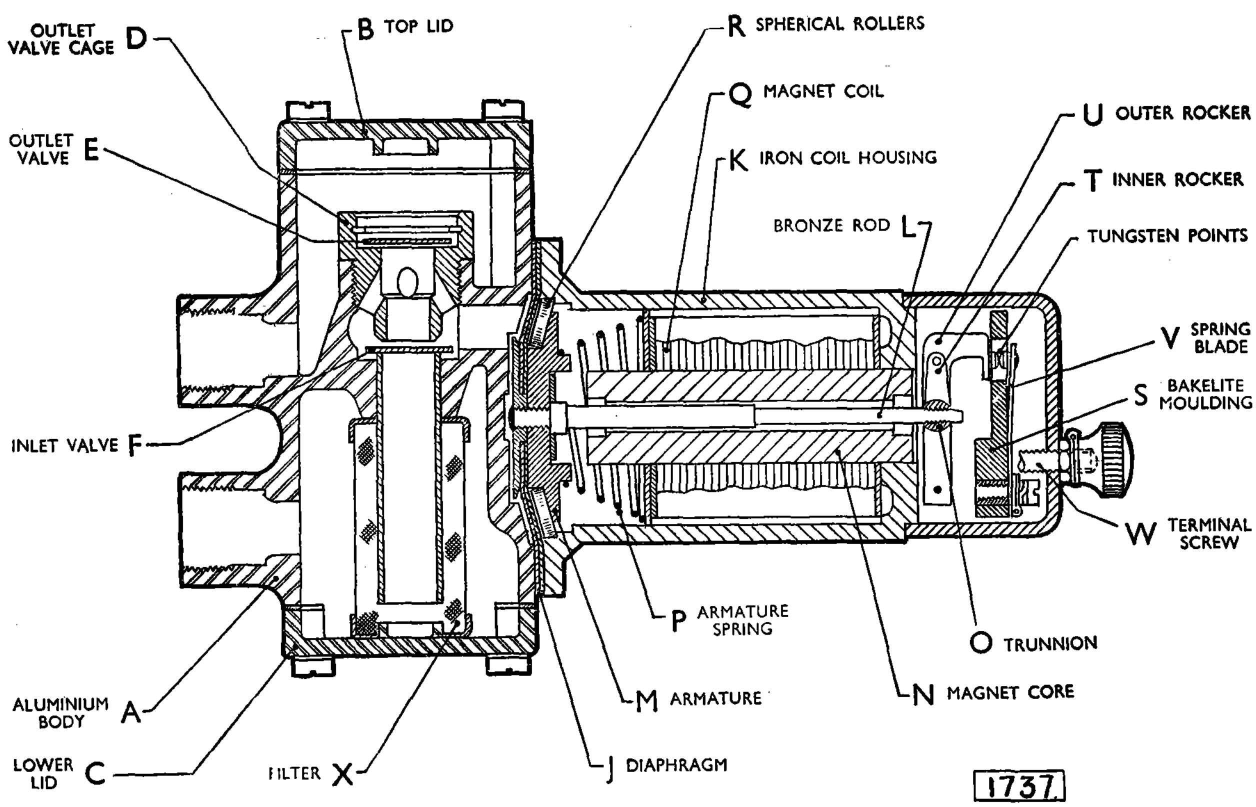


Fig. 20. Sectioned view of the petrol pump.

The contact breaker consists of a small bakelite moulding " S ", carrying two rockers, an inner rocker " T " and an outer rocker " U ", which are both hinged to the moulding at one end and connected together at their top end by two small springs arranged to give a " throw-over " action. A trunnion bearing " O " is fitted into the centre of the inner rocker, and the bronze armature sliding rod " L " is screwed into this.

The outer rocker is fitted with tungsten points, which make contact with corresponding points on spring blade " V ". This blade is connected to one end of the coil and the second coil end is connected to the terminal screw " W ".

A short length of flexible wire connects the outer rocker to one of the screws which holds the bakelite moulding, in order to provide a good earth.

To reduce arcing at the contact breaker, a condenser is fitted in parallel with the points.

Operation

When the pump is at rest the outer rocker lies in the outer position and the tungsten points are in contact. The current passes from the terminal, through the coil, back to the blade, through the points and to earth, thus energizing the magnet and attracting the armature. This comes forward, bringing the diaphragm with it, thus sucking petrol through the suction valve into the pumping chamber. When the armature has advanced nearly to the end of its stroke, the " throw-over " mechanism operates, and the outer rocker flies back, separating the points and breaking the circuit. The spring " P " then pushes the armature and the diaphragm back, forcing petrol through the delivery valve at a rate determined by the requirements of the engine. As soon as the armature gets near the end of this stroke, the " throw-over " mechanism again operates, the points again make contact and the cycle of operations is repeated.

The spring blade rests against a small projection on the bakelite moulding, and it should be set so that when the points are in contact it is deflected back from the moulding. The width of the gap at the points is approximately .030″ (.75 mm.), when the rocker is pulled back against the face of the iron housing.

If the magnet is removed from the body for any reason, care should be taken that the rollers " R " do not drop out.

Removal

Remove both inlet and outlet pipes (12 and 13) (Fig. 27) from the side of the pump (11) by withdrawing

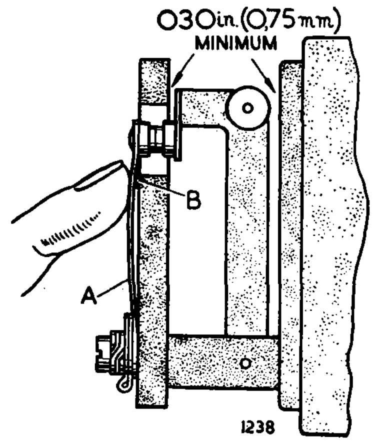


Fig. 21. If the contact blade "A" is held against the projection "B" there should be .030″ (0.75 mm.) gap between the white rollers and the body of the pump. If necessary, set the tip of the blade to obtain the correct clearance.

the banjo bolts and washers. Disconnect the electrical feed cable to the pump by unscrewing the knurled knob on the end of the pump. Disconnect the earth cable from the side of the pump. Remove the two self locking nuts attaching the pump to the bracket and withdraw the two washers from each stud. The pump can now be withdrawn from the bracket leaving the two rubber grommets in position. The rubber grommets in the bracket should be examined for deterioration and replaced if necessary, otherwise excessive petrol pump noise may result.

Refitting

Refitting is the reverse of the removal procedure.

Re-setting the Diaphragm

If the armature and centre-rod have been unscrewed it will be necessary to re-set these. In order to do this the spring blade which carries the contact points must be swung to one side. The armature should be screwed inwards, until the " throw-over " ceases to operate, and should then be screwed back gradually a sixth of a turn (or one hole) at a time, and pressed in and out until it is found that when it is pushed in slowly and firmly (not jerkily) the " throw-over " mechanism operates. It should then be unscrewed a further turn (five to six holes). The six screws which hold the magnet to the body may now be screwed into place, but before tightening these down it is essential that the diaphragm should be stretched to the outermost position. This is most easily done by inserting a matchstick behind one of the white fibre rollers on the outer rocker, thus holding the points in

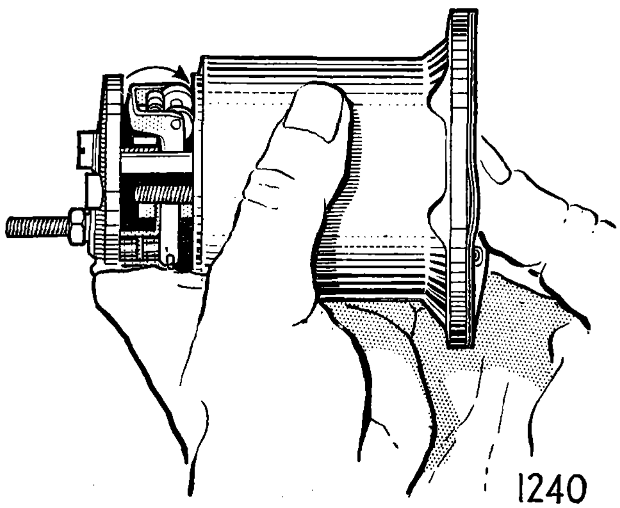


Fig. 22. Checking the " throw-over " of the toggle mechanism—depress the diaphragm slowly and firmly, not jerkily.

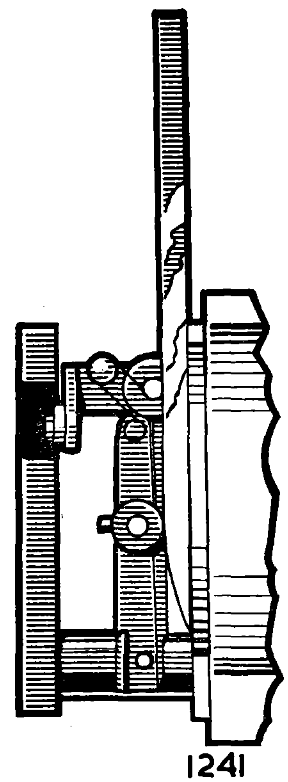


Fig. 24. Showing the tool in position for stretching the diaphragm when tightening the six securing screws.

contact (after first re-positioning the spring blade back into its normal position). If a current is then passed through the pump, the magnet will be energized and will pull the armature and diaphragm forward, and while it is in this position the six screws should be tightened. While the diaphragm-stretching operation can be done quite effectively by the matchstick method, there is available a special but simple diaphragm stretching tool (see Fig. 23). This is a steel wedge which is inserted under the trunnion " O " in the centre of the inner rocker in order to stretch the diaphragm to its outermost position before tightening the six flange screws.

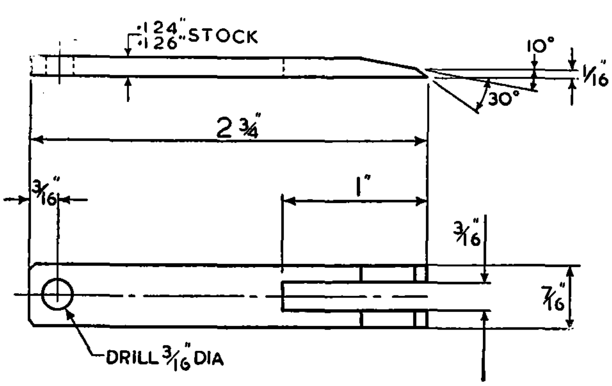


Fig. 23. Diaphragm stretching tool.

Finally, check over that when the spring blade (previously swung to one side) has been replaced in its normal position, the clearance hole in this is so positioned around the locking screw, that each contact point, according to the operation of the outer rocker, WIPES OVER THE CENTRE LINE OF THE OTHER POINT, and that this wiping action is not all to one side of the centre on either contact.

SHORT BODY FUEL PUMPS

Mark 2 Models	Commencing Chassis Nos. R.H. Drive	L.H. Drive
2.4 litre	106395	126248
3.4 litre	154030	176828
3.8 litre	203318	216064

On cars with the above chassis numbers and onwards, a modified fuel pump is fitted.

The new pump has a shorter coil housing than the original type. The new coil housing is approximately $2\frac{1}{4}''$ (57.1 mm.) in length against $2\frac{3}{4}''$ (69.8 mm.) of the previous type.

Servicing

The servicing of the new type of pump is the same as for the previous type except that the diaphragm setting, when new contacts are fitted, should be backed off (unscrewed) seven holes and not five to six as for the previous model.

Should trouble be experienced with the pump failing to operate at temperatures below —7°C. (22°F.) the latest type diaphragm with a single neoprene leaf and a translucent plastic leaf should be fitted with a gasket on **each** side of the diaphragm.

NOTE: It may be possible to start the pump if this trouble is experienced by leaving the ignition switch on for 2-3 minutes before starting the engine. If the engine fails to start, switch off the ignition for a further 2-3 minutes before trying again. With the ignition switched on, the coil of the pump becomes energised and sufficient warmth is generated to impart flexibility to the diaphragm.

INTRODUCTION OF AUF.301 FUEL PUMP

Mark 2 models	**Commencing Chassis Nos.** **R.H. Drive**	**L.H. Drive**
2.4 litre	117610	127550
3.4 litre	166654	179855
3.8 litre	232676	223683

Commencing with the above chassis numbers, Mark 2 models are fitted with the S.U. AUF.301 type fuel pump, which differs in construction to the S.U. pumps fitted to earlier models.

The principal variation is in the valve housing (see illustration). The valves are of a plastic (Melinex) material as opposed to the brass disc formerly used.

WARNING: If, at any time, it becomes necessary to blow through the fuel feed pipes, the outlet pipes **must** be disconnected from the pumps. Failure to observe this procedure will cause the Melinex valves to be displaced or damaged.

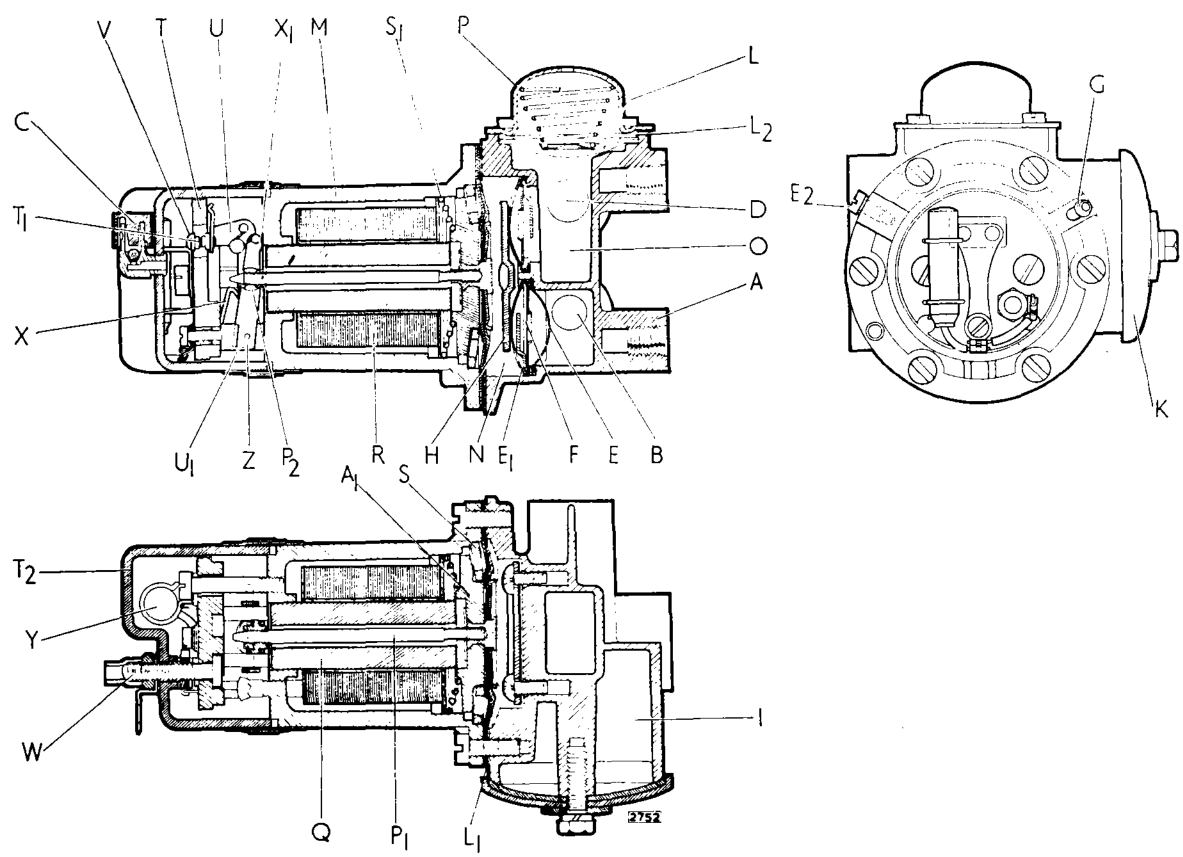


Fig. 25 Section view of AUF.301 Fuel Pump.

GENERAL DESCRIPTION

The pump comprises three main assemblies: the main body casting (A); the diaphragm armature and magnet assembly (M) contained within the housing; and the contact breaker assembly housed within the end cap (T2). A non-return valve assembly (C) is affixed to the end cover moulding to aid the circulation of air through the contact breaker chamber. The main fuel inlet (B) is maintained in communication with an inlet air bottle (1). Communication to the main pumping chamber (N) is provided by an inlet valve assembly.

This assembly comprises a Melinex valve disc (F) permanently assembled within a pressed-steel cage, which, in turn, is held in place by a valve cover (E1), while the outlet from the pumping chamber is provided with an identical valve assembly reversed in direction. Inlet and outlet valve assemblies and filters are held in position by a clamp plate (H). Both valve assemblies may be removed by detachment of the clamp plate (H) after removal of the self-tapping screws shown on the lower diagram. A filter (E) is provided, as shown, upstream of the inlet valve assembly. The delivery chamber (0) is bounded by a flexible plastic spring loaded diaphragm (L) contained by the vented cover 'P'. Sealing of the diaphragm (L) is provided by the rubber sealing ring (L2).

Magnetic Unit

The magnetic unit comprises an iron coil housing, an iron core (Q), an iron armature (A1) provided with a central spindle (P1) and permanently united with the diaphragm assembly (L1), a magnet coil (R) and a contact breaker assembly comprising parts (P2), (U1), (U), (T1), (V), etc. Between the coil housing and the armature are located 11 spherically edged rollers (S). These locate the armature (A1) centrally within the coil housing and allow absolute freedom of movement in a longitudinal direction.

The contact breaker consists of a bakelite pedestal moulding (T) carrying two rockers (U) and (U1) which are both hinged to the moulding at one end by the rocker spindle (Z) and interconnected at their top ends by two small springs arranged to give a throw-over action. A trunnion (P2) is carried by the inner rocker and the armature spindle (P1) is screwed into this trunnion. The outer rocker (U) is fitted with two tungsten points which contact with further tungsten points carried by the spring blade (V), This spring blade is connected to one end of the coil, while the other coil end is connected to the terminal (W). A short length of flexible wire (X) connects the outer rocker to one of the screws which hold the pedestal moulding onto the coil housing in order to provide an earth return to the body of the pump, which must, in turn, be very thoroughly earthed to the body of the vehicle by the earthing terminal provided on the flange of the coil housing.

Action of the Pump

When the pump is at rest the outer rocker (U) lies in the position illustrated, when the tungsten points (T1) are in contact. Current passes from the Lucar connector (W) through the coil and back to the blade (V), through the points and so to earth, thus energising the coil and attracting the armature (A1). The armature, together with the diaphragm assembly, then retracts, thus inspiring fuel through the inlet valve into the pumping chamber (N). When the armature has travelled well towards the end of its stroke the throw-over mechanism operates and the outer rocker moves rapidly backwards, thus separating the points and breaking the circuit.

The spring (S1) then loads the armature and diaphragm away from the coil housing and so forces the fuel through the delivery valve at a rate determined by the requirements of the engine. As the armature approaches the end of its stroke the throw-over mechanism again operates, the tungsten points remake contact and the cycle of operations is repeated. The spring blade (V) rests against the small projection moulding (T) and it should so be set that, when the points are in contact it is deflected away from the moulding. The extent of the gap at the points should be approximately .030 in., (.75 mm.) when the rocker (U) is manually deflected until it contacts the end face of the coil housing.

Replacing the Delivery Chamber Diaphragm

If the spring loaded diaphragm bounding the delivery chamber is ever removed, the following procedure should be adopted when replacing it.

Replace the perforated diaphragm disc first, depression towards the chamber. The rubber washer, transparent diaphragm shield, rubber diaphragm and 'O' ring are then replaced in that order. When replacing the cover, it is necessary to compress the spring so that the diaphragm is not stressed until firmly retained by the cover and 'O' ring. This may be done by passing a length of welding wire, suitably flattened at one end, through the hole in the top of the cover, down through the centre of the spring and through the diamond shaped hole in the spring seat. The flat on the end of the wire should be such that it just passes through the widest part of the hole in the spring seat and when rotated 90° will retain the seat so that it may be lifted to compress the spring.

With the spring compressed by holding the wire up with pliers, the cover should be tightened down evenly onto the 'O' ring already in position. When tightened fully the wire should be gently rotated back through the right angle to release the spring seat onto the diaphragm.

Resetting of Armature/Diaphragm Assembly after Dismantling

If the diaphragm assembly has for any reason been unscrewed, it is necessary to reset the position of the armature spindle in the trunnion. The procedure here is as follows. The screw which attaches the spring blade (V) should first be slackened and the blade swung to one side so that the tungsten points no longer contact. The armature should then be screwed inwards generously until, as the diaphragm assembly is pushed in and out, the throw-over ceases. The assembly should then be unscrewed gradually, a sixth of a turn at a time and continuously pressed in and out until it is found that when it is pushed in firmly and slowly the throw-over mechanism just operates. It should then be unscrewed by a further amount to approximately $1\frac{1}{4}$ turns (seven holes). The six screws which hold the coil housing to the main body may then be replaced and tightened. It is now necessary to check that the top of the inner rocker (U1) has made contact with the end face of the coil housing as indicated at X1. If there is a visible or measurable gap there, the six screws should then be slackened off and then retightened until this condition of contact at (X1) is achieved. Finally, the spring blade (previously sprung to one side) should then be replaced in its normal position. The slot in this is provided with an adequate clearance round its attachment screw. This allows it to be repositioned so that when the outer rocker operates to make and break contact between the tungsten points the one pair of points wipes over the centre-line of the other pair in a symmetrical manner.

Fault—Finding

First disconnect the delivery pipe to the carburetter, and if the pump then works, the most likely cause of the trouble is a sticking needle in the float chamber. Should the pump not work, however, disconnect the lead from the terminal and strike against the body of the pump to see if it sparks and, therefore, if any current is available. If the current is there, remove the bakelite

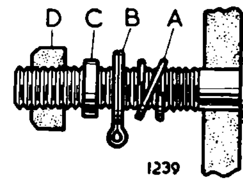


Fig. 26. *The terminal arrangement*
A. *Double coil spring washer.*
B. *Cable tag.*
C. *Lead washer.*
D. *Countersunk nut.*

cover and touch the terminal with the lead when the points are in contact—then if the pump still fails to work it may be due to dirt on the contact faces. This may be cleaned off by inserting a piece of thin card between them and sliding it to and fro. If, however, the pump still fails to work with dirt-free points, check that the bottom filter is not clogged, as this will stop a pump, although a rare happening. Next, slacken off the inlet pipe union, and if the pump then operates, the trouble is probably due to an obstruction in the pipe line to the tank which can possibly be cured by blowing down with a tyre pump.

If, however, with the inlet pipe union slackened off, the pump fails to work, or only works slowly and spasmodically, then the trouble is probably due to a fault in the pump itself, such as a stiffened up diaphragm, or undue friction in the rocker " throw-over " mechanism, or a combination of both.

To check over these two points, unscrew the six flange screws and detach the coil housing and rocker unit from the main body (taking care not to lose any of the eleven rollers under the diaphragm); and then by gently pressing the centre of the diaphragm assembly in and out observe whether the " throw-over " mechanism seems to operate freely. If it does not and there are traces of rust on any of the small steel spindles, lubricate sparingly with a spot of thin oil on a matchstick, where they pass through the brass rockers. Then turn to the diaphragm and in order to restore the original pliability of this, ruckle each of the two fabric layers vigorously between the thumb and fingers, after which it can be reassembled and carefully re-set for the " throw-over ", according to the instructions for this operation given in the paragraph headed " Re-setting the Diaphragm ".

If the pump becomes noisy, look for an air leak on the suction side. The simplest way to check for this is to disconnect the petrol pipe from the carburetter and allow the pump to discharge petrol into a pint can. If the end of the pipe is then submerged in the petrol and bubbles come through, there must be an air leak, and it must be found and cured.

If the pump keeps beating without delivering any petrol, it is possible that a piece of dirt is lodged under one of the valves. These can be removed for cleaning by detaching the top rectangular lid and unscrewing the valve cage. A choked filter or an obstruction on the suction side will cause the pump to become very hot and eventually cause a failure.

PETROL TANK

Removal

It is not essential to drain the petrol tank as it can be lowered vertically from its mounting. The car should be raised on a hoist to allow work to be carried out underneath.

Remove the three bolts attaching the exhaust silencers to the rubber mountings and the two bolts securing the exhaust pipes to the rear body coupling. The exhaust pipes will now fall away from the petrol

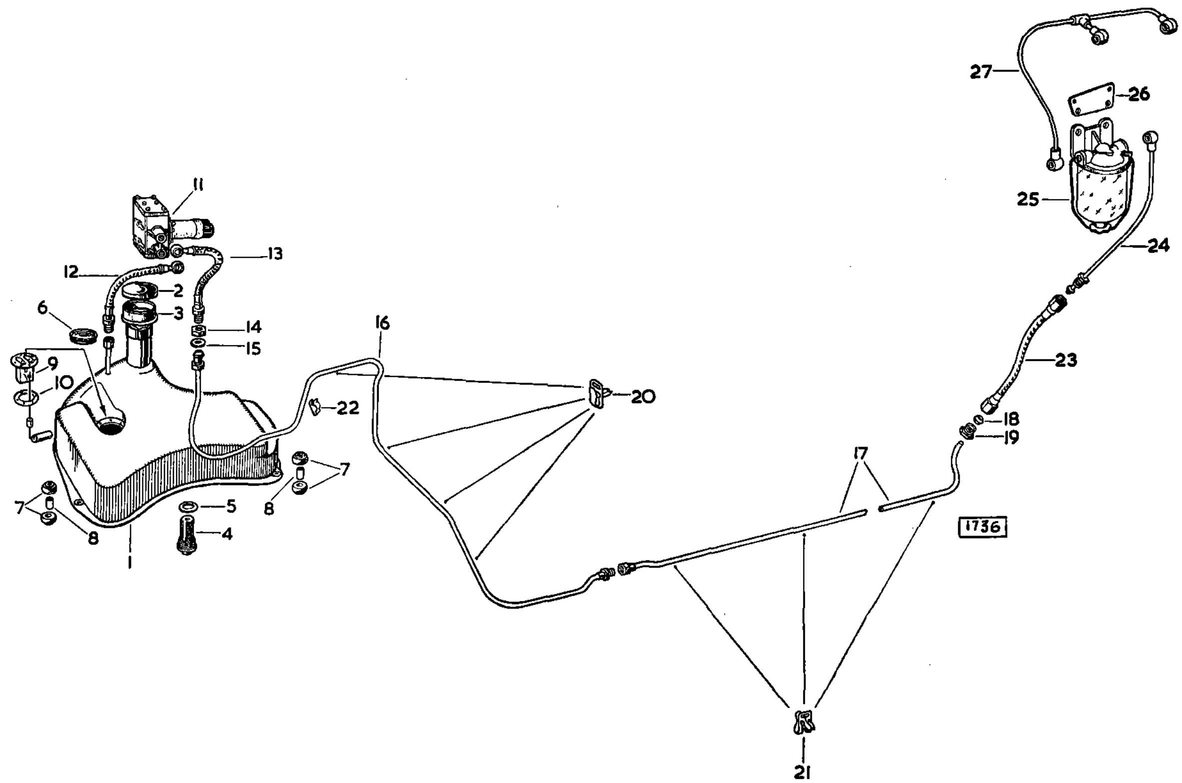


Fig. 27. The fuel system (2.4 *litre model*).

1. Petrol tank
2. Filler cap
3. Rubber grommet
4. Petrol tank filter
5. Gasket
6. Rubber grommet
7. Rubber mounting pad
8. Distance tube
9. Petrol tank element unit
10. Gasket
11. Petrol pump
12. Flexible petrol pipe
13. Flexible petrol pipe
14. Flexible pipe securing nut
15. Washer for nut
16. Rear petrol feed pipe
17. Front petrol feed pipe
18. Union olive
19. Union nut
20. Rear petrol pipe securing clip
21. Front petrol pipe securing clip
22. Rear petrol pipe edge clip
23. Petrol filter flexible pipe
24. Petrol filter pipe
25. Petrol filter
26. Mounting bracket
27. Carburetter feed pipe

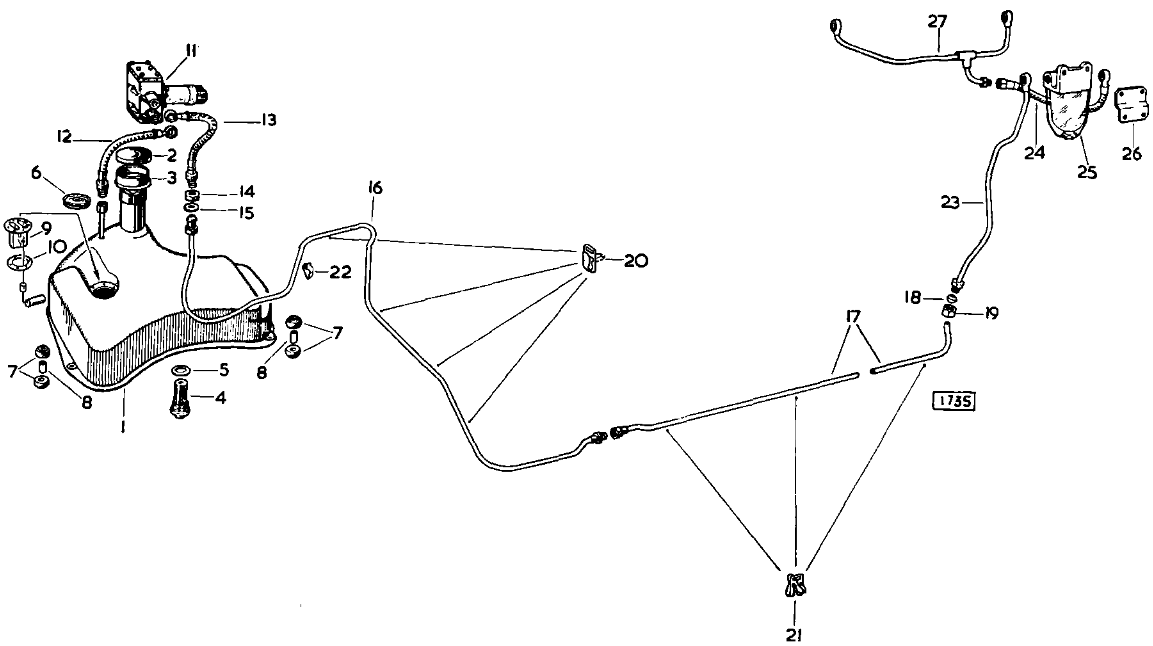


Fig. 28. *The fuel system* (3.4/3.8 *litre models*).

1. Petrol tank	10. Gasket	19. Union nut
2. Filler cap	11. Petrol pump	20. Rear petrol pipe securing clip
3. Rubber grommet	12. Flexible petrol pipe	21. Front petrol pipe securing clip
4. Petrol tank filter	13. Flexible petrol pipe	22. Rear petrol pipe edge clip
5. Gasket	14. Flexible pipe securing nut	23. Intermediate petrol filter pipe
6. Rubber grommet	15. Washer for nut	24. Petrol filter flexible pipe
7. Rubber mounting pad	16. Rear petrol feed pipe	25. Petrol filter
8. Distance tube	17. Front petrol feed pipe	26. Mounting bracket
9. Petrol tank element unit	18. Union olive	27. Carburetter feed pipe

tank. Open the petrol filler door on the left-hand wing and remove the filler cap.

Disconnect the flexible petrol pipe from the tank by unscrewing the union above the large grommet located behind the trim panel on the left-hand side of the luggage compartment. Remove the petrol gauge tank unit cover from the left-hand side of the luggage compartment floor and disconnect the three cables.

Remove the three self-locking nuts attaching the petrol tank to the body. Take off the three petrol tank mounting rubbers and washers and lower the petrol tank from the body. Withdraw the remaining distance pieces, rubbers and washers from the tank mounting studs.

Refitting

Refitting is the reverse of the removal procedure. Ensure that the electrical cables for the petrol tank unit are drawn up through the cover plate aperture before the tank is offered up to its mounting.

Note: To ensure that the cable connectors are correctly attached to the blade terminals on petrol gauge tank unit, slide back the insulating sleeve from cable connector to expose terminal end. Push home fully on to blade and slide insulating sleeve forward to cover joint.

PETROL GAUGE TANK UNIT

Removal

Roll back the luggage compartment floor covering to expose the tank unit cover plate on the left-hand side. Remove the cover plate by lifting the spring steel strip.

Disconnect the three electrical cables, green and black, white and green and a black wire from the earth.

Remove the six setscrews and twelve copper washers attaching the unit to the petrol tank.

The seal can be broken by a sharp tap on one side of the unit. Withdraw the unit taking care not to damage float arm.

Refitting

The existing gasket should be scraped away from the boss on the petrol tank taking care that none falls into the tank. Apply a suitable sealing compound to both sides of the new gasket which should be positioned on the petrol tank boss with the holes in line. Insert the element into the tank so that the float is towards the front of the car. Replace the six screws and twelve washers and tighten securely. Attach the white and green cable to the terminal (marked " W ") at the front of the unit, and the green and black cable to the terminal (marked " T ") at the rear.

Note : To ensure that the cable connectors are correctly attached to the blade terminals on petrol tank unit, slide back the insulating sleeve from the cable connector to expose terminal end. Push connector home fully on to blade and slide insulating sleeve forward to cover joint.

Remove one of the screws on top of the element housing and secure the earth wire. Replace the unit cover plate and floor covering in the luggage compartment.

SECTION D

COOLING SYSTEM

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

INDEX (*continued*)

COOLING SYSTEM

The water circulation is assisted by an impeller type pump mounted on the front cover of the engine, the system being pressurised and thermostatically controlled. Water is circulated from the base of the radiator block via the water pump through the cylinder block and cylinder head water passages and returned to the radiator header tank via the inlet manifold water jacket. The radiator is of the film type and holds approximately $6\frac{3}{4}$ pints (3.85 litres) of water. A fan, mounted on the spindle of the water pump draws in air through the radiator block.

DATA

	2.4 litre	3.4 litre 3.8 litre
Total capacity—including heater	20 pints (11.40 litres)	22 pints (12.55 litres)
Water pump—type	Centrifugal	
—drive	Fan belt	
Fan belt—angle of 'V'	40°	
Fan—no. of blades	12	12
Fan to engine speed ratio	0.9 : 1	
Cooling system control	Thermostat	
Thermostat data	See page D.9	
Radiator type	Film—10 fins/inch (4 fins/cm.)	
Radiator cap :		
Make and type	A.C.—relief valve	
Release pressure	4 lbs. per sq. in. (0.28 kg./cm.^{2})	
Release depression	$\frac{1}{2}$ lb. (0.23 kg.)	

Radiator flow figures : Water at 62° F. (17° C.)

lbs. per sq. in.	galls./min.	litres/min.
1	15.5	70.5
1.5	19.0	86.5
2	22	100.0
2.5	24.5	111.5
3	26.5	120.0
3.5	29.0	131.8
4	31.0	140.9

ROUTINE MAINTENANCE

DAILY

Checking Radiator Water Level

Every day, check the level of the water in the radiator and, if necessary, top up to the bottom of the filler neck.

Use water that is as soft as is procurable ; hard water produces scale which in time will affect the cooling efficiency of the system.

PERIODICALLY

Care of the Cooling System

The entire cooling system should occasionally be flushed out to remove sediment. To do this, open the radiator block and cylinder block drain taps and insert a water hose into the radiator filler neck. Allow the water to flow through the system, with the engine running at a fast idle speed (1,000 r.p.m.) to cause circulation, until the water runs clear.

Since deposits in the water will in time cause fouling of the surfaces of the cooling system with consequent impaired efficiency it is desirable to retard this tendency as much as possible by using water that is as nearly neutral (soft) as is available. One of the approved brands of water inhibitor may be used with advantage to obviate the creation of deposits in the system.

When **refilling the cooling system** open the heater control tap by placing the temperature control on the facia in the **hot** position. Check the radiator water level after running the engine and top up if necessary.

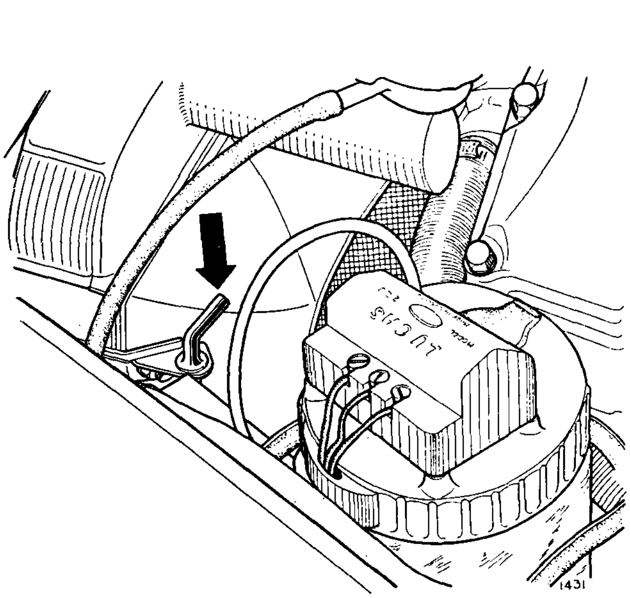


Fig. 1. Radiator drain tap remote control.

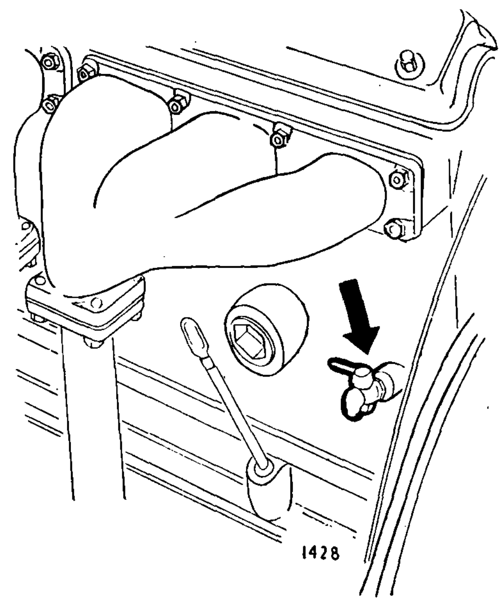


Fig. 2. Cylinder block drain tap.

FROST PRECAUTIONS

Anti-Freeze—Important

During the winter months it is strongly recommended that an anti-freeze compound with an inhibited Ethylene Glycol base is used in the proportions laid down by the anti-freeze manufacturers. It should be remembered that if anti-freeze is not used it is possible, owing to the action of the thermostat, for the radiator to " freeze-up " whilst the car is being driven, even though the water in the radiator was not frozen when the engine was started.

Before adding anti-freeze solution the cooling system should be cleaned by flushing.

The cylinder head gasket must be in good condition and the cylinder head nuts pulled down correctly, since if the solution leaks into the crankcase a mixture will be formed with the engine oil which is likely to cause blockage of the oil ways with consequent damage to working parts. Check the tightness of all water hose connections, water pump and manifold joints. To ensure satisfactory mixing, measure the recommended proportions of water and anti-freeze solution in a separate container and fill the system from this container, rather than add the solution direct to the cooling system.

When filling the cooling system, open the heater control tap by placing the temperature control on the facia in the HOT position. Check the radiator water level after running the engine and top up if necessary. If topping up is necessary during the period in which anti-freeze solution is in use, this topping up must be carried out using anti-freeze solution or the degree of protection provided may be lost. Topping up with water will dilute the mixture possibly to an extent where damage by frost will occur.

Engine Heater

Provision is made on one side of the cylinder block for the fitment of an American standard engine heater element No. 7, manufactured by James B. Carter Ltd., Electrical Heating and Manufacturing Division, Winnipeg, Manitoba, Canada, or George Bray & Co. Ltd., Leicester Place, Blackman Lane, Leeds 2, England.

RADIATOR

The radiator is of the film type having 10 cooling fins per inch (4 fins/cm.). It is pressurised by means of the radiator filler cap. This incorporates a pressure relief valve which is designed to hold a pressure of up to 4 pounds per square inch (0.28 kg./cm^2) above atmospheric pressure inside the system. When the pressure rises above four pounds the spring loaded valve lifts off its seat and the excess pressure escapes via the overflow pipe. As the water cools down again a small valve, incorporated in the centre of the pressure valve unit, opens and restores atmospheric pressure should a depression be caused by the cooling of the water.

By raising the pressure inside the cooling system, the boiling point of the coolant is raised by approximately six degrees thus reducing the risk of coolant loss from boiling.

Removal

Drain the radiator by operating the remote control at the top rear of the radiator header tank, and disconnect top and bottom radiator hoses.

On 3.4/3.8 litre cars unscrew the four nuts securing the cowl and allow it to rest on the water pump housing behind the fan. Remove the split pin securing the control rod to the drain tap and unscrew the drain tap from the radiator block. Remove the two setscrews securing the sides of the radiator to the body. Remove the two securing nuts at the bottom of the radiator. Carefully lift out the radiator taking care not to damage the matrix on the fan blades. Remove the fan cowl.

On 2.4 litre cars no cowl is fitted to the radiator. The remainder of the removal procedure above applies for the 2.4 litre model.

Important: Always keep the radiator block in an upright position so that there is no danger of sediment which may have accumulated on the bottom of the tank passing into the narrow core passages and causing a blockage.

Cleansing the System

Periodically the cooling system should be flushed out and cleansed with a suitable cleansing compound. The procedure is as follows :

Drain the system by removing the two drain taps and when the engine has cooled flush the system with cold water. When this has drained away, replace the taps and fill the system to the normal level with a solution of suitable cleansing compound. Beware of splashing compound on to the paintwork as this would cause serious damage. The engine must now be run for the period prescribed by the makers of the compound after which the system must be drained, thoroughly flushed and refilled with soft water.

Refitting

Refitting is the reverse of the removal procedure.

FAN

Removal

Remove the radiator as described above.

Slacken the dynamo adjusting link bolt and the two dynamo bolts and nuts underneath the dynamo. Release the fan belt tension and remove the fan belt. Before removing the setscrews securing the fan to the hub, mark the positions of the semi-circular balance piece(s) relative to the fan and fan hub. (On initial assembly the ends of the balance piece(s) and fan are marked with a centre punch and a small hole is drilled through the balance piece(s), hub and fan to assist re-assembly.) Remove the fan from the hub by unscrewing the four setscrews fitted with shakeproof washers.

Refitting

Refitting is the reverse of the removal procedure, but attention should be paid to the removal notes in order to preserve the balance of the assembly.

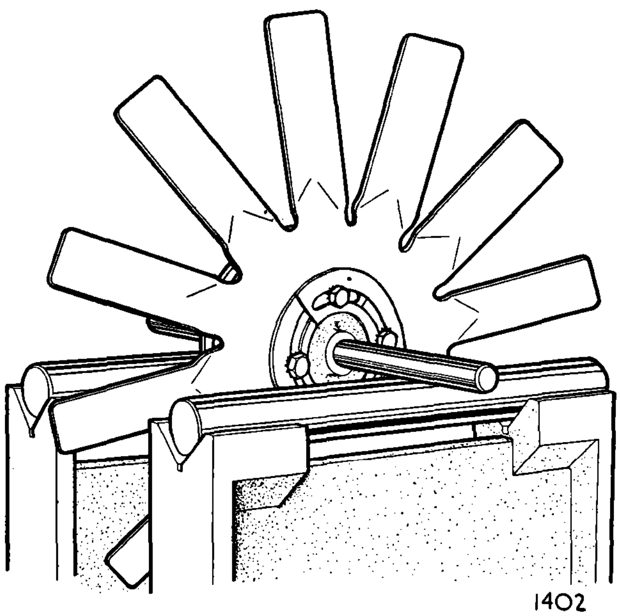


Fig. 3. Balancing the fan assembly.

If it becomes necessary to replace any part of the assembly then it should be rebalanced as shown in Fig. 3. Static balancing is effected by varying the position of the semi-circular balance piece(s) which are retained by setscrews securing the fan to the hub. These should be arranged so that the fan remains at rest in any position. After re-balancing, the ends of the balance piece(s) and the fan should be marked with a centre punch, a small hole drilled through the balance piece(s), hub and fan and the old hole filled in with solder.

Adjust the fan belt as described under " Fan Belt—Adjustment ".

FAN BELT

Adjustment (2.4 Litre and early 3.4 and 3.8 Litre).

Slacken the two dynamo bolts and nuts underneath the dynamo and the adjusting link bolt. Pull the dynamo outwards until the fan belt can be flexed approximately $\frac{1}{2}''$ (12.7 mm.) either way, midway between the fan and dynamo pulleys. Tighten the adjusting link bolt and the dynamo mounting bolts.

Note: Slackness of the belt will cause slip with the possible result of a squealing noise from the belt, a reduced charging rate from the dynamo or overheating of the engine.
Too much tension will create undue wear of belt, pulleys, water pump and dynamo bearings.

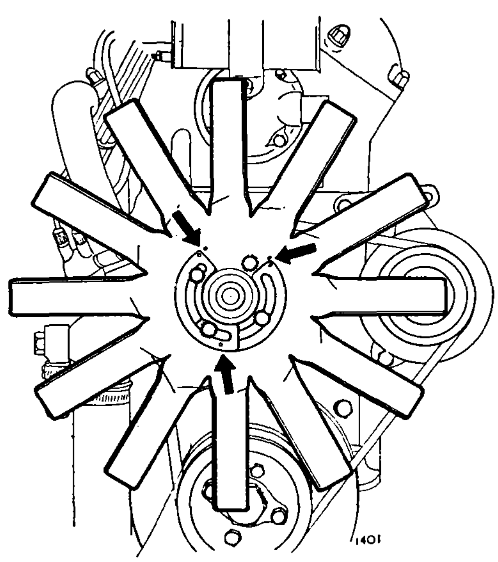


Fig. 4. Fan, showing balance pieces and location hole.

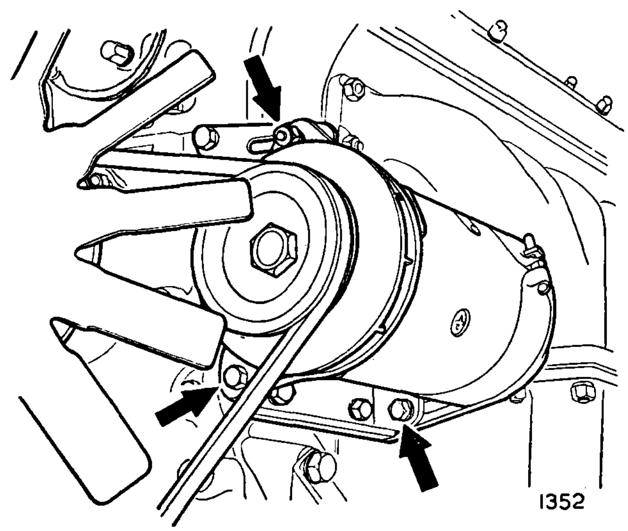


Fig. 5. To adjust the fan belt tension slacken the three dynamo mounting bolts and move the dynamo into the desired position. (2.4 Litre and early 3.4 and 3.8 Litre models).

Removal

Release the fan belt tension by slackening the two dynamo bolts and nuts underneath the dynamo and the adjusting link bolt. Swing the dynamo towards the engine until the fan belt can be removed from the pulley. Remove the belt from the crankshaft pulley and withdraw over fan.

Refitting

Refitting is the reverse of the removal procedure but it is important that the belt is not stretched over the pulleys by any means other than by hand. If a tool is used to lever the belt on or off, the endless cords in the belt may be broken.

THERMOSTAT

This is a valve incorporated in the cooling system which restricts the flow of coolant through the radiator until the engine has reached its operating temperature. When the engine temperature rises to a pre-determined figure (see " Thermostat Data ") the thermostat valve commences to open and allows the water to circulate round the radiator. The flow of water increases as the temperature rises until the valve is fully open. Included in the system is a water by-pass utilizing a slot in the thermostat housing integral with the water outlet pipe. This allows the coolant to by-pass the radiator until the thermostat opening temperature is attained, thus providing a rapid warming up of the engine and in cold weather an early supply of warm air to the interior of the car via the heater.

Removal

Drain sufficient water from the system to allow the level to fall below the thermostat by operating the remote control of the drain tap situated at the top left-hand side of the radiator block. Slacken the clip and remove the top water hose from the elbow pipe on the thermostat housing. Remove the two nuts and spring washers securing the water outlet elbow and remove elbow. Lift out the thermostat, noting the gasket between the elbow pipe and thermostat housing.

Checking

Thoroughly clean the thermostat and check that the small hole in the valve is clear. Check the thermostat for correct operation by immersing in a container of cold water together with a thermometer and stirrer. Heat the water, keeping it well stirred and observe if the characteristics of the thermostat are in agreement with data given under " Thermostat Temperatures ".

Refitting

Refitting is the reverse of the removal procedure.

Always fit a new gasket between the elbow pipe and the thermostat housing. Ensure that the recess in the thermostat housing and all machined faces are clean.

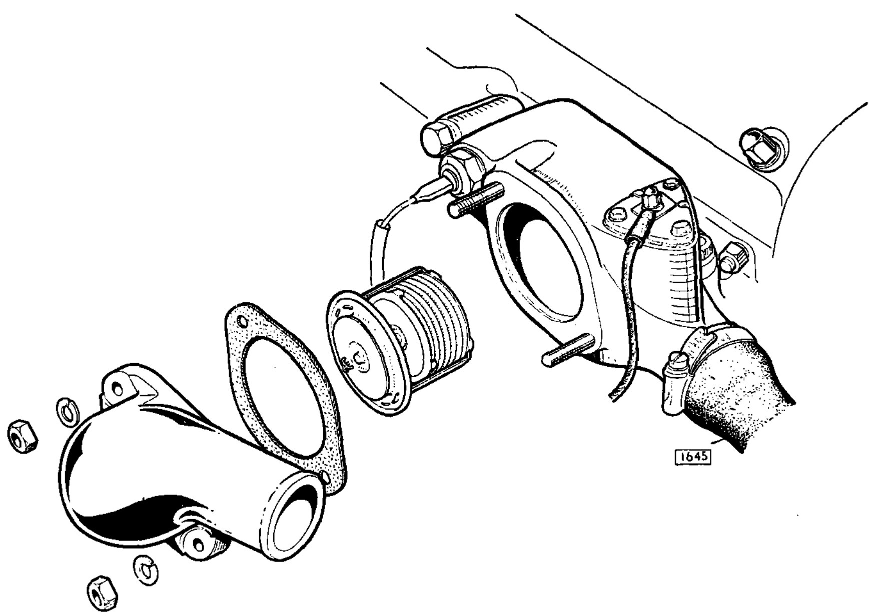


Fig. 6. Exploded view of thermostat and housing (3.4 litre shown).

Thermostat Data

Thermostat Identification Jaguar No.	Smiths No.	Initial Opening Temperature °C.	Fully Open Temperature °C.	Remarks
C.13944	X.85025/74	74 ±2	86—91	
C.13944/1	X.85025/80	80 ±2	92—97	High setting for extreme winter conditions.

The opening temperature figure and Smiths Part No. are stamped on each thermostat.

Quick-Lift Thermostat

Model No.	**Commencing Engine Numbers**
2.4 litre Mark 2	BH.7577
3.4 litre Mark 2	KH.6370
3.8 litre Mark 2	LC.3671

Thermostat Identification Jaguar No.	Smiths No.	Initial Opening Temperature	Fully Open Temperature	Remarks
C.20766	C.3502—1013	159°F. (70.5°C.)	168°F. (75.5°C.)	
C.20766/1	C.3502—1016	174°F. (78.8°C.)	183°F. (83.7°C.)	High setting for extreme winter conditions.

The opening temperature and Smiths Part No. are stamped on each thermostat.
This thermostat is interchangeable with the previous type.

WATER PUMP

The water pump (Fig. 7) is of the centrifugal vane impeller type, the impeller being mounted on a steel spindle which in turn runs in a double row of ball bearings. These are sealed at their ends to exclude all dirt and to retain the lubricant. The main seal on the pump spindle is located in the pump housing by a metal cover and the carbon face maintains a constant pressure on the impeller by means of a thrust spring inside the seal. A hole drilled in the top of the casting acts as an air vent and lead into an annular groove in the casting into which stray water is directed by means of a rubber thrower on the pump spindle. A drain hole at the bottom of the groove leads away any water and prevents seepage into the bearing.

Removal

Remove the radiator as described on page D.6. Slacken off the dynamo bolts and pushing the dynamo towards the engine, remove the fan belt.

On the 2.4 litre model remove the locking washer securing the damper bolt by knocking back the tabs

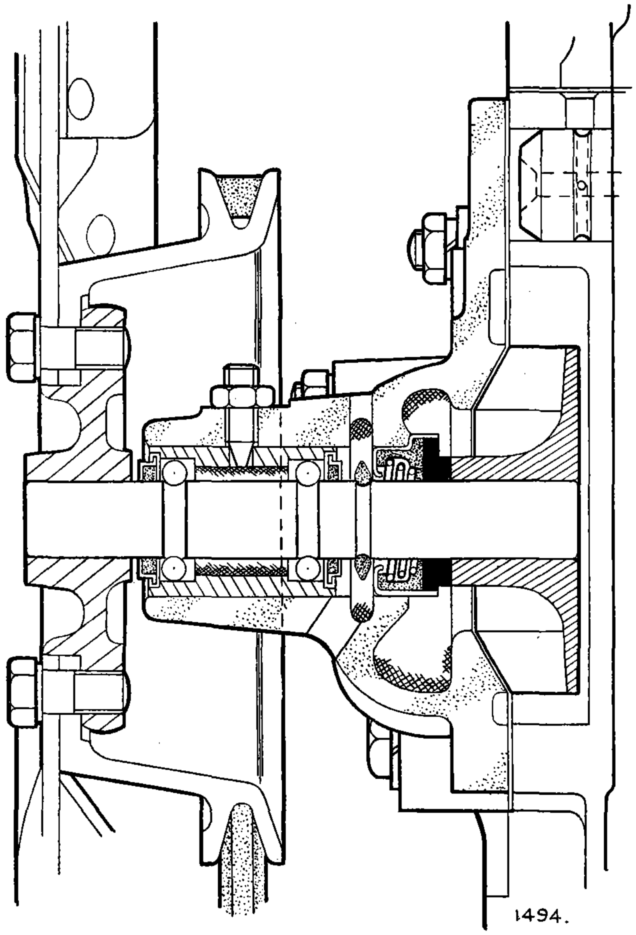


Fig. 7. Sectioned view of water pump.

and unscrewing the two setscrews. Remove the four remaining setscrews when the pulley and damper can be removed.

Remove the fan and fan pulley as described on page D.6. Detach hose connections from the water pump.

Unscrew the set bolts and nuts and remove the water pump from the timing cover. Note the gasket between the pump and the timing cover.

Dismantling

Remove the fan hub by means of a suitable extractor as shown in Fig. 8. Slacken locknut and remove Allen head locating screw.

Withdraw the spindle and impeller assembly from the pump casting. This assembly must not be pushed out by means of the shaft or the bearing will be damaged. A tube measuring $1\frac{3}{32}''$ (27.77 mm.) outside diameter and $\frac{31}{32}''$ (24.61 mm.) inside diameter must be used to push out the assembly from the front of the pump.

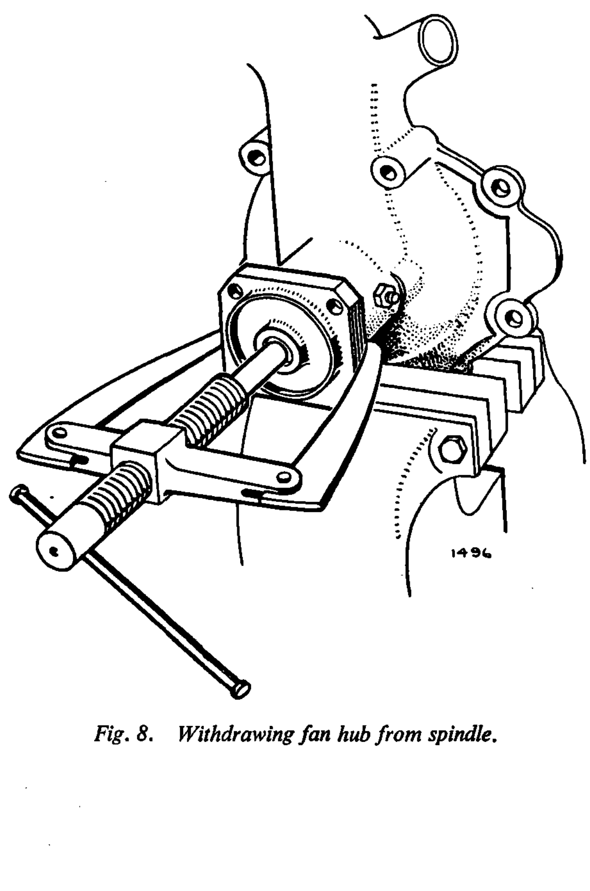


Fig. 8. Withdrawing fan hub from spindle.

Press out the spindle from the impeller as shown in Fig. 9 and remove seal and rubber thrower. The spindle and bearing assembly cannot be dismantled any further.

Checking

Thoroughly clean all parts of the pump except the spindle and bearing assembly in a suitable cleaning solvent.

Note: The bearing is a permanently sealed and lubricated assembly and therefore must not be washed in the solvent.

Inspect the bearing for excessive end play and remove any burrs, rust or scale from the shaft with fine emery paper, taking the precaution of covering the bearing with a cloth, to prevent emery dust from entering the bearing. If there are any signs of wear or corrosion in the bearing bore or on the face in front of the impeller the housing should be renewed.

Re-assembly

Install shaft and bearing assembly into the pump body from the rear and line up the location hole in the bearing with the tapped hole in the body. Fit locating screw and locknut. Place the rubber thrower in its groove on the spindle in front of the seal. Coat the outside of the brass seal housing with a suitable water resistant jointing compound and fit into the recess in the pump casting. Push the seal into its housing with the carbon face towards the rear of the pump. Ensure that the seal is seated properly.

Press on impeller as shown in Fig. 10 until the rear face of the impeller is flush with the end of the spindle. In a similar manner press the fan hub on to the spindle until it is flush with the end.

Refitting

Refitting is the reverse of the removal procedure. Care should be taken to renew the pump to timing cover gasket, lightly smearing with grease before fitting.

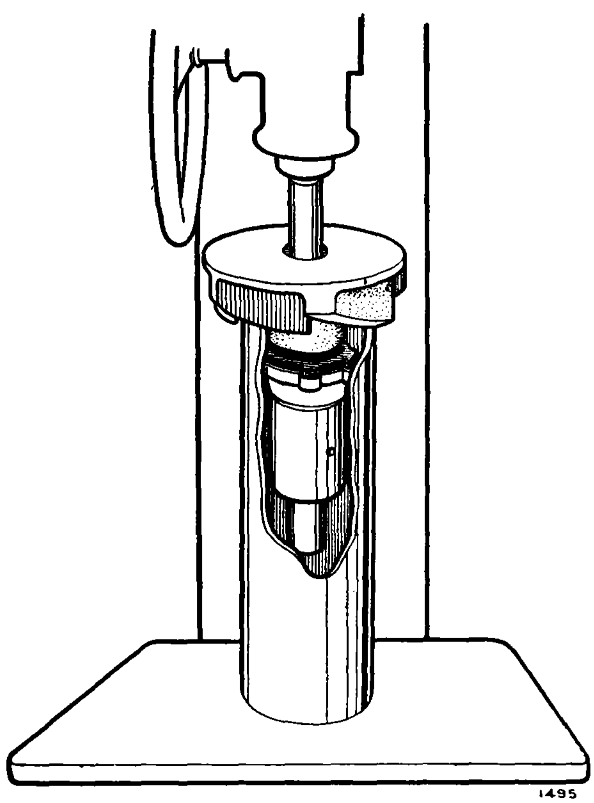


Fig. 9. Removing water pump impeller from pump spindle.

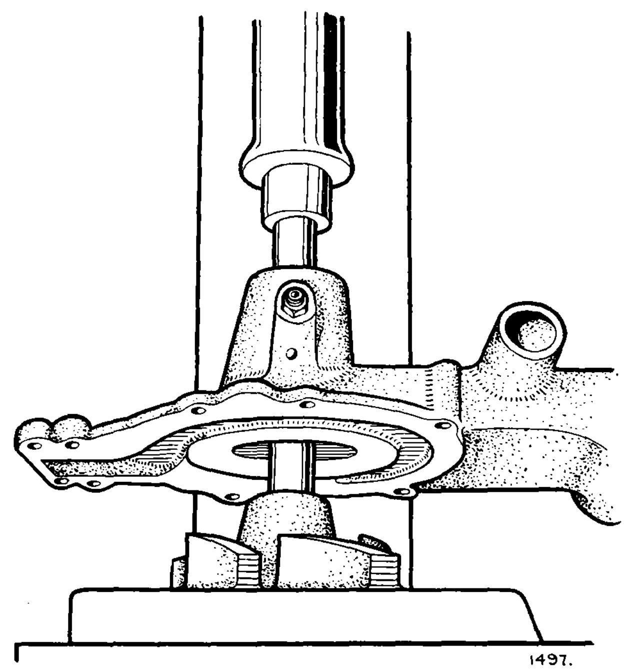
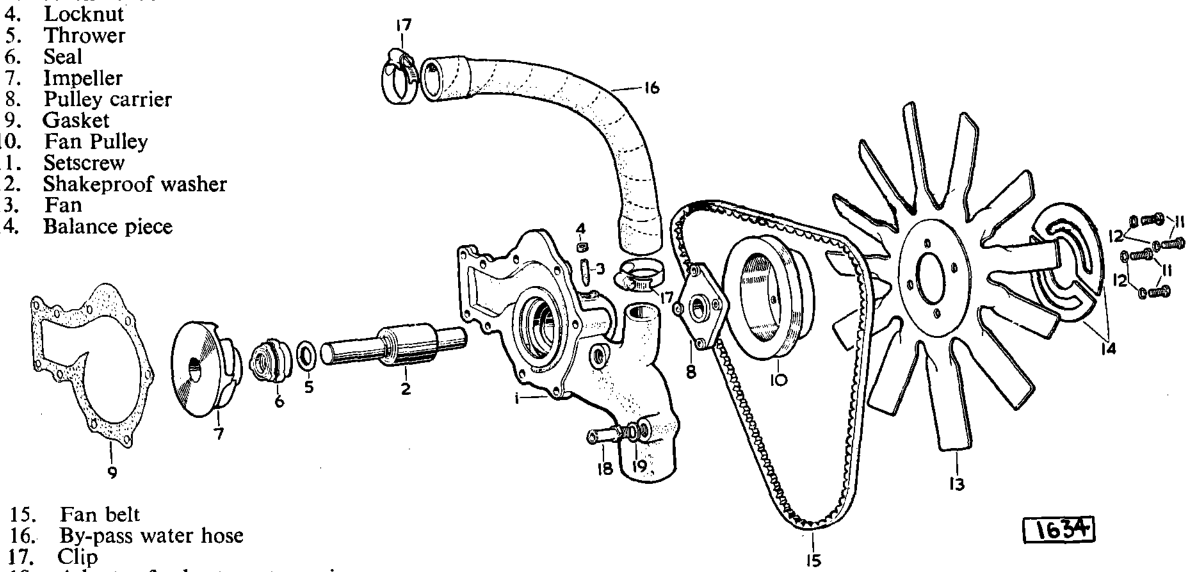


Fig. 10. Fitting impeller.

1. Pump body
2. Spindle and bearing assembly
3. Allen headed screw
4. Locknut
5. Thrower
6. Seal
7. Impeller
8. Pulley carrier
9. Gasket
10. Fan Pulley
11. Setscrew
12. Shakeproof washer
13. Fan
14. Balance piece



15. Fan belt
16. By-pass water hose
17. Clip
18. Adaptor for heater return pipe (2.4 litre shown)
19. Copper water

Fig. 11. Exploded view of water pump.

WATER TEMPERATURE GAUGE

The indicator head is attached to the instrument panel and operates on a thermal principle using a bi-metal strip surrounded by a heater winding. The transmitter unit is mounted in the inlet manifold water jacket adjacent to the thermostat. For the full description and fault analysis of this instrument refer to Section P " Electrical and Instruments ".

SUPPLEMENTARY INFORMATION TO SECTION D "COOLING SYSTEM"

AUTOMATIC FAN BELT TENSIONER

Reference Page : D.7 and 8.

Later cars are fitted with a spring-loaded jockey pulley on the right-hand side of the engine. This pulley maintains the correct fan belt tension without any periodic adjustment being required. If it should become necessary to replace the fan belt, the following instructions should be carried out.

FAN BELT

Removal

Slacken the two bolts securing the dynamo to the mounting bracket. Remove the nut and unscrew the bolt securing the top link to the dynamo. Slacken the bolt securing the dynamo link to the engine and press the dynamo in towards the cylinder block.

Remove the fan belt by pressing the jockey pulley inwards.

Refitting

Place the new fan belt in position on the water pump, jockey and crankshaft pulleys.

Press the jockey pulley inwards and pass the fan belt over the dynamo pulley.

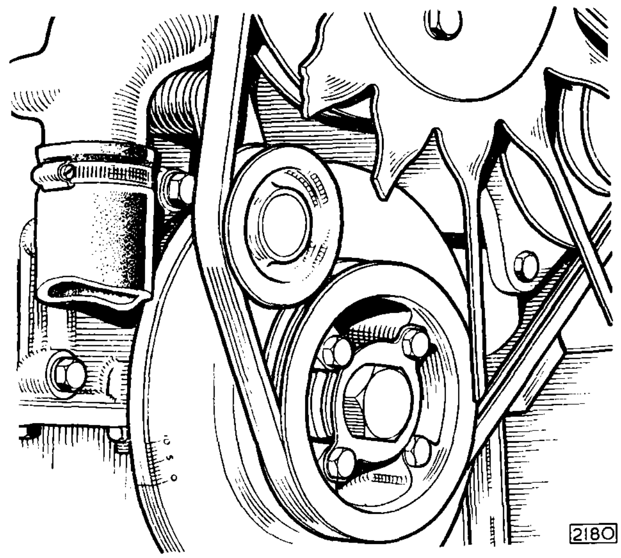


Fig. 12. The automatic fan belt tensioner.

Insert the top bolt through the dynamo adjusting link and screw into the lug on the dynamo.

Pull the dynamo away from the cylinder block as far as possible and tighten the top securing bolts.

Replace the locknut on the top bolt.

Tighten the bolt securing the link to the engine and also the two bottom dynamo mounting bolts.

SECTION E

CLUTCH

MARK 2 MODELS

2·4, 3·4 and 3.8 litre

INDEX

INDEX *(continued)*

CLUTCH

DESCRIPTION

The clutch is of the single dry plate type and consists of a spring loaded driven plate assembly, a cover assembly and a graphite release bearing. The operating mechanism consists of a pendant-type foot pedal, coupled by a push rod to an independent master cylinder, integral with which is a fluid reservoir. This is connected by piping and a flexible hose to a slave cylinder mounted on the clutch housing. Depressing the clutch pedal moves the piston in the master cylinder and imparts thrust to the slave cylinder piston which in turn, operates the graphite release bearing by means of a push rod and operating fork. The bearing is forced against the clutch release lever plate which causes the release levers to withdraw the pressure plate and thus release the clutch driven plate.

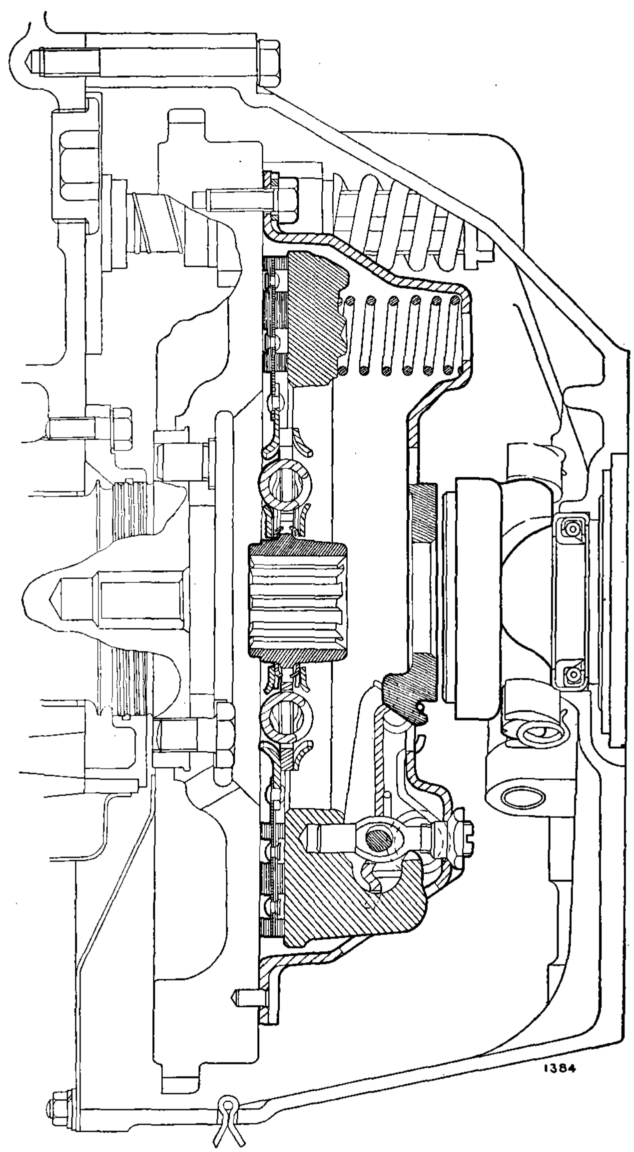


Fig. 1. Sectional view of clutch.

DATA

	2.4 litre	3.4 litre	3.8 litre
Make	Borg and Beck	Borg and Beck	Borg and Beck
Model	9 A6—G	10 A6—G	10 A6—G
Outside diameter	9.13″—9.16″ (231 mm.—232 mm.)	9.84″—9.87″ (249 mm.—250 mm.)	9.84″—9.87″ (249 mm.—250 mm.)
Inside diameter	6.12″—6.13″ (153 mm.—154 mm.)	6.75″—6.76″ (171 mm.—172 mm.)	6.75″—6.76″ (171 mm.—172 mm.)
Type	Single dry plate	Single dry plate	Single dry plate
Clutch release bearing	Graphite	Graphite	Graphite
Operation	Hydraulic	Hydraulic	Hydraulic
Clutch thrust springs —number	9	12	12
—colour	6 Cream 3 Yellow/Light Green	Cream	Black
—free length	2.68″ (68 mm.)	2.68″ (68 mm.)	2.68″ (68 mm.)
Driven Plate—type	Borglite	Borglite	Borglite
Driven plate damper springs —number	6	6	6
—colour	White/Light Green	Red/Cream	Brown/Cream

ROUTINE MAINTENANCE

WEEKLY

Clutch Fluid Level

The clutch is operated hydraulically from a master cylinder situated at the rear of the engine compartment on the driver's side of the car. The hydraulic fluid is stored in a reservoir combined with the master cylinder and it is important that the level does not fall below the bottom of the filler neck.

EVERY 2,500 MILES (4,000 KM.)

Clutch Pedal Free Travel

There should be $\frac{3}{4}$″ (19 mm.) free travel or unloaded movement at the pedal pad before feeling the resistance of the clutch thrust springs.

The free travel is most easily felt by depressing the pedal pad by hand until a marked resistance is felt. If the adjustment is incorrect, rapid wear of the clutch withdrawal mechanism or other troubles may result.

Adjustment is effected by slackening the locknut and turning the operating rod between the slave cylinder and the clutch withdrawal lever. Screwing the rod into the knuckle joint will increase the pedal free travel ; screwing the rod out will decrease the free travel.

	Commencing Engine No.
2.4 Litre Mark 2	BJ.5110
3.4 Litre Mark 2	KJ.7659
3.8 Litre Mark 2	LE.2533

Commencing at the above engine numbers a hydrostatic clutch operating slave cylinder is fitted.

Normal clutch wear is automatically compensated for by this slave cylinder and no clearance adjustment is necessary.

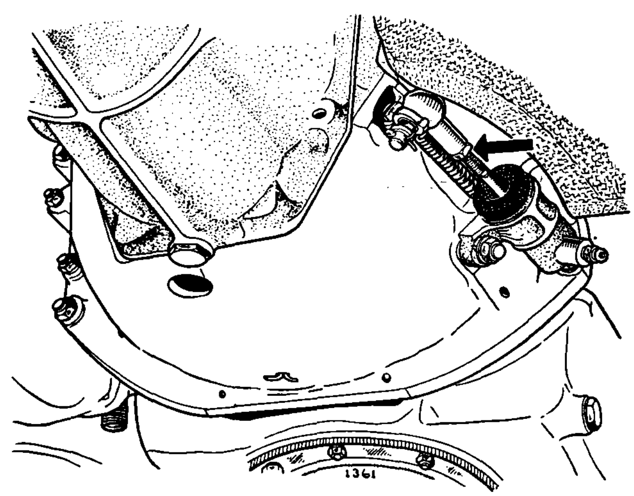


Fig. 2. Adjustment of clutch operating rod (Early Cars).

RECOMMENDED HYDRAULIC FLUIDS

Castrol/Girling Crimson Clutch/Brake fluid is recommended. This conforms to S.A.E. 70 R3 specification but gives a higher boiling point for additional safety.

The mixture of Castrol/Girling Crimson with a different fluid already existing in the system is undesirable.

If Castrol/Girling Crimson is not readily available, only a fluid which is guaranteed to conform to S.A.E. 70 R3 specification may be used as an alternative.

In the event of deterioration of the rubber seals and hoses due to the use of an incorrect fluid, all the seals and hoses must be replaced and the system thoroughly flushed and refilled with one of the above fluids. (See " Flushing the System ").

HYDRAULIC SYSTEM—GENERAL INSTRUCTIONS

Should it be found necessary to dismantle any part of the clutch system (that is, master cylinder or slave cylinder), the operation must be carried out under conditions of scrupulous cleanliness. Clean the mud and grease off the unit before removal from the vehicle and dismantle on a bench covered with a sheet of clean paper. Do not swill a complete unit, after removal from the vehicle, in paraffin, petrol or trichlorethylene (trike) as this would ruin the rubber parts and, on dismantling, give a misleading impression of their original condition. Do not handle the internal parts, particularly rubbers, with dirty hands. Place all metal parts in a tray of clean brake fluid to soak ; afterwards dry off with a clean fluffless cloth, and lay out in order on a sheet of clean paper. Rubber parts should be carefully examined and if there is any sign of swelling or perishing they should be renewed ; in any case it is usually good policy to renew **all** rubbers. The main castings may be swilled in any of the normal cleaning fluids but all traces of the cleaner must be dried out before assembly. In the case of the master cylinder make sure that the by-pass port is clear by probing with a bent piece of wire not exceeding .018" (0.46 mm.) diameter.

If the by-pass port is clogged, rapid wear of the release bearing or clutch slip will result due to pressure being built up in the system.

All internal parts should be dipped in clean brake fluid and assembled wet, as the fluid acts as a lubricant. When assembling the rubber parts use the fingers only.

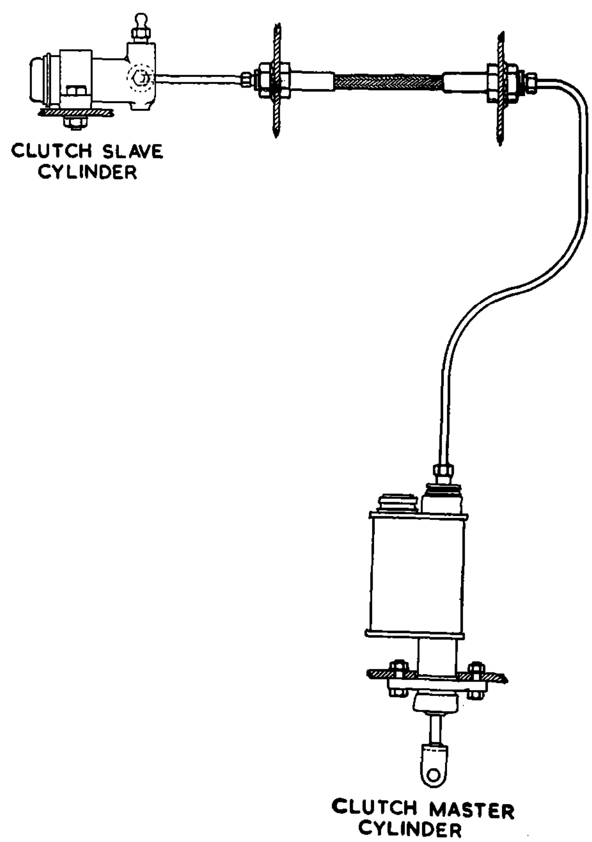


Fig. 3. Clutch hydraulic system.

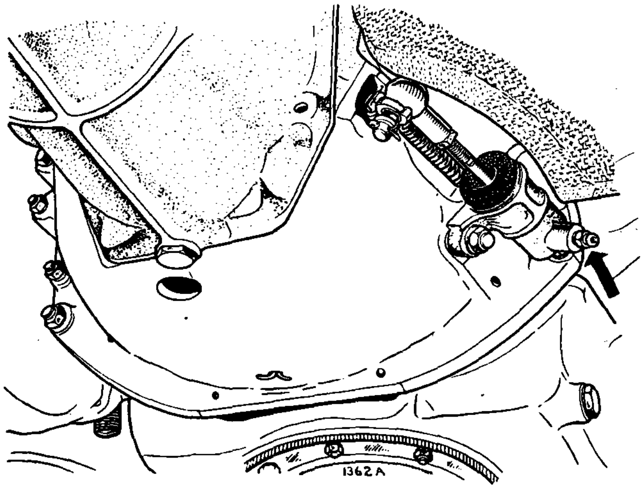


Fig. 4. Position of clutch bleed nipple.

BLEEDING THE SYSTEM

" Bleeding " the clutch hydraulic system (expelling air) is not a routine maintenance operation and should only be necessary when a portion of the hydraulic system has been disconnected or if the level of the fluid in the reservoir has been allowed to fall. The presence of air in the hydraulic system may result in difficulty in engaging gear owing to the clutch not disengaging fully.

The procedure is as follows :—

Fill up the master cylinder reservoir with brake fluid exercising great care to prevent the entry of dirt. Attach a rubber bleed tube to the nipple on the slave cylinder on the right-hand side of the clutch housing and allow the tube to hang in a clean glass jar partly filled with brake fluid. Unscrew the nipple one complete turn. Depress the clutch pedal slowly, **tighten the bleeder nipple before the pedal reaches the end of its travel** and allow the pedal to return unassisted.

Repeat the above procedure, closing the bleed nipple at each stroke, until the fluid issuing from the tube is entirely free of air, care being taken that the reservoir is replenished **frequently** during this operation, for should the level be allowed to drop below half-way air will enter the system.

On completion, top up the master cylinder reservoir to the bottom of the filler neck.

Do not on any account use the fluid which has been bled through the system to replenish the reservoir as it will have become aerated. Always use fresh fluid straight from the tin.

FLUSHING THE SYSTEM

Should the fluid in the system become thick or " gummy " after many years in service, or after a vehicle has been laid up for some considerable time, the system should be drained, flushed and re-filled. It is recommended that this should be carried out once every five years.

Pump all fluid out of the hydraulic system through the bleeder screw of the clutch slave cylinder. To the bleeder screw on the slave cylinder connect one end of a rubber tube, and allow the other end to fall into a container, slacken the screw one complete turn and pump the clutch pedal by depressing it quickly and allowing it to return without assistance ; repeat, with a pause in between each operation, until no more fluid is expelled. Discard the fluid extracted. When the pedal is being pumped the bleeder screw must be tightened before it reaches the end of its stroke.

Fill the supply tank with industrial methylated spirit and flush the system as described above. Keep the supply tank replenished until at least a quart of spirit has passed through the bleeder screw.

Remove the master cylinder and pour off any remaining spirit. Refit the master cylinder, re-fill with clean brake fluid and " bleed " the system.

NOTE: If the system has been contaminated by the use of mineral oil, etc., the above process will not prove effective. It is recommended that the various units, including the pipe lines, be dismantled and thoroughly cleaned and that all rubber parts, including flexible hoses, be renewed. The contaminated fluid should be destroyed immediately.

REMOVAL AND REFITTING A FLEXIBLE HOSE

In some cases, the cause of faulty clutch may be traced to a choked flexible hose. Do not attempt to clear the obstruction by any means except air pressure, otherwise the hose may be damaged. If the obstruction cannot be cleared the hose must be replaced by a new one.

Removal

To renew a flexible hose, adopt the following procedure :—

Unscrew the tube nut from the hose union, then unscrew the locknut and withdraw the hose from the bracket. Disconnect the hose at the other end.

Refitting

When re-fitting a hose, first ensure that it is not twisted or " kinked " (this is MOST IMPORTANT) then pass the hose union through the bracket and, whilst holding the union with a spanner to prevent the hose from turning, fit the locknut and the shakeproof washer ; connect up the pipe by screwing on the tube-nut.

THE MASTER CYLINDER

The master cylinder consists mainly of a tank and barrel assembly (3 Fig. 5), the former surrounds the latter and is secured by soldering ; at one end of the barrel a fixing flange is mounted, and this is secured in the same manner. The tank is fitted with a filler cap (1) which incorporates a baffle and screws down against a seal (2). A piston (8) is contained within the barrel, and has a rubber main cup (10) spring loaded against its inner end ; between the cup and the piston a thin washer (9) is interposed to prevent the cup from being drawn into the small feed holes drilled around the piston head. The outer end of the piston carries a rubber secondary cup (7) and is formed with a depression to receive the spherical end of a push rod (6) which carries a piston stop and is retained by a circlip (5). A rubber boot (4), through which the push rod passes, is fitted on to the barrel to prevent the intrusion of dirt and moisture.

At the end opposite to the push rod, an end plug (14) screws down against a gasket (13) and forms the outlet connection.

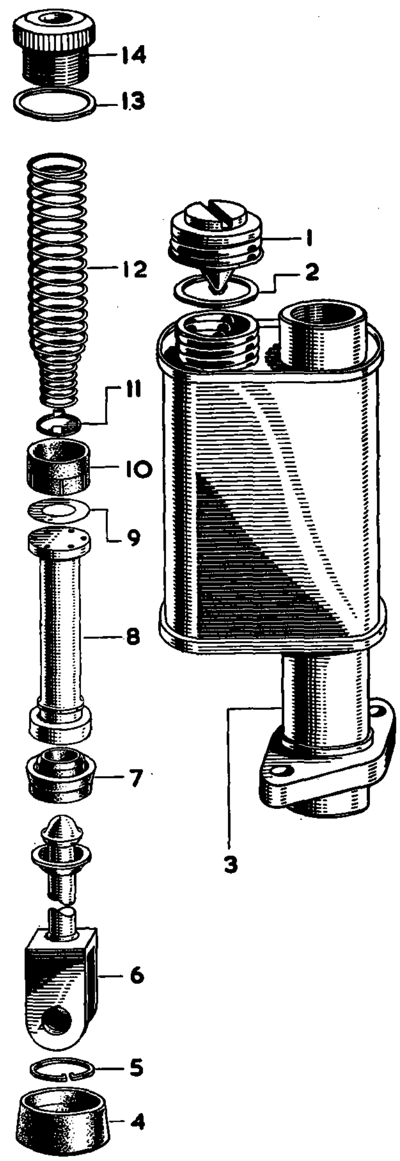


Fig. 5. Exploded view of the master cylinder

Principle of Operation

Depressing the clutch pedal causes the push rod to thrust the piston along the bore of the barrel, and the fluid thus displaced passes to the slave cylinder. Upon removal of the load from the clutch pedal, the return spring thrusts the piston back against its stop faster than fluid is able to return from the slave cylinder ; this creates a depression in the master cylinder which draws the edge of the main cup away from the head of the piston and allows fluid from the tank to flow through the feed holes thus uncovered to make up the temporary deficiency. Meanwhile fluid returning from the slave cylinder, under load from the operating fork return spring re-enters the master cylinder.

When the piston is fully back against its stop, the main cup uncovers a small by-pass port in the barrel, and this allows the release of excess fluid to the tank, thus permitting the operating fork to return to the " fully engaged " position ; the by-pass port also compensates for contraction or expansion of the fluid, due to changes in temperature, allowing fluid to be drawn into or escape from the system. Should this port become blocked, the excess fluid would be unable to escape and the clutch would consequently slip.

Removal

Disconnect the outlet pipe from the end of the master cylinder, detach the push rod fork end from the clutch pedal, unscrew the fixing bolts and detach the master cylinder from the vehicle. Remove the filler cap (1 Fig. 5), drain the fluid into a clean container, and replace the cap.

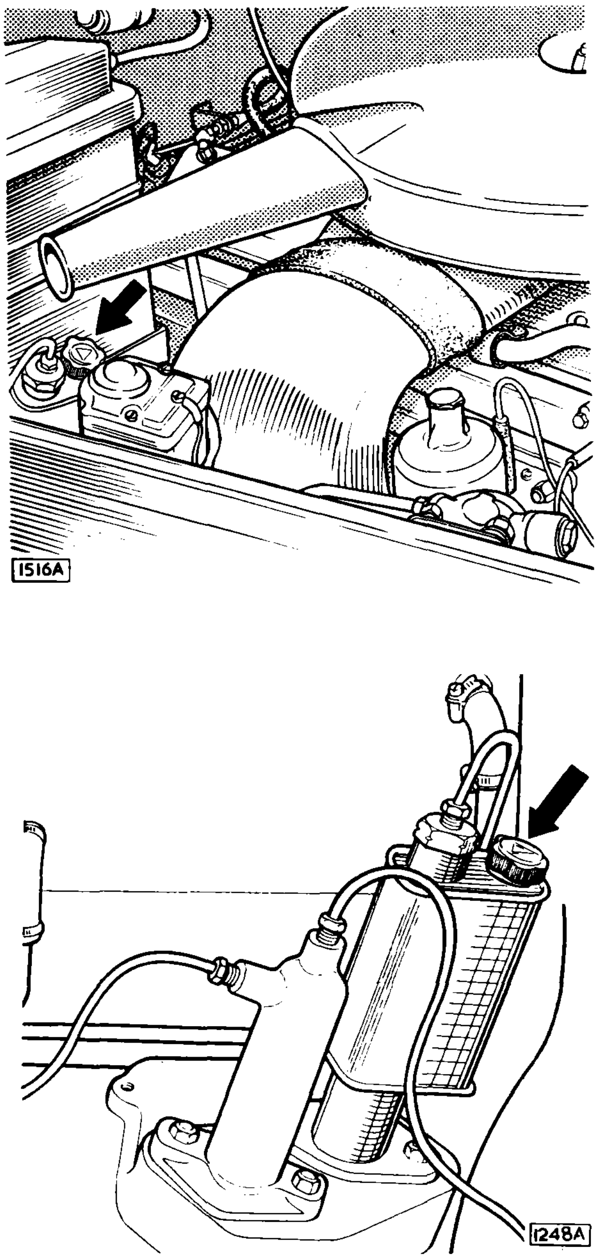


Fig. 6. Location of fluid reservoir (right and left hand drive).

Dismantling

(1) Detach the rubber boot (4) from the end of the barrel, and move the boot along the push rod. Depress the push rod to relieve the spring load from the circlip (5), remove the circlip and withdraw the push rod, the piston (8), the piston washer (9), the main cup (10) and the spring (12). The end plug (14) should not normally need to be removed from the barrel.

(2) Remove the secondary cup (7) by stretching it over the end of the piston.

Assembling

(1) If previously removed, fit the end plug (14) and a new gasket (13).

(2) Fit the spring retainer (11) on to the small end of the spring ; if the retainer is new the ears are to be bent over to secure it on the spring.

(3) Insert the spring, large end leading, into the barrel. Follow up with the main cup (10), lip leading, taking care not to turn back or buckle the lip.

(4) Insert the piston washer (9) so that the curved edge is towards the cup.

(5) Using the fingers only, stretch the secondary cup (7) on to the piston, with the small end towards the head, (that is, the drilled end) and with the groove engaging the ridge ; gently work round the cup, with the fingers, to ensure correct bedding.

(6) Insert the piston into the barrel, with the head uppermost.

(7) If previously removed, stretch the rubber boot (4) on to the push rod, with the open end of the boot towards the spherical end of the push rod.

(8) Offer up the push rod to the barrel, push inwards and secure the piston stop, which is on the push rod, by fitting the circlip (5) at the end of the bore ; it is MOST IMPORTANT that the circlip be correctly fitted in its groove. Stretch the large end of the boot on to the end of the barrel and into its correct position.

(9) Fill the tank with clean brake fluid to within half an inch of the filler cap orifice, and refit the filler cap (1) together with the seal (2) ; ensure that the filler cap is securely tightened, using a coin. With the master cylinder upright, filler cap at the top, test by pushing the push rod and piston further into the bore and allowing it to return unassisted ; after one or two applications fluid should flow from the outlet connection.

Refitting

Secure the master cylinder to the vehicle by fitting the fixing bolts through the flange. Connect the pipe to the outlet connection, the push rod to the pedal, and bleed the system. Check for leaks by depressing the clutch pedal once or twice and examining all hydraulic connections.

THE SLAVE CYLINDER

The clutch slave cylinder consists of a body (4 Fig. 7) which incorporates two threaded connections and is bored to accommodate a piston (5) against the inner face of which a rubber cup (3) is loaded by a cup filler (2) and a spring (1) ; the travel of the piston is limited by a circlip (6) fitted in a groove at the end of the bore. A rubber boot (7) through which a push-rod passes, is fitted on to the body to prevent the intrusion of dirt or moisture.

One of the connections in the body receives a pipe from the clutch master cylinder, whilst the other is fitted with a bleeder screw ; the connection for the pipe is parallel to the mounting flange on the body.

Removal

To remove from the vehicle, disconnect the pipe, detach the rubber boot from the body and remove the fixing screws ; leave the push-rod attached to the vehicle. If the boot is not being renewed it may be left on the push-rod.

Dismantling

Remove the circlip (6) from the end of the bore and apply a low air pressure to the open connection to expel the piston (5) and the other parts ; remove the bleeder screw.

Assembling

Prior to assembly, smear all internal parts and the bore of the body with Rubberlube.

Fit the spring (1) in the cup filler (2) and insert these parts, spring uppermost, into the bore of the body (4). Follow up with the cup (3), lip leading, taking care not to turn back or buckle the lip ; then insert the piston (5), flat face innermost, and fit the circlip (6) into the groove at the end of the bore.

Refitting

Fit the rubber boot (7) on the push-rod, if removed previously, and offer up the slave cylinder to the vehicle, with the push-rod entering the bore. Secure the cylinder with the fixing screws and stretch the large end of the boot into the groove on the body. Fit into their respective connections the bleeder screw and the pipe from the clutch master cylinder.

" Bleed " the clutch as described on page 7.

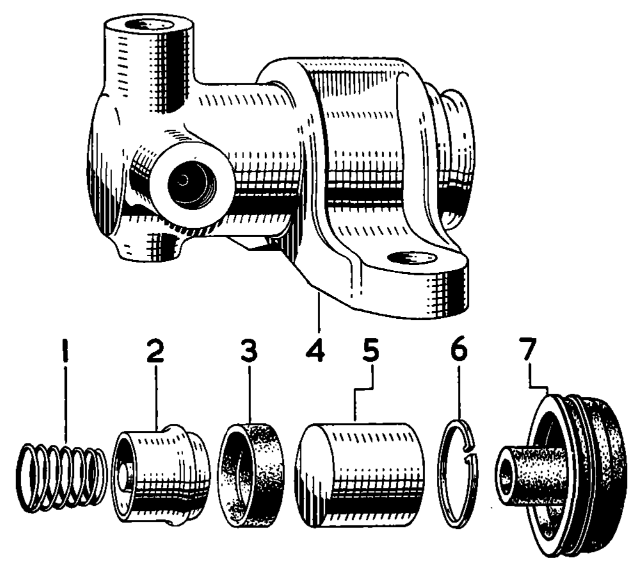


Fig. 7. Exploded view of clutch slave cylinder.

Refitting Hydrostatic Slave Cylinder

When refitting the hydrostatic clutch slave cylinder it is IMPORTANT that the operating rod adjustment dimension as shown in Fig. 8 is adhered to.

To obtain this dimension, proceed as follows :—

(1) Extract the clevis pin securing the operating rod to the clutch lever.

(2) Release the fork end locknut.

(3) Push the clutch operating lever away from the slave cylinder until resistance is felt and retain in this position.

(4) Push the operating rod to the limit of its travel into the slave cylinder and adjust the fork end to a dimension of .75" (19 mm.) between the centre of the fork end and the centre of the clutch operating lever. Tighten the locknut.

(5) Release the operating rod and connect the fork end to the lever. Refit the clevis pin.

(6) Bleed the clutch slave cylinder in the normal manner.

NOTE: This slave cylinder can be identified by the absence of the return spring which was fitted to the previous slave cylinder body.

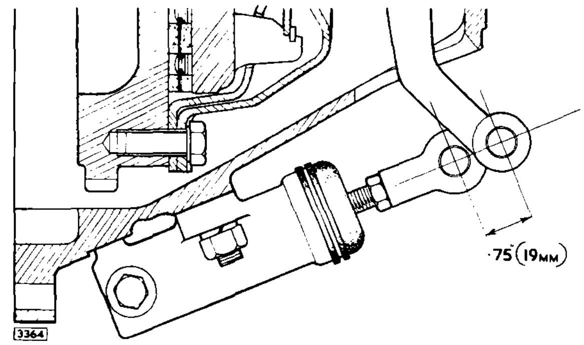


Fig. 8. Setting dimensions for refitting hydrostatic slave cylinder.

THE CLUTCH UNIT

The driven plate assembly (14, Fig. 9) is of the flexible centre type, in which a splined hub is indirectly attached to a disc and transmits the power and overrun through a number of coil springs held in position by shrouds.

The cover assembly consists of a pressed steel cover (1) and a cast iron pressure plate (3) loaded by thrust springs (2) the number of which vary with the model. Mounted on the pressure plate are release levers (4), which pivot on floating pins (9), retained by eye bolts (8). Adjustment nuts (10) are screwed on to the eye bolts and secured by staking. Struts (7) are interposed between lugs on the pressure plate and the outer end of the release levers. Anti-rattle springs (11) restrain the release levers and retainer springs (6) connect the release lever plate (5) to the levers.

The graphite release bearing (12) is shrunk into a bearing cup which is mounted on the throw-out forks and held by the release bearing retainer springs (13).

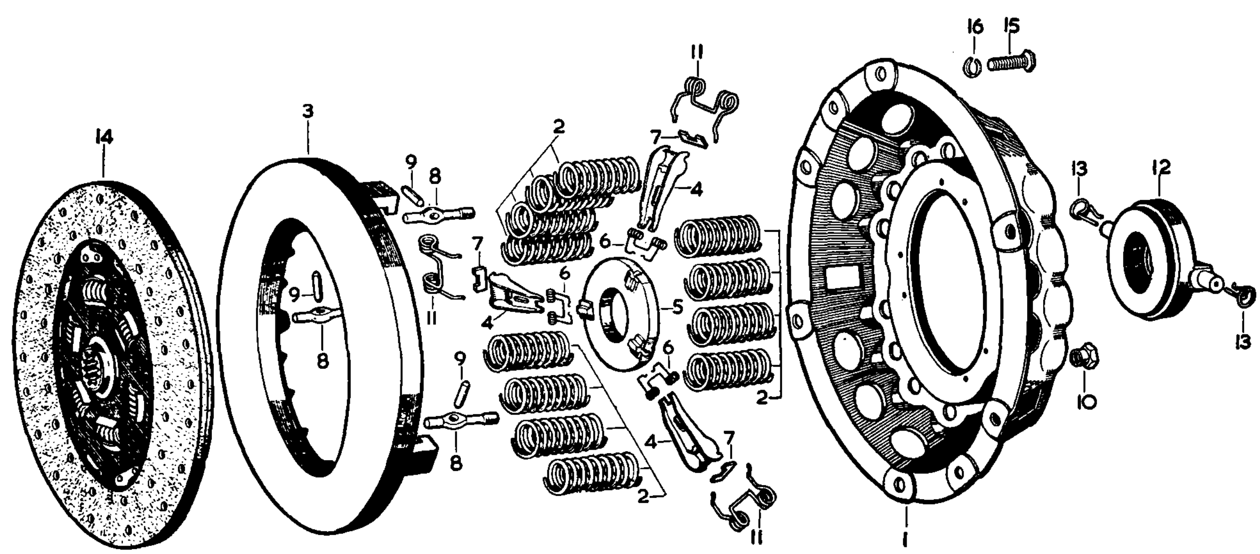


Fig. 9. Exploded view of clutch assembly.

1. Cover
2. Thrust spring
3. Pressure plate
4. Release lever
5. Release lever plate
6. Release lever retainer
7. Release lever strut
8. Release lever eyebolt
9. Eyebolt pin
10. Adjustment nut
11. Anti-rattle spring
12. Release bearing and cup assembly
13. Release bearing retainer
14. Driven plate assembly
15. Securing bolt
16. Spring washer

GENERAL INSTRUCTIONS

When overhauling the clutch the following instructions should be noted and carried out :—

Clutch Cover Assembly

Before dismantling the clutch, suitably mark the following parts so that they can be re-assembled in the same relative positions to each other to preserve the balance and adjustment ; clutch cover, lugs on the pressure plate and the release levers.

When re-assembling make sure that the markings coincide and, if new parts have been fitted which would affect the adjustment, carefully set the release levers (see page 14).

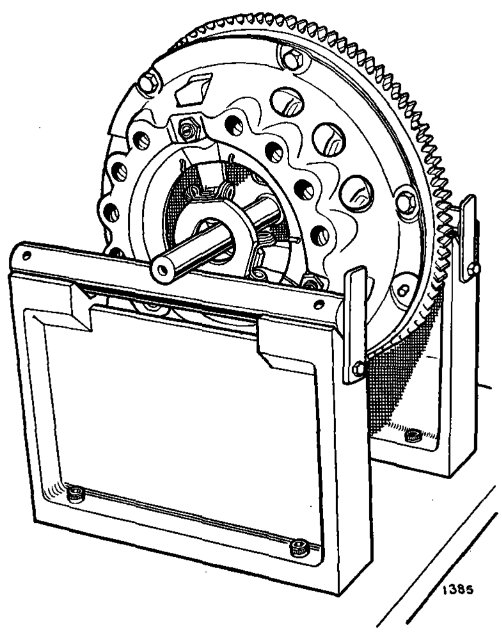


Fig. 10 Clutch and flywheel balance.

If a new pressure plate has been fitted, it is essential that the complete cover assembly should be re-balanced, for which reason it is not a practical proposition where special equipment is not available.

Before assembly, thoroughly clean all parts and renew those which show appreciable wear. A very slight smear of grease such as Lockheed Expander Lubricant or Duckham's Keenol K.O.12 should be applied to the release lever pins, contact faces of the struts, eyebolt seats in the clutch cover, drive lug sides on the pressure plate and the plain end of the eyebolts.

Release Bearing

If the graphite release bearing ring is badly worn it should be replaced by a complete bearing assembly.

CONDITION OF CLUTCH FACINGS

The possibility of further use of the friction facings of the clutch is sometimes raised, because they have a polished appearance after considerable service. It is natural to assume that a rough surface will give a higher frictional value against slipping, but this is not correct.

Since the introduction of non-metallic facings of the moulded asbestos type, in service, a polished surface is a common experience, but it must not be confused with a glazed surface which is sometimes encountered due to conditions discussed below.

The ideal smooth or polished condition will provide a normal contact, but a glazed surface may be due to a film or a condition introduced, which entirely alters the frictional value of the facings. These two conditions might be simply illustrated by the comparison between a polished wood, and a varnished surface. In the former the contact is still made by the original material, whereas in the latter instance, a film of dried varnish is interposed between the contact surfaces.

The following notes are issued with a view to giving useful information on this subject :—

(*a*) After the clutch has been in use for some little time, under perfect conditions (that is, with the clutch facings working on true and polished or ground surfaces of correct material, without the presence of oil, and with only that amount of slip which the clutch provides for under normal conditions) then the surface of the facings assumes a high polish, through which the grain of the material can be clearly seen. This polished facing is of mid-brown colour and is then in a perfect condition.

(*b*) Should oil in small quantities gain access to the clutch in such a manner as to come in contact with the facings it will burn off, due to the heat generated by slip which occurs under normal starting conditions. The burning off of this small amount of lubricant, has the effect of gradually darkening the facings, but, provided the polish on the facings remains such that the grain of the material can be clearly distinguished, it has very little effect on clutch performance.

(*c*) Should increased quantities of oil or grease obtain access to the facings, one or two conditions, or a combination of the two, may arise, depending upon the nature of oil, etc.

(1) The oil may burn off and leave on the surface facings a carbon deposit which assumes a high glaze and causes slip. This is a very definite, though very thin deposit, and in general it hides the grain of the material.

(2) The oil may partially burn and leave a resinous deposit on the facings, which frequently produces a fierce clutch, and may also cause a " spinning " clutch due to a tendency of the facings to adhere to the flywheel or pressure plate face.

(3) There may be a combination of (1) and (2) conditions, which is likely to produce a judder during clutch engagement.

(*d*) Still greater quantities of oil produce a black soaked appearance of the facings, and the effect may be slip, fierceness, or judder in engagement, etc., according to the conditions. If the conditions under (*c*) or (*d*) are experienced, the clutch driven plate should be replaced by one fitted with new facings, the cause of the presence of the oil removed and the clutch and flywheel face thoroughly cleaned.

ALIGNMENT

Faulty alignment will cause excessive wear of the splines in the hub of the driven plate, and eventually fracture the steel disc around the hub centre as a result of " swash action " produced by axial movement of the splined shaft.

PEDAL ADJUSTMENT (not hydrostatic clutch)

This adjustment is most important and the instructions given should be carefully followed ; faulty adjustment falls under two headings :—

(*a*) Insufficient free (or unloaded) pedal travel may cause a partly slipping clutch condition which becomes aggravated as additional wear takes place on the facings, and this can result in a slipping clutch leading to burning out unless corrected. Over-travel of effective pedal movement only imposes undue internal strain and causes excessive bearing wear.

(*b*) Too much free pedal movement results in inadequate release movement of the bearing and may produce a spinning plate condition that is, dragging clutch rendering clean changes impossible.

REMOVAL

To remove the clutch, the engine and gearbox must first be removed (refer to Section B).

Slacken the clutch mounting screws a turn at a time by diagonal selection until the thrust spring pressure is released. Remove the set screws and withdraw the complete clutch assembly from the flywheel. Remove the driven plate assembly and take care to maintain the driven plate faces in a clean condition. Observe that the clutch and flywheel are balanced as an assembly. This location is indicated by balance marks ' B ' stamped on the clutch and flywheel (Fig. 21).

DISMANTLING

Before dismantling, mark all the major components.

To dismantle the clutch, either bolt the assembly to the baseplate of the Churchill fixture, to a spare flywheel, or place the clutch on the bed of a press with blocks under the pressure plate in such a manner that the cover is free to move downwards when pressure is applied.

Having compressed the clutch in one of these various ways, unscrew the nuts (Fig. 11), (considerable torque is initially necessary in order to break off the squeezed-in portion of each nut), and slowly release the clamping pressure. Lift the cover and the thrust springs off the pressure plate and remove the release lever mechanism. Fig. 12 shows the method whereby the strut is disengaged from the lever, after which the threaded end of the eye-bolt and the inner end of the lever are held as close together as possible to enable the shank of the eye-bolt to clear the hole in the pressure plate.

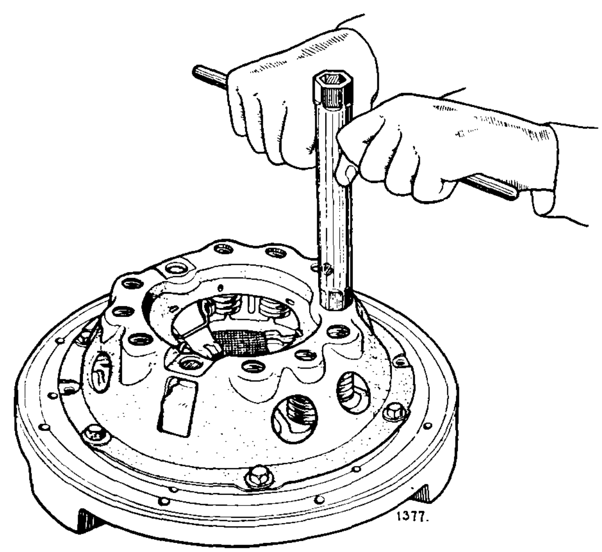


Fig. 11. Removal of the adjustment nuts.

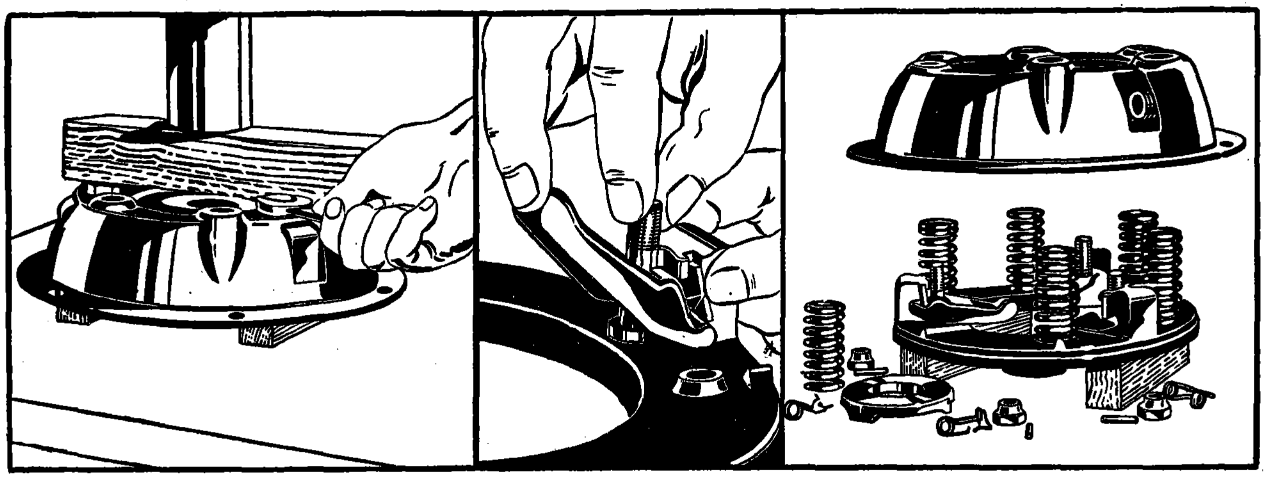


Fig. 12. Dismantling clutch assembly using ram press.

ASSEMBLING

It is essential that all major components be returned to their original positions if the balance of the assembly is to be preserved.

Fit a pin (9, Fig. 9) into an eyebolt (8) and locate the parts within a release lever (4). Hold the threaded end of the eyebolt and the inner end of the lever as close together as possible and, with the other hand, engage the strut (7) within the slots in a lug on the pressure plate, with the other end of the strut push outwards towards the periphery of the plate. Offer up the lever assembly, first engaging the eyebolt shank within the hole in the plate, then locate the strut within the groove in the lever. Fit the remaining levers in the same way, not forgetting to lubricate all contact faces.

Place the pressure plate on the baseplate of the Churchill fixture, on a spare flywheel, or on blocks on the bed of a press and position the thrust springs (2) on the bosses of the plate. Note particularly, that when all of the springs are not painted the same colour, they must be arranged in a symmetrical manner. Having arranged all the springs, and after ensuring that the anti-rattle springs (11) are fixed within the cover, rest the cover on the springs, carefully aligning the pressure plate lugs with the cover slots. If the Churchill fixture or a spare flywheel is being used, move the clutch to align the holes in the cover flange with the tapped holes in the flywheel or baseplate and then clamp the cover down with the fixing screws, turning them a little at a time to avoid distortion. If a press is being used, arrange a block across the cover and compress the assembly. Then screw the adjusting nuts (10) into an approximately correct position.

The release levers must now be set to the correct height, adopting any of the three methods described below after which the adjusting nuts should be locked by punching them into the eyebolt slots. After setting the levers, fit the release lever plate.

ADJUSTING THE RELEASE LEVERS

To ensure satisfactory operation, correct adjustment of the release levers is essential. In service, the original adjustment made by the makers never needs attention and re-adjustment is only necessary if the clutch has been dismantled.

To facilitate the adjustment of the levers Messrs. Borg & Beck produce a series of gauge plates, of which the one shown in Fig. 13 is typical. Numerous gauge plates exist to cover most sizes of clutch, together with the various thicknesses of driven plate which may be employed (see chart on page 18).

An alternative method of lever adjustment is to use the universal fixture known as the No. 99 manufactured by V. L. Churchill & Co. Ltd., which caters for the $6\frac{1}{4}''$—$11''$ clutch.

Finally, where neither a gauge plate nor Churchill tool is available the levers may be set using the actual driven plate as a gauge and these three methods are described below.

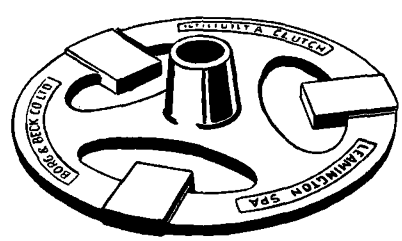


Fig. 13. The gauge plate.

(1) Using a Borg & Beck gauge plate (Fig. 14)

(*a*) Mount the clutch on the actual or a spare flywheel (1, Fig. 14) or alternatively clamp it down to a flat surface, with the gauge plate (4) occupying the position normally taken by the driven plate. The ground lands of the gauge plate should each be located under a release lever (5).

(*b*) Adjust the levers by turning the eyebolt nuts (6) until the levers are just in contact with a short straight edge resting upon the boss of the gauge plate.

(*c*) Having made a preliminary setting some attempt must be made to operate the clutch several times in order to settle the mechanism. Normally, this operation can be carried out in a drilling machine or light press having a suitable adaptor, arranged to bear upon the lever tips.

(*d*) Carry out a further check and re-adjust if necessary.

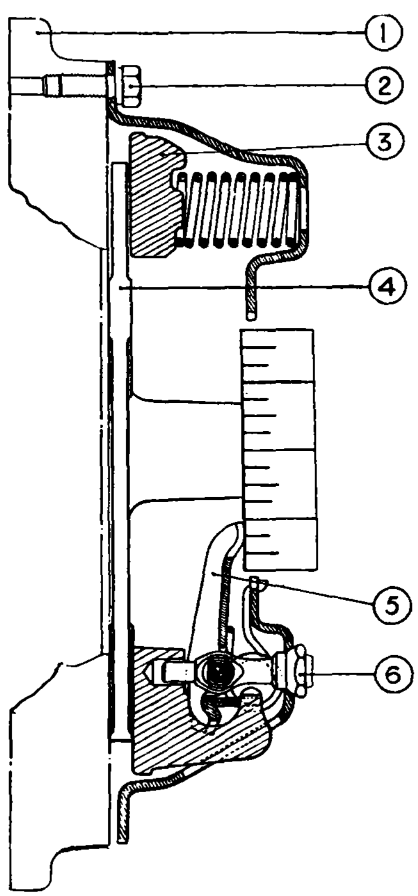


Fig. 14. Release lever adjustment.

(2) Using the Churchill Fixture

This tool, which is illustrated in Fig. 15 provides for the accurate adjustment of the levers; additionally, it affords a convenient fixture upon which to dismantle and assemble the unit. A device is included to operate the clutch and thereby to settle the working parts after assembly. To use the tool, adopt the following procedure, which also indicates the additional operations when dismantling and assembling the clutch.

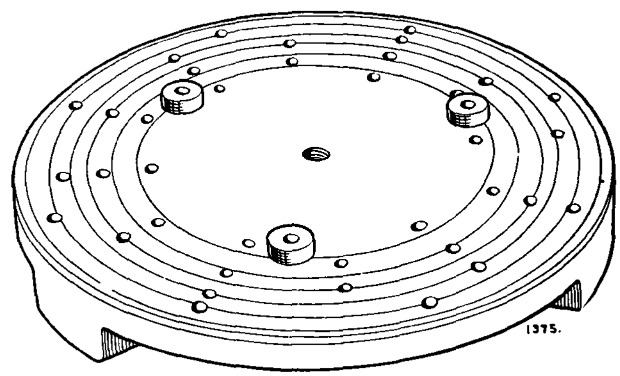


Fig. 15. The special base plate for clutch adjustment.

Remove from the box the gauge finger, the pillar and the actuator, as shown in Fig. 15 and consult the code card to determine the reference of the adaptor and the spacers appropriate to the clutch which is being serviced.

Rest the base plate on a flat surface, wipe it clean and place the spacers upon it in the positions quoted on the code card, as in Fig. 15. Place the clutch on the spacers, aligning it with the appropriate tapped holes in the base, arranging it so that the release levers are as close to the spacers as possible.

Screw the actuator into the centre hole in the base plate and press the handle down to clamp the clutch. Then screw the set bolts provided firmly into the tapped holes in the baseplate using a speed brace; remove the actuator.

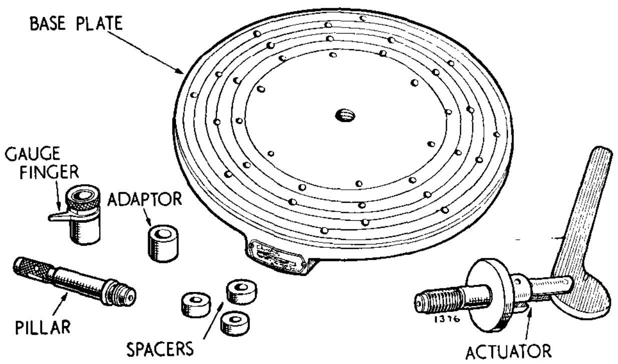


Fig. 16. The base plate and accessories.

Remove the adjusting nuts (Fig. 11) and gradually unscrew the set bolts to relieve the load of the thrust springs (Fig. 17). Lift the cover off the clutch and carry out whatever additional dismantling may be desired.

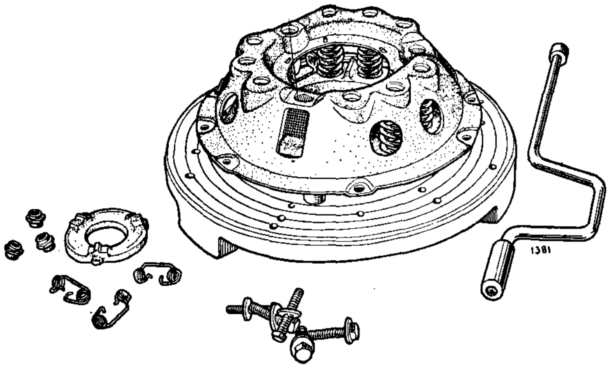


Fig. 17. Removing clutch cover assembly.

After carrying out the necessary servicing of the clutch components, re-assemble the parts on the clutch pressure plate, place the cover upon it and transfer the assembly to the base plate, resting on the spacers and aligned correctly.

Carefully bolt the cover to the base plate and screw the adjusting nuts on tc the eyebolts until flush with the tops of the latter. Screw the actuator into the base (Fig. 18) and pump the handle a dozen times to settle the clutch mechanism. Remove the actuator. Screw the pillar firmly into the base and place upon it the appropriate adaptor, recessed face downwards, and the gauge finger.

Turn the adjusting nuts until the finger just touches the release levers, pressing downwards on the finger assembly to ensure that it is bearing squarely on the adaptor (Fig. 19).

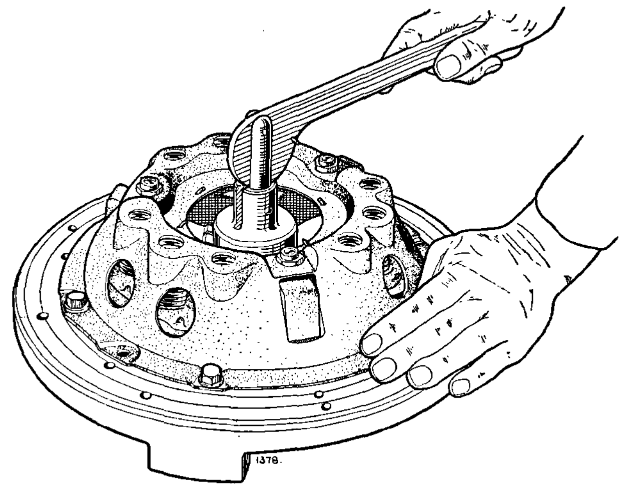


Fig. 18. Screwing actuator into base plate.

Remove the finger adaptor and pillar, replace the actuator and operate the clutch a further dozen times. Replace the pillar and check the lever setting, making any final correction.

Finally, lock the adjusting nuts. The cylindrical portion of the nut must be peened into the slot in the eyebolt, using a blunt chisel and hammer.

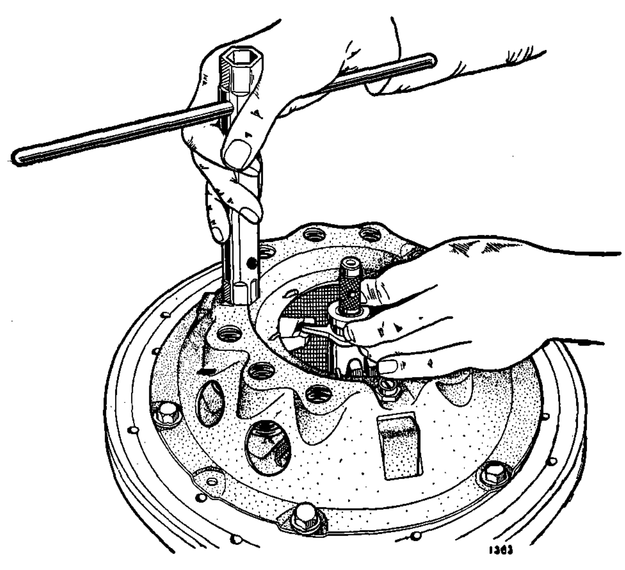


Fig. 19. Using finger assembly to adjust release levers.

(3) Using the Actual Driven Plate

This method of setting the levers is not highly accurate and should only be resorted to when neither a gauge plate nor Churchill Fixture is available. The drawback to this method lies in the fact that although the driven plate is produced to close limits, it is difficult to ensure absolute parallelism. Although the error in the plate is small, it is magnified some five-fold at the lever tip due to the lever ratio.

The method to be adopted is as follows :—

(*a*) Mount the clutch on the flywheel with the driven plate in its normal position or clamp the assembly to any flat surface having a hole within it to accommodate the boss of the driven plate.

(*b*) Consult the chart on page 18 to ascertain the height of the lever tip from the flywheel and adjust the levers until this dimension is achieved.

(*c*) Having made a preliminary setting slacken the clamping pressure, turn the driven plate through a right angle, re-clamp the cover and check the levers again as a safeguard against any lack of truth in the driven plate.

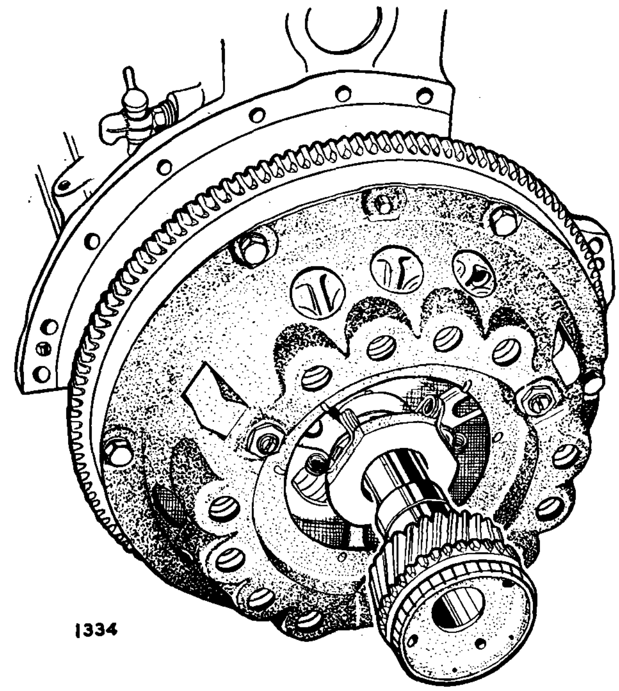


Fig. 20. Centralising driven plate.

REFITTING

Place the driven plate on the flywheel taking care that the larger part of the splined hub faces the gearbox. Centralise the plate on the flywheel by means of the dummy shaft (a constant pinion shaft may be used for this purpose, Fig. 20). Secure the cover assembly with the six setscrews and spring washers, tightening the screws a turn at a time by diagonal selection. Ensure that the 'B' stamped adjacent to one of the dowel holes coincides with the 'B' stamped on the periphery of the flywheel (Fig. 21). Do not remove the dummy shaft until all the setscrews are securely tightened, otherwise the driven plate will come off centre and difficulty will be met in engaging the constant pinion shaft into the bush in the rear end of the crankshaft.

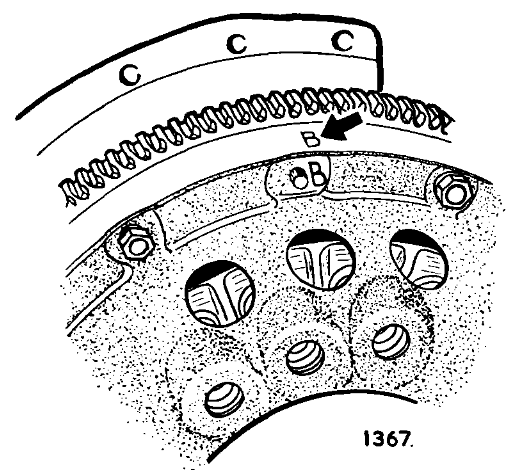


Fig. 21. Balance marks on the clutch and flywheel.

DATA FOR CLUTCH LEVER TIP SETTING

Clutch Model	Driven Plate	Gauge Plate Part No.	Lever tip height from flywheel face Dimension " A "	Gauge Plate Land Thickness Dimension " C "	Gauge Plate Dia.	Remarks
9″	Borglite	CG192	1.895″ (48.14 mm.)	0.330″ (8 381 mm.)	8.375″ (212.7 mm.)	Dimension "A" 2.40″ (60.95mm.) if taken with Release Lever Plate in position.
10″	Borglite	CG14322	1.955″ (49.65 mm.)	0.330″ (8.381 mm.)	8.375″ (212.7 mm.)	Dimension "A" 2.45″ (62.23mm.) if taken with Release Lever Plate in position.

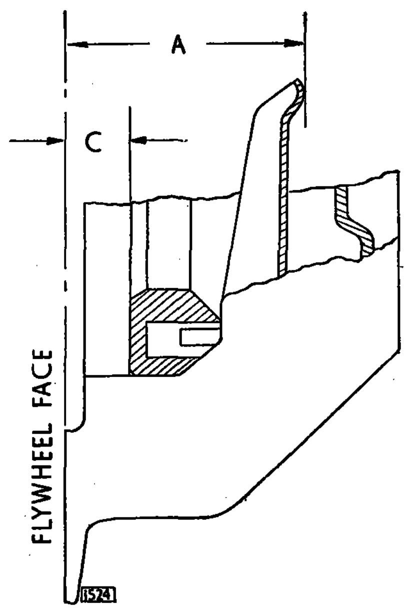


Fig. 22. Dimensions for clutch lever tip setting.

FAULT-FINDING

SYMPTOM	CAUSE	REMEDY
Drag or Spin	(a) Oil or grease on the driven plate facings	Fit new facings and oil seal
	(b) Misalignment between the engine and splined clutch shaft	Check over and correct the alignment
	(c) Air in clutch system	" Bleed " system
	(d) Bad external leak between the clutch master cylinder and the slave cylinder	Renew pipe and unions
	(e) Excessive clearance between the release bearing and the release lever plate	Adjust to $\frac{1}{16}''$ (1.58 mm.) clearance (Not applicable for cars fitted with hydrostatic slave cylinder)
	(f) Warped or damaged pressure plate or clutch cover	Renew defective part
	(g) Driven plate hub binding on splined shaft	Clean up splines and lubricate with small quantity of high melting point grease such as Duckham's Keenol
	(h) Distorted driven plate due to the weight of the gearbox being allowed to hang on clutch plate during assembly	Fit new driven plate assembly using a jack to take overhanging weight of the gearbox
	(i) Broken facings of driven plate	Fit new facings, or replace plate
	(j) Dirt or foreign matter in the clutch	Dismantle clutch from flywheel and clean the unit, see that all working parts are free CAUTION: Never use petrol or paraffin for cleaning out clutch
Fierceness or Snatch	(a) Oil or grease on driven plate facings	Fit new facings and ensure isolation of clutch from possible ingress of oil or grease
	(b) Misalignment	Check over and correct alignment
	(c) Worn out driven plate facings	New facings required
Slip	(a) Oil or grease on driven plate facings	Fit new facings and eliminate cause of foreign presence
	(b) Failure to adjust at clutch slave cylinder to compensate for loss of release bearing clearance consequent upon wear of the driven plate facings ($\frac{1}{16}''$ (1.58 mm.) clearance is necessary between the release bearing and the release lever plate)	Adjust push rod as necessary (Not applicable for cars fitted with hydrostatic slave cylinder)
	(c) Seized piston in clutch slave cylinder	Renew parts as necessary
	(d) Master cylinder by-pass port choked	Clear with bent wire not exceeding 0.018″ (0.46 mm.) diameter

FAULT-FINDING *(continued)*

SYMPTOM	CAUSE	REMEDY
Judder	(a) Oil, grease or foreign matter on driven plate facings	Fit new facings or driven plate and oil seal
	(b) Misalignment	Check over and correct alignment
	(c) Pressure plate out of parallel with flywheel face in excess of the permissible tolerance	Re-adjust levers in plane, and, if necessary, fit new eyebolts
	(d) Contact area of friction facings not evenly distributed. Note that friction facing surface will not show 100% contact until the clutch has been in use for some time, but the contact actually showing should be evenly distributed round the friction facings	This may be due to distortion, if so fit new driven plate assembly
	(e) Bent splined shaft or buckled driven plate	Fit new shaft or driven plate assembly
Rattle	(a) Damaged driven plate, broken springs, etc., (b) Worn parts in release mechanism (c) Excessive backlash in transmission (d) Wear in transmission bearings (e) Bent or worn splined shaft (f) Graphite release bearing loose on throw out fork	Fit new parts as necessary
Tick or Knock	Hub splines worn due to misalignment	Check and correct alignment then fit new driven plate
Fracture of Driven Plate	(a) Misalignment distorts the plate and causes it to break or tear round the hub or at segment necks	Check and correct alignment and introduce new driven plate
	(b) If the gearbox during assembly be allowed to hang with the shaft in the hub, the driven plate may be distorted, leading to drag, metal fatigue and breakage	Fit new driven plate assembly and ensure satisfactory re-assembly
Abnormal Facing Wear	Usually produced by overloading and by the excessive slip starting associated with overloading	In the hands of the operator

SUPPLEMENTARY INFORMATION
TO
SECTION E "CLUTCH"

DATA

Reference Page: E.5

Later 2.4 litre and 3.4 litre Mark 2 Models are fitted with different clutch springs which are denoted by the following colour code.

Models	New Springs
2.4 litre	9 black
3.4 litre	12 yellow/light green

Clutch assemblies with the new type springs are interchangeable with earlier types.

	Commencing Engine Numbers
3.4 Litre Mark 2 ..	KJ.8237
3.8 Litre Mark 2 ..	LE.2981

Commencing at the above engine numbers, all 3.4 and 3.8 litre Mark 2 models are fitted with a Borg and Beck diaphragm spring clutch.

The Borg and Beck diaphragm spring clutch is serviced in the U.K. ONLY by fitting an exchange unit which is available from Jaguar Cars Ltd., Spares Division, Coventry.

Individual parts are available from the same source for the repair of this clutch in Overseas Markets where exchange units may not be readily available. IT IS ESSENTIAL, when overhauling the diaphragm spring clutch, to rigidly observe the service instructions detailed below and particular attention is drawn to the necessary special tools required.

The diaphragm spring is riveted inside the cover pressing with two fulcrum rings interposed between the shoulders of the rivets and the cover pressing. The diaphragm spring also pivots on these two fulcrum rings. Depressing the clutch pedal actuates the release bearing causing a corresponding deflection of the diaphragm spring thus pulling the pressure plate from the driven plate and freeing the clutch.

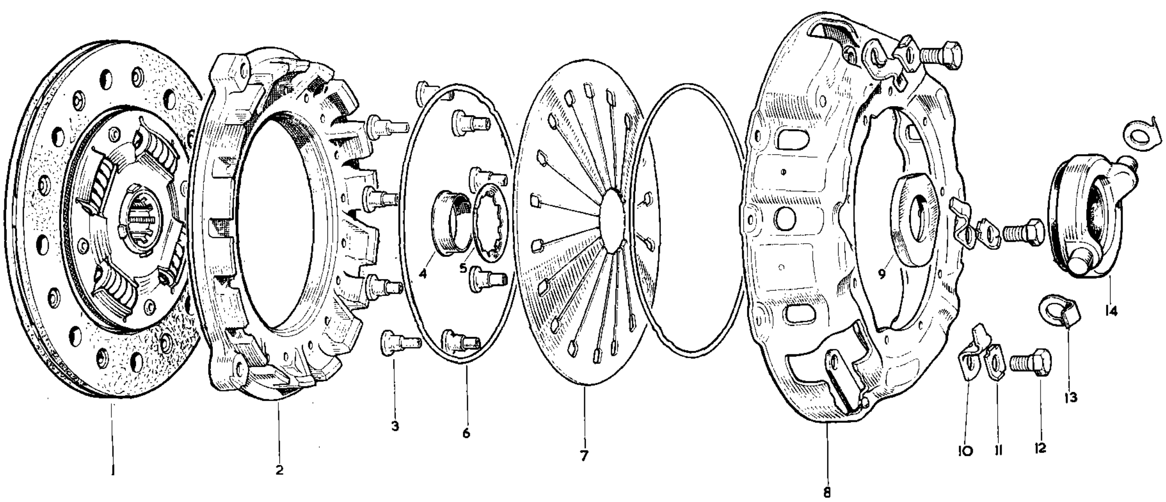


Fig. 23. Exploded view of the diaphragm spring clutch.

1. Driven Plate
2. Pressure plate
3. Rivet
4. Centre sleeve
5. Belleville washer
6. Fulcrum ring
7. Diaphragm spring
1. Cover Pressing
9. Release plate
10. Retainer
11. Tab washer
12. Setscrew
13. Retainer
14. Release bearing

DISMANTLING

Removing Release Plate

The centrally mounted release plate is held in position by a small centre sleeve which passes through the diaphragm spring and belleville washer into the release plate.

To free the plate, collapse the centre sleeve with a hammer and chisel. To avoid any possible damage whilst carrying out this operation, support the release plate in the locating boss of the special tool which should be held firmly in a vice.

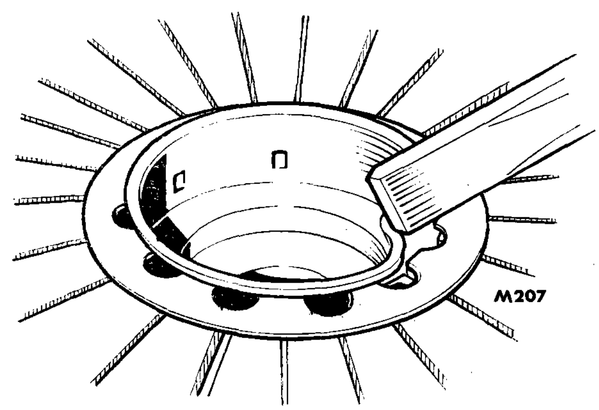


Fig. 24. Collapsing the centre sleeve with a hammer and chisel.

Separating the Pressure Plate from Cover Pressing

Knock back the locking tabs and remove the three setscrews securing the pressure plate to the straps riveted to the cover pressing. These straps within the cover pressing must NOT be detached as this is an assembly reduced to its minimum as a spare part.

Dismantling the Cover Assembly

Remove the rivets securing the diaphragm spring and fulcrum rings by machining the shank of the rivets using a spot face cutter.

IT IS ESSENTIAL that the thickness of the cover is not reduced in excess of .005" (.127 mm.) at any point.

The remaining portions of the rivets may be removed with a standard pin punch.

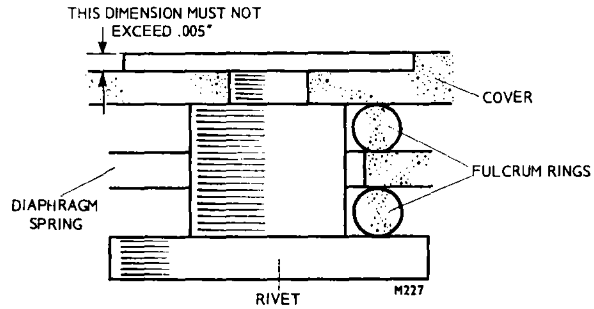


Fig. 25. Do not reduce the thickness of the cover pressing in excess of .005" (.127 mm.).

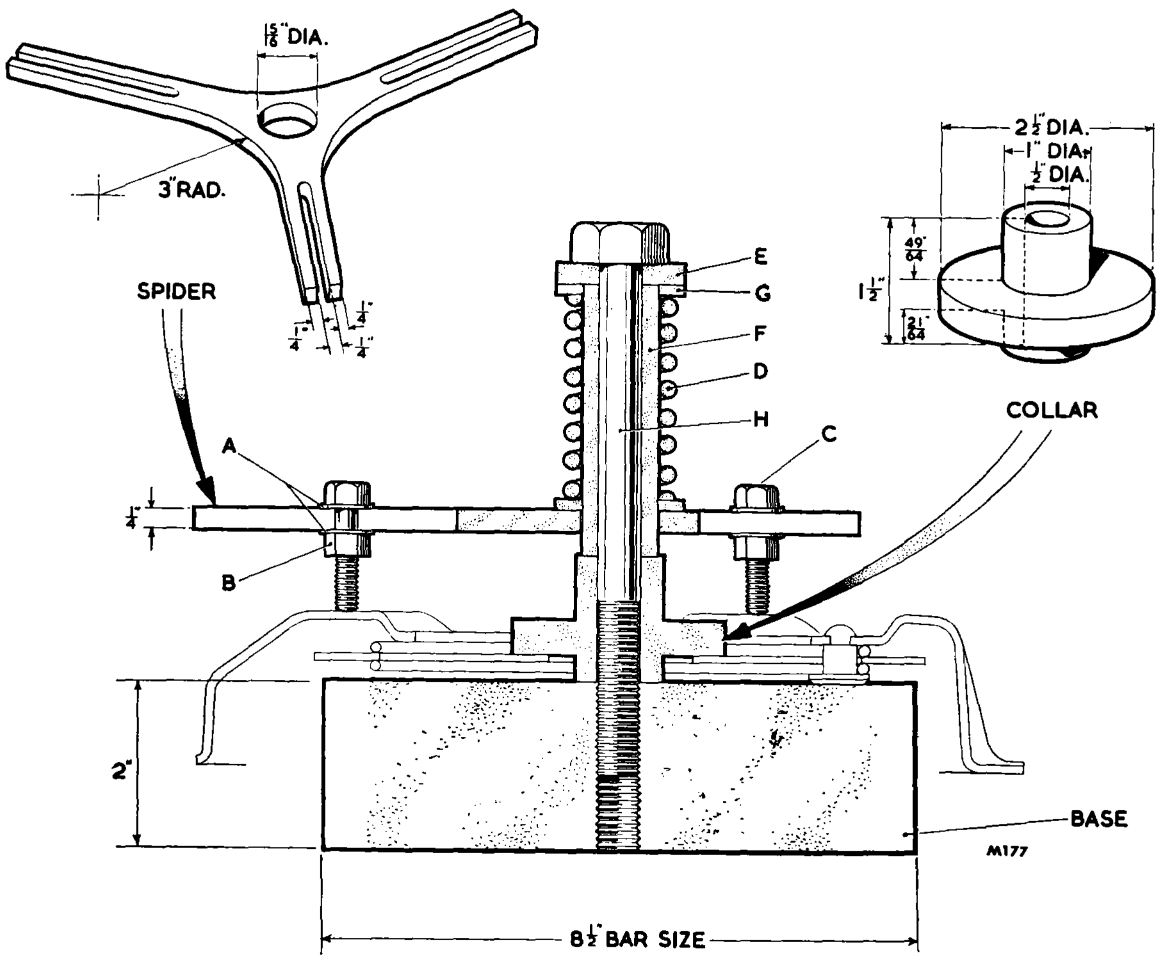


Fig. 26. Dimensions of special tool for compressing the diaphragm spring when riveting the spring to cover pressing.

Ref.	Qty.	Description
A	6	¼" Flat washer
B	3	¼" Nut
C	3	1¼" Diameter setscrew
D	1	Spring (Minimum load of 100 lbs. fitted length).
E	1	Washer ½" I.D. × 1½" O.D. × ¼" thick
F	1	Tube ½" I.D. × 3¼" long
G	2	Washer ⅞" I.D. × 1½" O.D. × ⅛" thick
H	1	Bolt ½" Whit. × 6" long

REBUILDING

The Cover Assembly

Prior to rebuilding, check the cover pressing for distortion. Bolt the cover firmly to a *flat* surface plate and check that a measurement taken from the cover flange to the machined land inside the cover pressing does not vary by more than .007″ (.2 mm.). If the measurement exceeds this figure the cover pressing must be replaced.

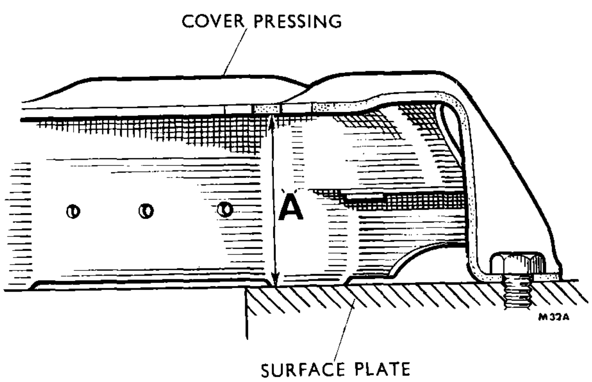


Fig. 27. The measurement "A" must not vary by more than .007″ (.2mm.).

To achieve a satisfactory result when riveting the diaphragm spring into the cover pressing, a special tool must be fabricated to the specifications given in Fig. 26.

All parts except the spring can be made from mild steel.

Position the fulcrum ring inside the cover pressing so that the location notches in the fulcrum ring engage a depression between two of the larger diameter holes in the cover pressing.

Place the diaphragm spring on the fulcrum ring inside the cover and line the long slots in the spring with the small holes in the cover pressing. Locate a further fulcrum ring on the diaphragm spring so that the location notches are diametrically opposite the location notches in the first ring. Fit new shouldered rivets ensuring that the shouldered portion of each seats on the machined land inside the cover.

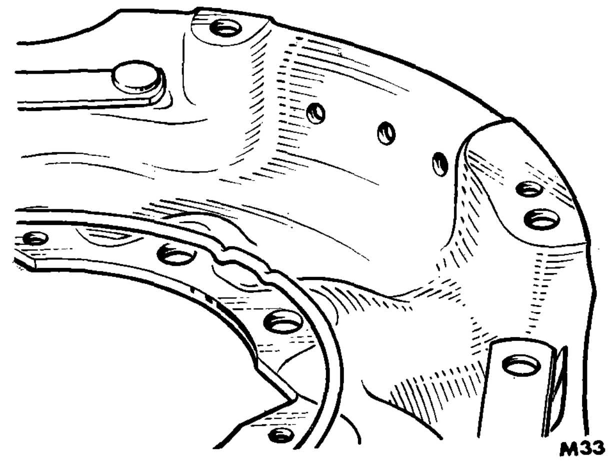


Fig. 28. Assembly of cover pressing and fulcrum ring.

Place the base of the special tool on to the rivet heads. Invert the clutch and base plate.

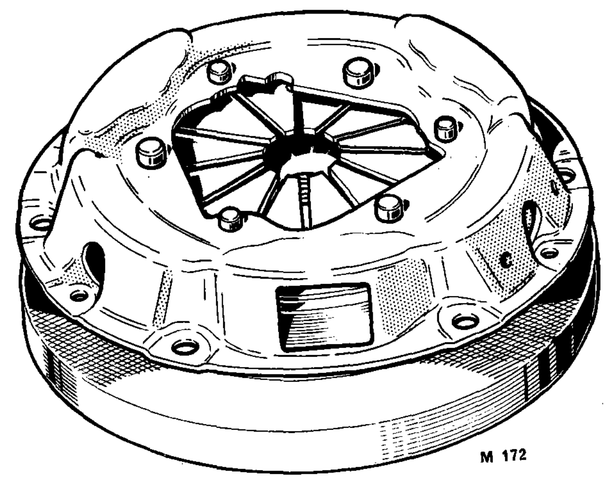


Fig. 29. Clutch and base plate inverted.

Fit the collar to the large bolt and fit the large bolt complete with spring, spider and collar into the tapped hole in the base. Position the three setscrews on the spider so that they contact the cover pressing. Tighten down the centre bolt until the diaphragm spring becomes flat and the cover pressing is held firmly by the setscrews.

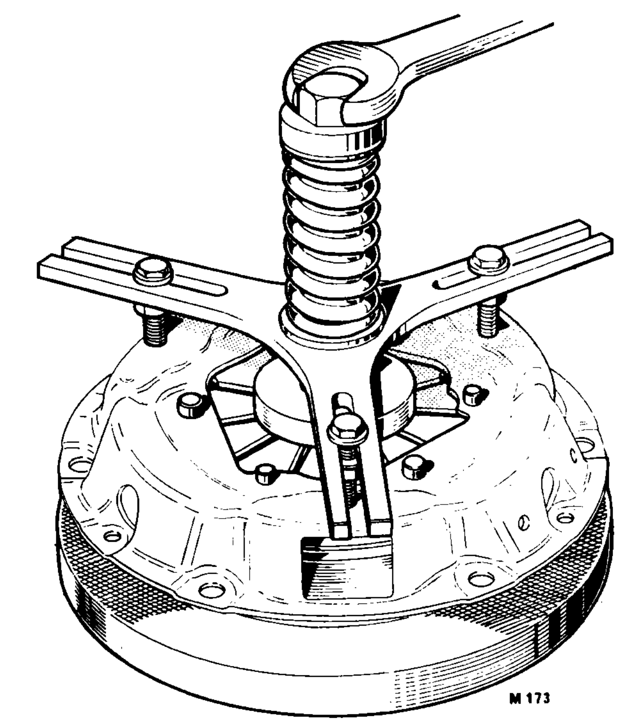


Fig. 30. Tighten down the large nut so that the diaphragm spring is compressed flat.

Rivet securely with a hand punch.

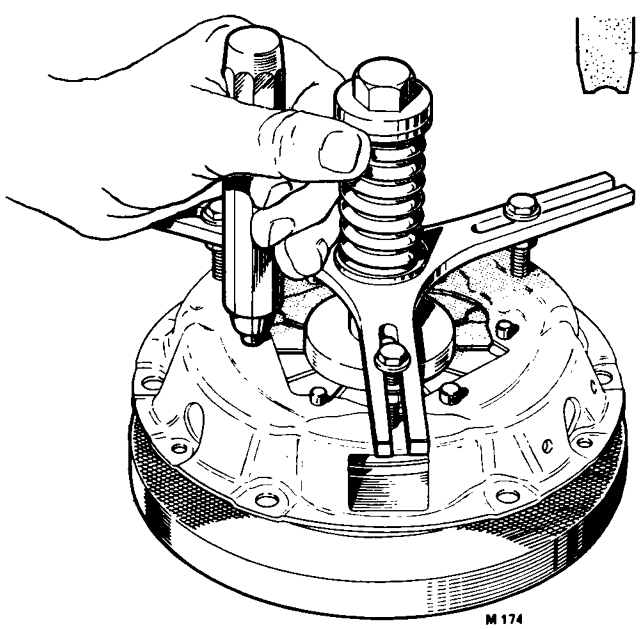


Fig. 31. Riveting with a hand punch.

Assembling the Pressure Plate to Cover Pressing

Before assembling the pressure plate to the cover pressing, examine the plate for any signs of wear. Should it have been damaged or have excessive scoring, it is strongly recommended that a new plate is fitted. If, however, renewal of the pressure plate is not possible, grinding of the original unit may be undertaken by a competent machinist bearing in mind that incorrect grinding of the plate may seriously affect the operation of the clutch. IN NO CIRCUMSTANCES MUST THE PRESSURE PLATE BE GROUND TO A THICKNESS OF LESS THAN 1.070" (27.178 mm.).

Position the pressure inside the cover assembly so that the lugs on the plate engage the slots in the cover pressing. Insert the three setscrews through the straps which are riveted to the cover pressing and lock with the tab washers.

Fitting a New Release Plate

A special tool (Part number SSC.805) is available from Automotive Products Ltd., Service & Spares Division, Banbury, England, for completion of this operation. Ensure that all parts of the clutch and special tool are clean.

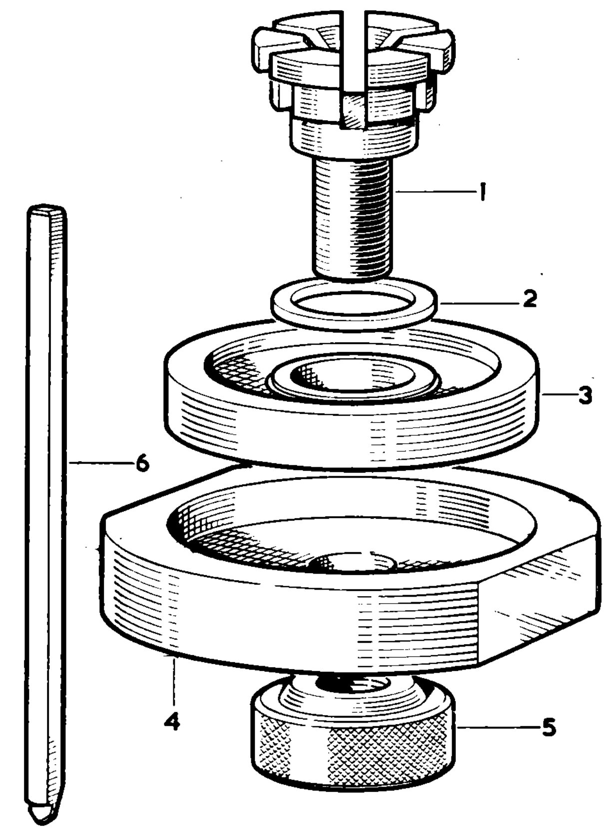


Fig. 32. Special tool (SSC805). 1. Staking guide. 2. Washer. 3. Locating boss. 4. Base plate. 5. Knurled nut. 6. Punch.

Grip the base of the tool in a vice and place the locating boss into the counterbore of the base plate. Place the release plate, face downwards, into the counterbore of the locating boss.

Apply a little high melting point grease to the tips of the diaphragm spring fingers and position the clutch, pressure plate friction face upwards, on to the release plate. Ensure that the diaphragm spring fingers locate between the small raised pips on the release plate.

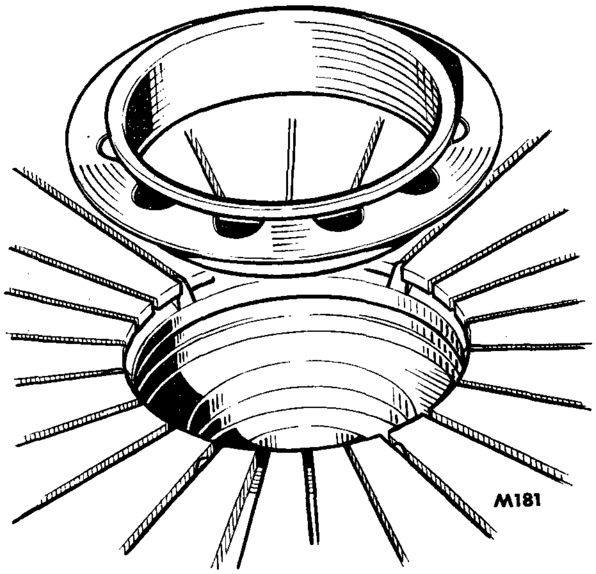


Fig. 33. Fitting the sleeve and belleville washer.

Place the belleville washer, concave surface towards the spring, on to the centre of the diaphragm spring and then push the centre sleeve through the spring into the release plate.

Drop the special washer into the sleeve and insert the staking guide into the centre of the assembly. Fit the knurled nut to the thread on the staking guide and tighten down until the whole assembly is solid. Using the special punch, stake the centre sleeve in six places into the groove in the release plate.

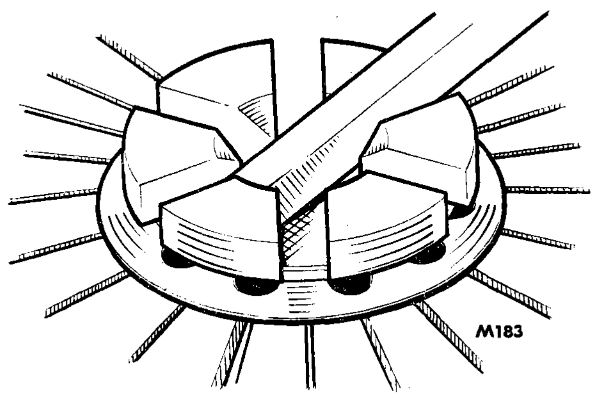


Fig. 34. Staking the sleeve to the release plate.

SECTION F

GEARBOX AND OVERDRIVE

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

INDEX *(continued)*

GEARBOX AND OVERDRIVE

The gearbox is of the four-speed type with synchromesh on the second, third and top gears ; these gears are of single helical form and are in constant mesh. The first and reverse gears have spur teeth which slide into mesh.

The overdrive (fitted as an optional extra) is of the Laycock de Normanville type and is dealt with separately at the end of this section.

GEARBOX

	Gearbox Ratios	Overall Ratios (Standard model)		Overall Ratios (Overdrive model)	
	All models	2.4 litre	3.4 and 3.8 litre	2.4 litre	3.4 and 3.8 litre
Gearbox prefix *	GB	GB	GB	GB	GB
Gearbox suffix	JS	JS	JS	JS	JS
First and reverse	3.377 : 1	14.419 : 1	11.954 : 1	15.365 : 1	12.731 : 1
Second	1.86 : 1	7.942 : 1	6.584 : 1	8.463 : 1	7.012 : 1
Third	1.283 : 1	5.478 : 1	4.541 : 1	5.837 : 1	4.836 : 1
Top	1 : 1	4.27 : 1	3.54 : 1	4.55 : 1	3.77 : 1
Overdrive	.778 : 1			3.539 : 1	2.933 : 1
Axle ratio		4.27 : 1	3.54 : 1	4.55 : 1	3.77 : 1

* The letter " N " at the end of the prefix letters " GB " indicates that a gearbox mainshaft suitable for the attachment of an overdrive is fitted.

Ordering Spare Parts

It is essential when ordering spare parts for an individual gearbox, to quote the prefix and suffix letters in addition to the gearbox number.

The gearbox number is stamped on a lug situated at the left-hand rear corner of the gearbox casing and on the top cover.

DATA

Second gear end-float on mainshaft—.002" to .004" (.05 to .10 mm.)
Third gear end-float on mainshaft—.002" to .004" (.05 to .10 mm.)
Layshaft end-float on countershaft—.002" to .004" (.05 to .10 mm.)

ROUTINE MAINTENANCE

EVERY 2,500 MILES (4,000 KM.)

Gearbox Oil Level

Check the level of the oil in the gearbox with the car standing on level ground.

A combined level and filler plug is fitted on the left-hand side of the gearbox. Clean off any dirt from around the plug before removing it.

The level of the oil should be to the bottom of the filler and level plug hole.

Overdrive Oil Level—Important

The oil for the lubrication and operation of the overdrive unit is fed from the gearbox casing and therefore checking the gearbox oil level will also check the level of the oil in the overdrive unit, but as this unit is hydraulically controlled, extra attention should be paid to exercising absolute cleanliness when replenishing with oil. It is also important that the oil level is not allowed to fall appreciably otherwise the operation of the overdrive may be affected.

EVERY 10,000 MILES (16,000 KM.)

Changing the Gearbox Oil

The draining of the gearbox should be carried out at the end of a run when the oil is hot and therefore will flow more freely. The drain plug is situated at the front end of the gearbox casing.

After all the oil has drained replace the drain plug and refill the gearbox with the recommended grade of oil through the combined filler and level plug hole situated on the left-hand side of the gearbox casing; the level should be to the bottom of the hole.

Overdrive—Oil Changing

The oil for the overdrive unit is common with that in the gearbox but draining the gearbox casing will not drain the oil from the overdrive unit. A large brass drain plug is provided in the base of the overdrive unit and when draining the gearbox this plug should also be removed utilizing the Churchill tool No. J.3.

Whilst this drain plug is removed the overdrive oil pump filter should be cleaned. This oil filter is accessible through the drain plug aperture and can be withdrawn by hooking the end of a piece of malleable wire in the centre hole.

Thoroughly wash the filter gauze and allow to dry; when refitting engage the flange of the oil pump inside the overdrive unit with the top edge of the filter and engage the small hole in its base with the small button on the inside face of the drain plug. Fully tighten the drain plug utilizing the Churchill tool No. J.3.

Refill the gearbox and overdrive with oil through the gearbox filler and level plug hole. RECHECK THE LEVEL AFTER THE CAR HAS BEEN RUN as a certain amount of oil will be retained in the hydraulic system of the overdrive.

Particular attention should be paid to maintaining absolute cleanliness when filling the gearbox and overdrive with oil as any foreign matter that enters may seriously affect the operation of the overdrive.

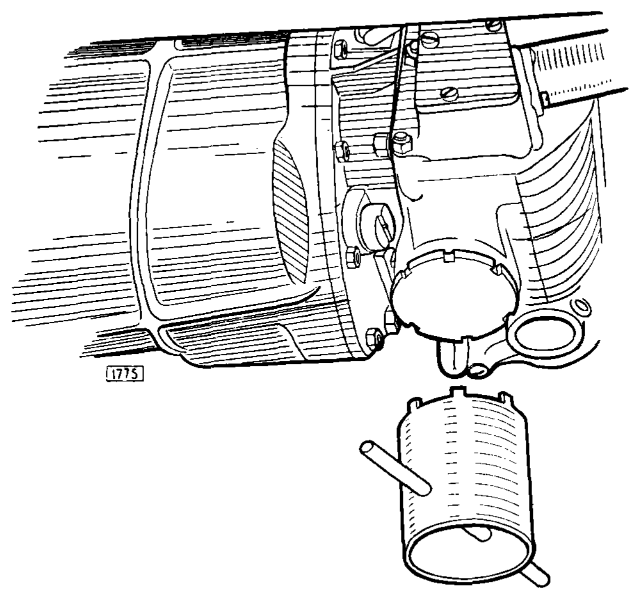


Fig. 1. The overdrive drain plug being removed utilizing the Churchill tool No. J.3

Recommended Lubricants

Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent Caltex Texaco
Mobiloil A	Castrol XL	X-100 30	Esso Extra Motor Oil 20W/30	Energol 30	NOL 30	Havoline 30

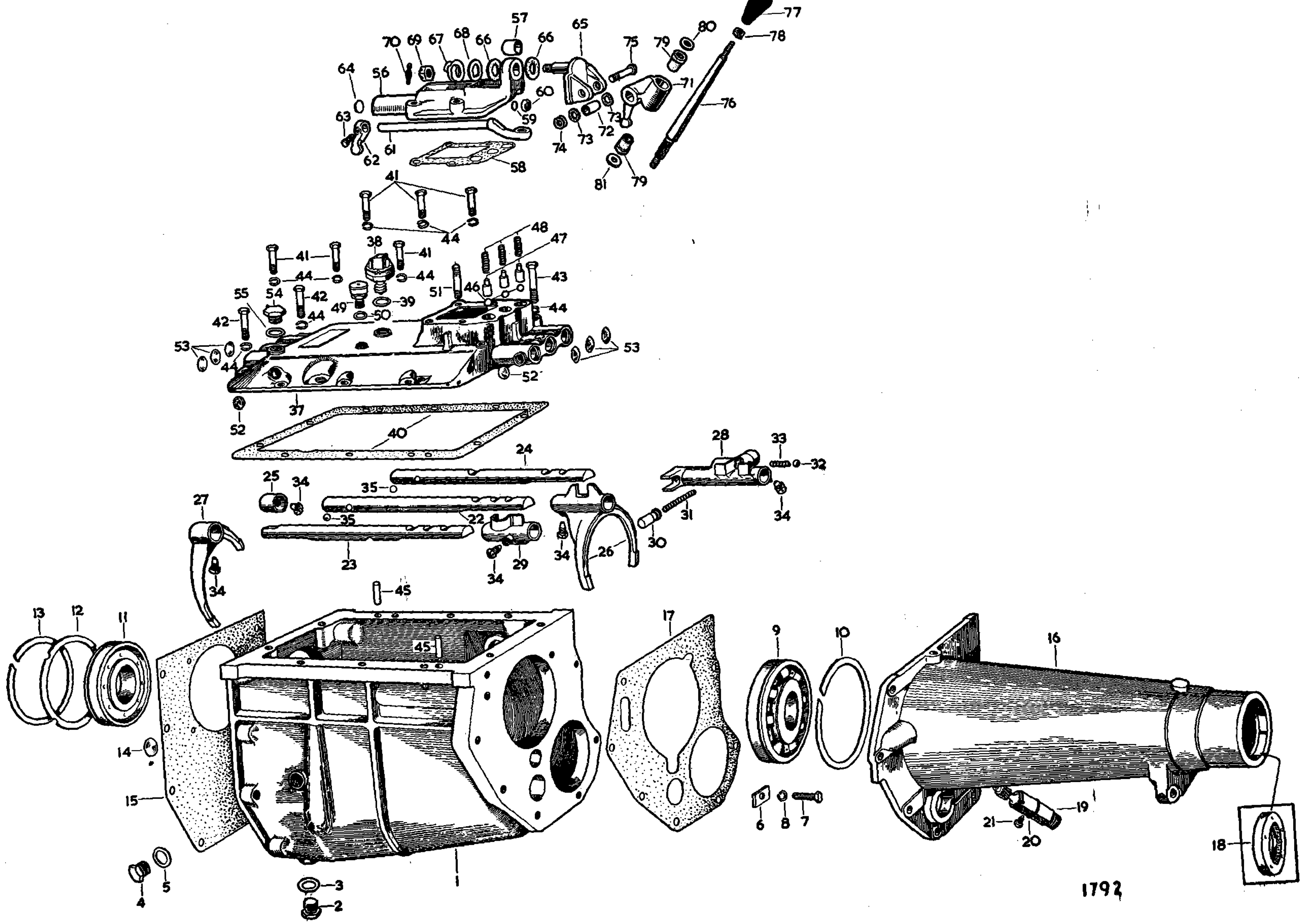
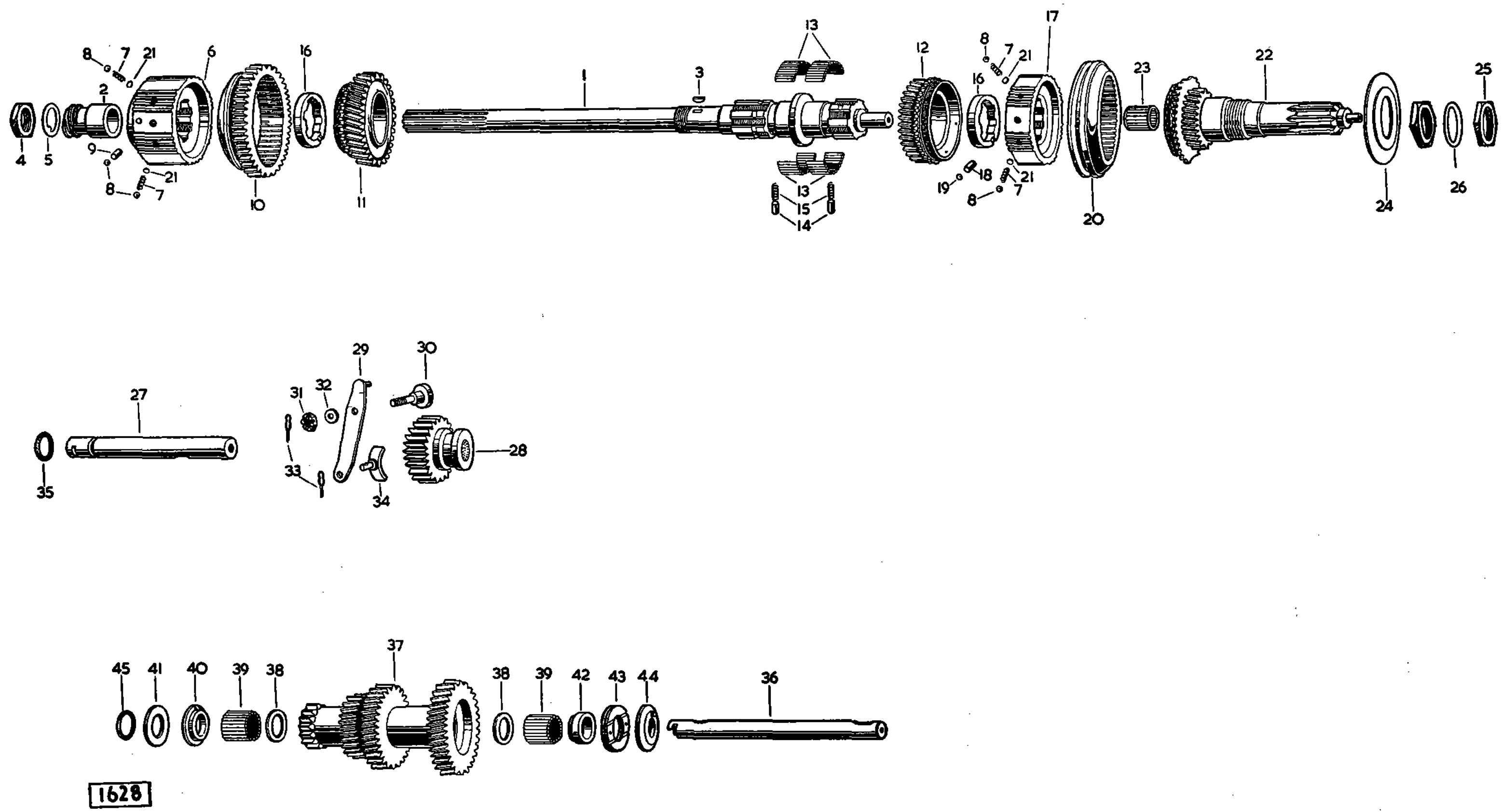


Fig. 2. Exploded view of gearbox casing and top cover.

1. Gearbox case
2. Drain plug
3. Fibre washer
4. Oil filler plug
5. Fibre washer
6. Locking plate
7. Setscrew
8. Spring washer
9. Ball bearing
10. Circlip
11. Ball bearing
12. Collar
13. Circlip
14. Fibre washer
15. Gasket
16. Gearbox extension
17. Gasket
18. Oil seal
19. Speedometer drive gear
20. ' O ' ring
21. Dowel screw
22. Striking rod, 1st/2nd gears
23. Striking rod, 3rd/top gears
24. Striking rod, reverse gear
25. Stop
26. Change speed fork, 1st/2nd gears
27. Change speed fork, 3rd/top gears
28. Change speed fork, reverse gear
29. Selector, 3rd/top gears
30. Plunger
31. Spring
32. Locking ball
33. Spring
34. Dowel screw
35. Ball
37. Top cover
38. Switch
39. Gasket
40. Gasket
41. Bolt
42. Bolt
43. Bolt
44. Spring washer
45. Dowel
46. Ball
47. Plunger
48. Spring
49. Breather
50. Fibre washer
51. Stud
52. Welch washer
53. Welch washer
54. Plug
55. Copper washer
56. Top cover housing



1. Mainshaft
2. Speedometer driving gear
3. Key
4. Nut
5. Tab washer
6. Synchronising sleeve 2nd gear
7. Spring
8. Ball
9. Plunger
10. 1st speed mainshaft gear
11. 2nd speed mainshaft gear
12. 3rd speed mainshaft gear
13. Needle roller
14. Plunger
15. Spring
16. Thrust washer
17. Synchronising sleeve
18. Plunger
19. Ball
20. Operating sleeve
21. Shim
22. Constant pinion shaft
23. Roller bearing
24. Oil thrower
25. Locknut
26. Tab washer
27. Reverse spindle
28. Reverse gear
29. Lever
30. Fulcrum pin
31. Slotted nut
32. Plain washer
33. Split pin
34. Reverse slipper
35. Sealing ring
36. Countershaft
37. Gear unit on countershaft
38. Retaining ring
39. Needle roller
40. Thrust washer
41. Thrust washer
42. Retaining ring
43. Thrust washer
44. Thrust washer
45. Sealing ring

Fig. 3. Exploded view of gears.

GEARBOX—TO REMOVE AND REFIT

In order to remove the gearbox (and overdrive if fitted) it is necessary to remove the gearbox and engine as an assembly as described on page 19 of Section B " Engine ". As removal of the power unit entails lowering the assembly away from the car it will be necessary to first remove the front suspension assembly as described on page 9 of Section J " Front Suspension". The operation should, therefore, be carried out on a hoist preferably of the " four-poster " type or over a pit, with lifting tackle running overhead.

GEARBOX—TO DISMANTLE

Drain the gearbox by removing plug and fibre washer situated at base of the casing. Place gearbox in neutral and remove the ten setscrews with spring washers securing the top cover. Lift off top cover noting that this is located by two dowels fitted in the gearbox case. Remove and scrap the gasket.

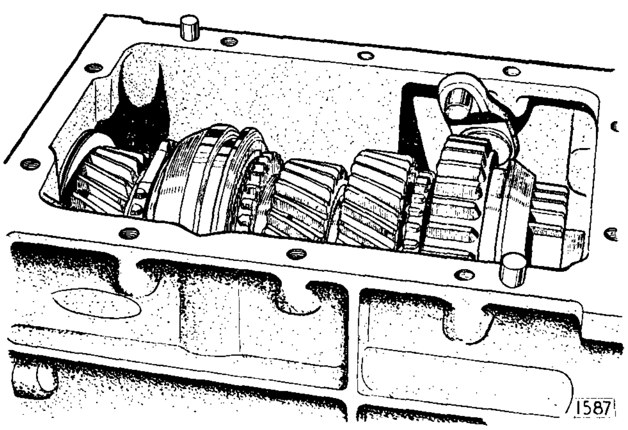


Fig. 4. The gearbox top cover removed showing the layout of the mainshaft gears.

Remove the clutch slave cylinder from the clutch housing. Detach the spring clips and remove the clutch release bearing. Release the locknut and remove the Allen headed screw securing the clutch fork to shaft. Withdraw shaft downwards and remove fork. From inside the clutch housing remove the locking wire from the two bolts and tap back the tabs on the locking washers. Unscrew the eight bolts and remove the clutch housing.

Remove the locking screw retaining the speedometer driven gear bush in the extension. Withdraw the driven gear and bearing.

Remove the fibre blank from the front end of the layshaft.

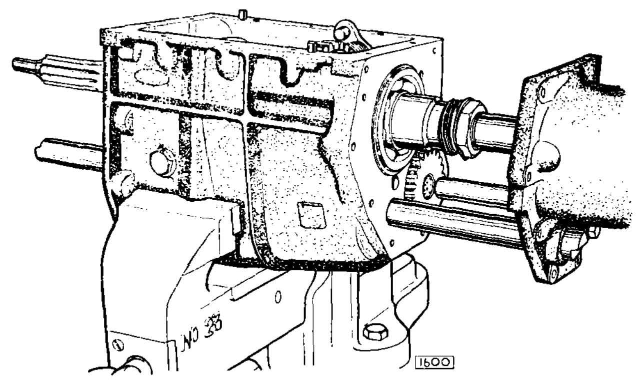


Fig. 5. Showing the removal of the extension; note the dummy countershaft inserted at the front end of the casing.

On non-overdrive gearboxes remove the seven setscrews securing the rear extension to the gearbox casing. (Do not disturb the layshaft/reverse idler locking plate). Withdraw the extension complete with shafts at the same time inserting a dummy countershaft into the countershaft bore at the front of the gearbox casing (see Fig. 5). The dummy shaft and countershaft must be kept in contact until the countershaft is clear of the casing.

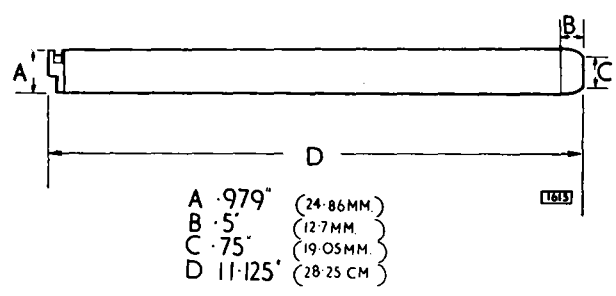


Fig. 6. Dummy countershaft dimensions.

Engage top and first gears. On non-overdrive gearboxes tap back the tab washer securing the locknut at the rear of the mainshaft and unscrew the locknut. Withdraw the speedo drive gear. Remove the woodruff key from the mainshaft. Withdraw the dummy countershaft allowing the layshaft gear unit to drop into the bottom of the casing.

On gearboxes equipped with an overdrive, remove the circlip, plain washer and shims from behind the gearbox rear bearing.

Rotate the constant pinion shaft until the two cutaway portions of the driving gear are facing the top and bottom of the casing. Tap the mainshaft to the front to knock the constant pinion shaft with ball bearing forward out of the case (see Fig. 7). Remove the constant pinion shaft and withdraw the roller bearing from the shaft spigot. Continue to tap mainshaft forward until free of the rear bearing. Tap the bearing rearward out of casing.

Push the reverse gear forward out of engagement to clear the mainshaft first speed gear. Lift the front end of the mainshaft upwards and remove complete with all mainshaft gears forward out of the casing leaving the layshaft in the bottom of the casing (see Fig. 8).

Draw reverse wheel rearwards as far as it will go to clear layshaft first speed gear. Lift out layshaft gear unit observing inner and outer thrust washers fitted at each end of the gears. Take care not to lose any needles which are located at each end of the gear unit.

Push reverse gear back into the case and remove through top. Note bush which is a press fit in reverse gear.

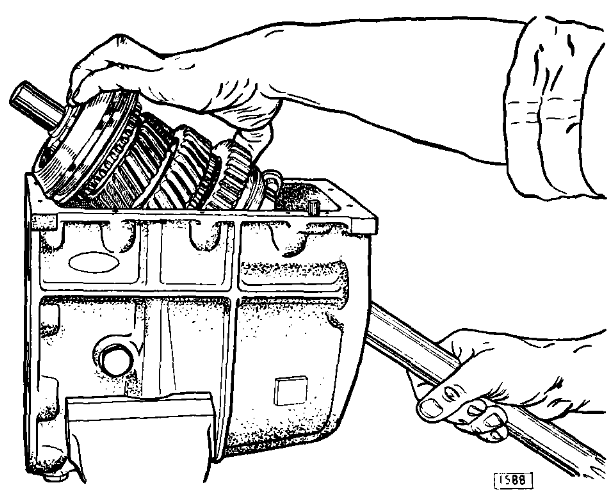


Fig. 8. Removing the mainshaft from the gearbox casing.

DISMANTLING THE MAINSHAFT

Withdraw the top/third gear operating and synchronising sleeves forward off the shaft. Press the operating sleeve off the synchronising sleeve and remove the six synchronising balls and springs. Remove the interlock plungers and balls from the synchro sleeve.

Withdraw the second gear synchronising sleeve complete with first speed gear rearwards off the shaft. Press the first speed gear off the synchronising sleeve and remove the six synchronising balls and springs. Remove the interlock ball and plunger from the synchro sleeve.

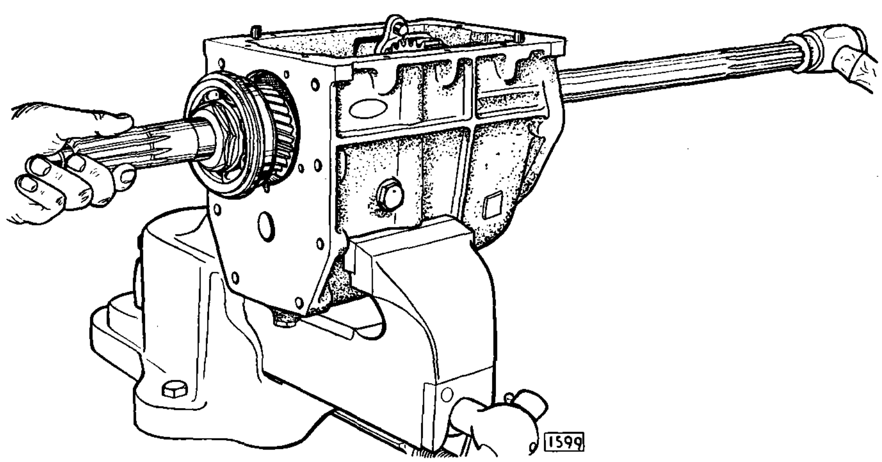


Fig. 7. The constant pinion shaft is removed by tapping the mainshaft forward.

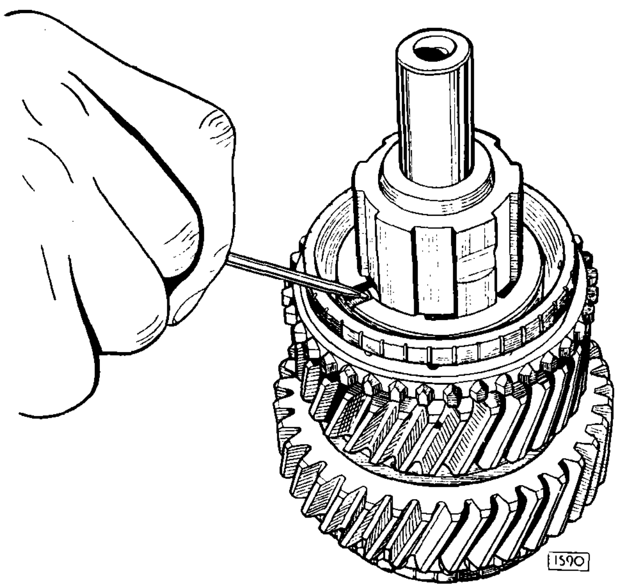


Fig. 9. Depressing the third speed thrust washer locking plunger.

Press in the plunger locking the third speed gear thrust washer (see Fig. 9) and rotate washer until splines line up, when washer can be withdrawn. Remove the washer forward off shaft followed by third speed gear, taking care not to lose any needles which will emerge as the gear is removed. Remove the spring and plunger.

Press in the plunger locking the second speed gear thrust washer (see Fig. 10) and rotate washer until splines line up, when washer can be withdrawn. Remove the washer rearwards off shaft followed by second speed gear, taking care not to lose any needles which will emerge as the gear is removed. Remove the spring and plunger.

DISMANTLING THE CONSTANT PINION SHAFT

Knock back tab washer securing locknuts and remove locknuts (right-hand thread). Withdraw the bearing from the shaft and remove the oil thrower.

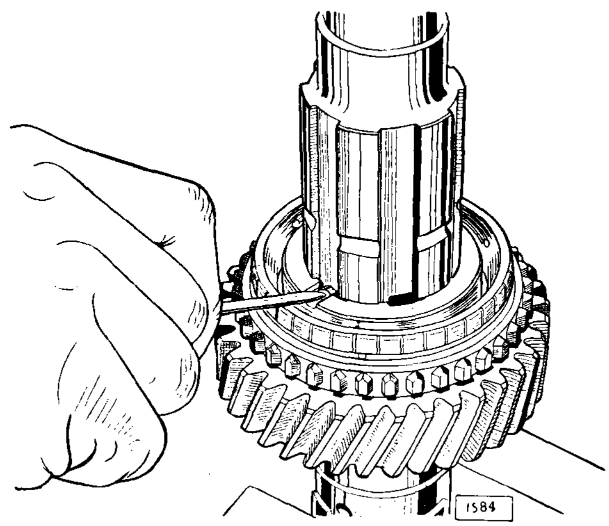


Fig. 10. Depressing the 2nd speed thrust washer plunger.

GEARBOX—TO RE-ASSEMBLE

CHECKING LAYSHAFT END-FLOAT

Check the clearance between bronze thrust washer and the casing at rear of layshaft (see Fig. 11). The end-float should be .002″ to .004″ (.05 to .10 mm.). Thrust washers are available in thicknesses of .152″, .156″, .159″, .162″ and .164″ (3.86, 3.96, 4.04, 4.11 and 4.17 mm.) to provide a means of adjusting the end-float.

Note: The gearbox must not be gripped in a vice when checking the end float otherwise a false reading will be obtained.

Remove dummy countershaft and insert a thin rod in its place.

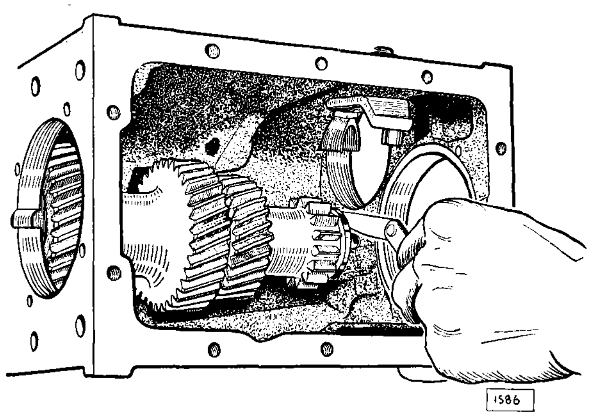


Fig. 11. Checking layshaft end float.

Place bushed reverse gear in slipper and draw gear rearwards as far as possible to give clearance for fitting layshaft gear unit.

ASSEMBLING THE MAINSHAFT

Fit the needle rollers (41 off) behind the shoulder on the mainshaft and slide the second speed gear, synchronising cone to rear, on to rollers. Apply grease to the needle rollers to facilitate assembly. Fit the second speed thrust washer spring and plunger into plunger hole. Slide thrust washer up shaft and over splines. Align large hole in synchro cone and with a steel pin compress plunger and rotate thrust washer into locked position with cutaway in line with plunger. Check the end-float of the second gear on the mainshaft by inserting a feeler gauge between the thrust washer and the shoulder on the mainshaft. The clearance should be .002″ to .004″ (.05 to .10 mm.). Thrust washers are available in the following thicknesses to enable the end-float to be adjusted :

.471″/.472″—(11.96/11.99 mm.)

.473″/.474″—(12.01/12.03 mm.)

.475″/.476″—(12.06/12.09 mm.)

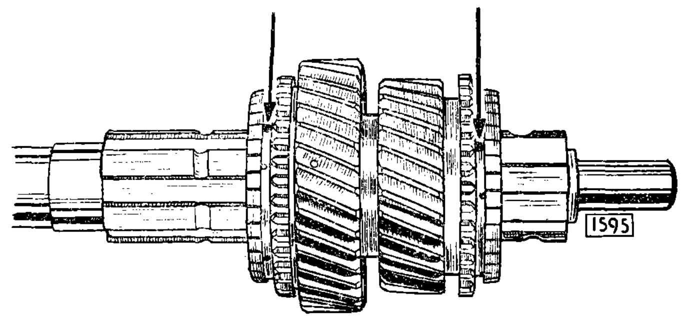


Fig. 12. Showing the holes through which the thrust washer locking plungers are depressed.

Fit the needle rollers (41 off) in front of the shoulder on the mainshaft and slide the third speed gear, synchronising cone to front, on to rollers. Apply grease to the needle rollers to facilitate assembly. Fit the third speed thrust washer spring and plunger into plunger hole. Slide thrust washer down shaft and over splines. Align large hole in synchro cone and with a steel pin compress plunger and rotate thrust washer into locked position with cutaway in line with plunger. Check the end-float of the third gear on the mainshaft by inserting a feeler gauge between the thrust washer and the shoulder on the mainshaft. The clearance should be .002″ to .004″ (.05 to .10 mm.). Thrust washers are available in the following thicknesses to enable the end-float to be adjusted :

.471"/.472"—(11.96/11.99 mm.)
.473"/.474"—(12.01/12.03 mm.)
.475"/.476"—(12.06/12.09 mm.)

ASSEMBLING THE 2nd GEAR SYNCHRO ASSEMBLY

Fit the springs and balls (and shims if fitted) to the six blind holes in the synchro sleeve. Fit the 1st speed gear to the 2nd speed synchronising sleeve with the relieved tooth of the internal splines in the gear in line with the stop pin in the sleeve (see Fig. 13). Compress the springs by means of a hose clip or by inserting the assembly endwise in a vice and slowly closing the jaws. Slide the operating sleeve over the synchronising sleeve until the balls can be heard and felt to engage the neutral position groove.

It should require 62 to 68 lbs. (28 to 31 kg.) pressure to disengage the synchronising sleeve from the neutral position in the operating sleeve. In the absence of the necessary equipment to check this pressure, grip the operating sleeve in the palms of the hands and press the synchronising sleeve with the fingers until it disengages from the neutral position ; it should require firm finger pressure before disengaging. Shims can be fitted underneath the springs to adjust the pressure of the balls against the operating sleeve.

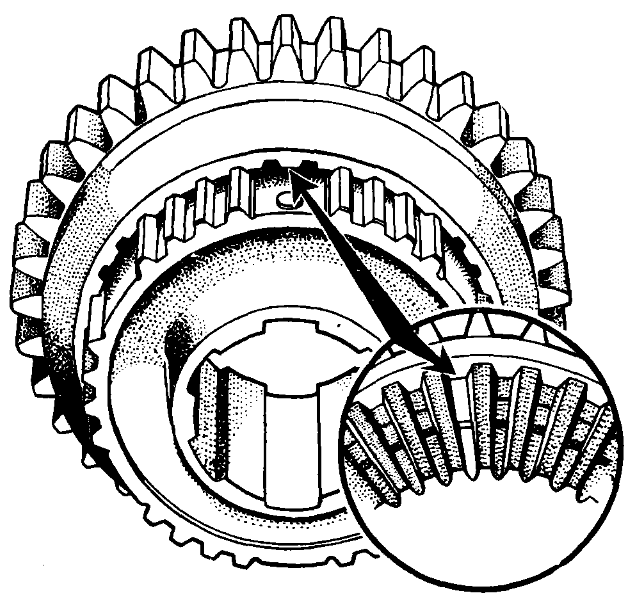


Fig. 13. When fitting the 1st speed gear to the 2nd speed synchro sleeve the relieved tooth on the internal splines must be in line with the stop pin in the sleeve.

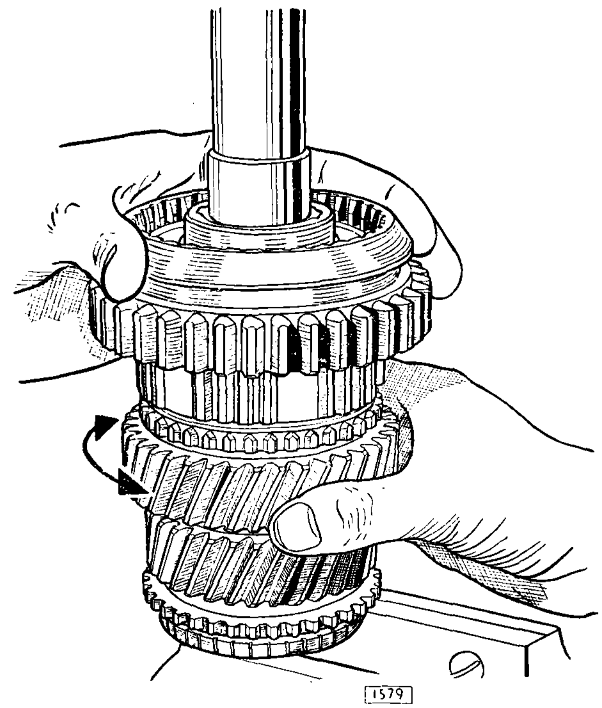


Fig. 14. With 1st gear engaged and slight downward pressure on the synchro assembly the 2nd speed gear should be free to rotate.

FITTING THE 2nd GEAR ASSEMBLY TO THE MAINSHAFT

Fit the 1st speed gear/2nd speed synchro assembly to the mainshaft (any spline) and check that the synchro sleeve slides freely on the mainshaft, when the ball and plunger is not fitted. If it does not, try the sleeve on different splines on the mainshaft and check for burrs at the end of the splines.

Remove the synchro assembly from the mainshaft, fit the ball and plunger and refit to the same spline on the mainshaft.

Check the interlock plunger as follows :—

Slide the outer operating sleeve into the first gear position as shown in Fig. 14.

With slight downward pressure on the synchro assembly the 2nd speed gear should rotate freely without any tendency for the synchro cones to rub.

If the synchro cones are felt to rub, a longer plunger should be fitted to the synchro sleeve. Plungers are available in the following lengths :—

.490", .495" and .500" (12.4, 12.52 and 12.65 mm.).

ASSEMBLING THE 3rd/TOP SYNCHRO ASSEMBLY

Fit the springs and balls (and shims if fitted) to the six blind holes in the inner synchronising sleeve. Fit the wide chamfer end of the operating sleeve to the large boss end of inner synchronising sleeve (see Fig. 15) with the two relieved teeth in operating sleeve in

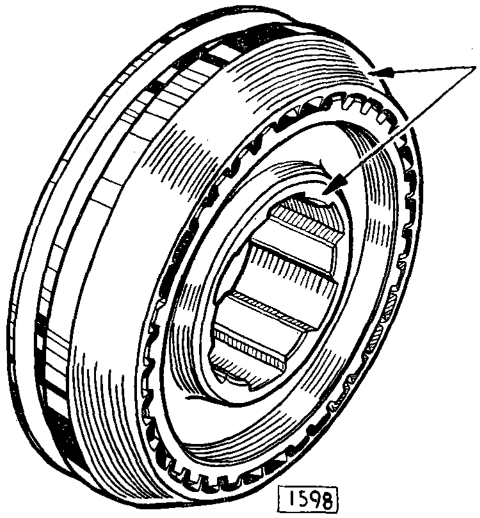


Fig. 15. The wide chamfer end of the operating sleeve must be fitted to the same side as the large boss of the inner synchro sleeve.

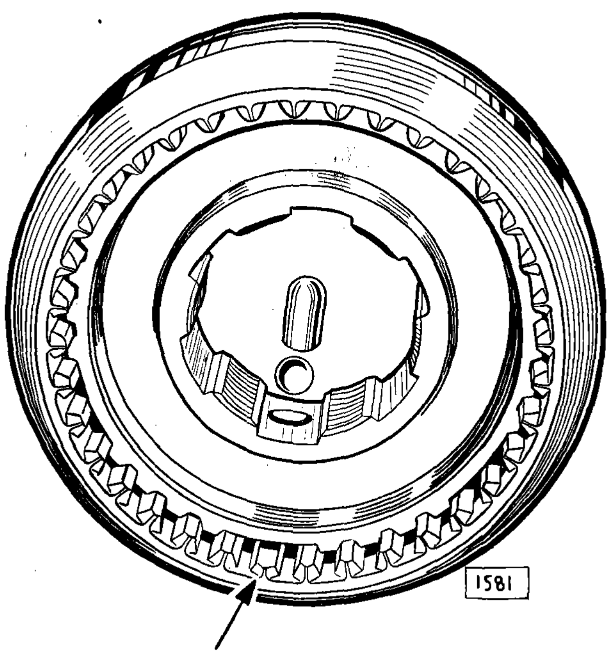


Fig. 16. The relieved teeth in the operating sleeve must be in line with the interlock plunger holes in the synchro sleeve.

line with the two ball and plunger holes in the synchronising sleeve (see Fig. 16). Compress the springs by means of a hose clip or by inserting the assembly endwise in a vice and slowly closing the jaws. Slide the operating sleeve over the synchronising sleeve until the balls can be heard and felt to engage the neutral position groove.

It should require 52 to 58 lbs. (24 to 26 kg.) pressure to disengage the synchronising sleeve from the neutral position in the operating sleeve. In the absence of the necessary equipment to check this pressure grip the operating sleeve in the palms of the hands and press the synchronising sleeve with the fingers until it disengages from the neutral position ; it should require firm finger pressure before disengaging. Shims can be fitted underneath the springs and balls to adjust the pressure of the balls against the operating sleeve.

FITTING THE 3rd/TOP SYNCHRO ASSEMBLY TO THE MAINSHAFT

Fit the interlock balls and plungers, balls first, to the holes in the synchronising sleeve.

When fitting the 3rd speed/top gear synchro assembly to the mainshaft note the following points :—

(a) There are two transverse grooves on the mainshaft splines which take the 3rd/top synchro assembly and the relieved tooth at the wide chamfer end of the outer operating sleeve must be in line with the **foremost** groove in the mainshaft (Fig. 17). Failure to observe this procedure will result in the locking plungers engaging the wrong grooves thereby preventing full engagement of top and third gears.

(b) The wide chamfer end of the outer operating sleeve must be facing forward, that is, towards the constant pinion shaft end of the gearbox.

The inner sleeve must slide freely on the mainshaft, when the balls and plungers are not fitted. If it does not, check for burrs at the ends of the splines.

Fit the two balls and plungers to the holes in the inner synchro sleeve and refit the synchro assembly to the mainshaft observing points ' a ' and ' b ' above.

Check the interlock plungers as follows :— .

Slide the 3rd/top operating sleeve over the 3rd speed gear dogs as shown in Fig. 18. With the 3rd gear engaged lift and lower the synchro assembly ; it should be possible to move the assembly approximately $\frac{3}{32}''$ (2.5 mm.) without any drag being felt. If it is found that the synchro assembly does not move freely a shorter 3rd speed plunger should be fitted ; looking

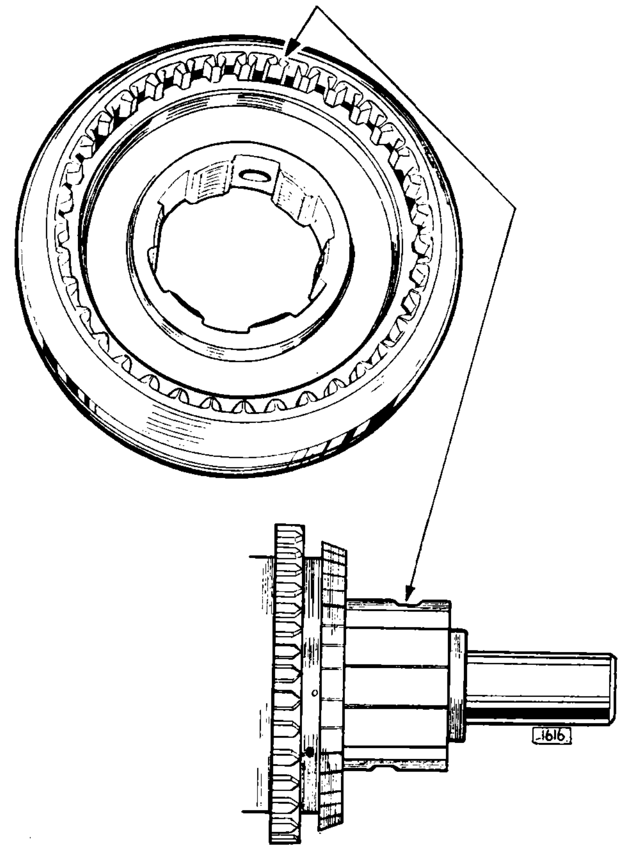


Fig. 17. The relieved tooth at the wide chamfer end of the outer operating sleeve must be in line with the foremost groove in the mainshaft.

at the wide chamfer end of the outer operating sleeve this is the plunger that is not opposite the relieved tooth in the operating sleeve.

Plungers are available in the following lengths :—
.490", .495" and .500" (12.4, 12.52 and 12.65 mm.).

Next slide the operating sleeve into the top gear position as shown in Fig. 19.

Lift and lower the synchro assembly ; it should be possible to move the assembly approximately $\frac{3}{16}$" (4.5 mm.) without any drag being felt. Also with slight downward pressure exerted on the synchro assembly the 3rd speed gear should be free to rotate without any tendency for the synchro cones to rub.

If it is found that the synchro assembly does not move freely a shorter top gear plunger should be fitted. If the 3rd gear synchro cones are felt to rub a longer top gear plunger should be fitted ; looking at the wide chamfer end of the outer operating sleeve, the top gear plunger is one in line with the relieved tooth in the operating sleeve.

Plungers are available in the following lengths :
.490", .495" and .500" (12.4, 12.52 and 12.65 mm.).

ASSEMBLING THE CONSTANT PINION SHAFT

Fit the oil thrower followed by ball bearing on to shaft with circlip and collar fitted to outer track of bearing. Screw on nut (right-hand thread) and fit

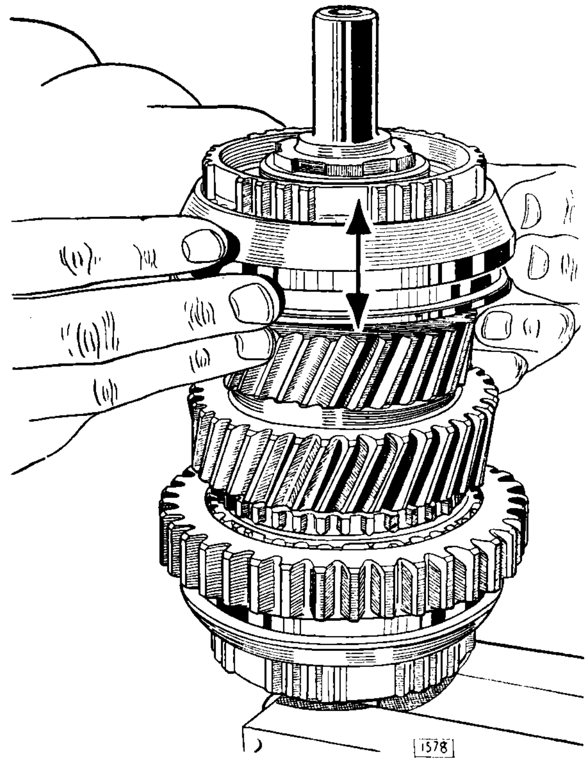


Fig. 18. Checking 3rd speed interlock plunger. With 3rd speed engaged there should be approximately $\frac{3}{32}$" (2.5 mm.) axial movement without drag.

tab washer and locknut. Fit the roller race into the shaft spigot bore.

ASSEMBLING THE GEARS TO THE CASING

Enter the mainshaft through the top of the casing and pass to the rear through bearing hole in case. Fit a new gasket to the front face of casing. Offer up the constant pinion shaft at the front of the case with cutaway portions of toothed driving member facing the top and bottom of the casing. Tap the constant pinion shaft to the rear until the collar and circlip on the bearing butt against the casing. Holding the constant

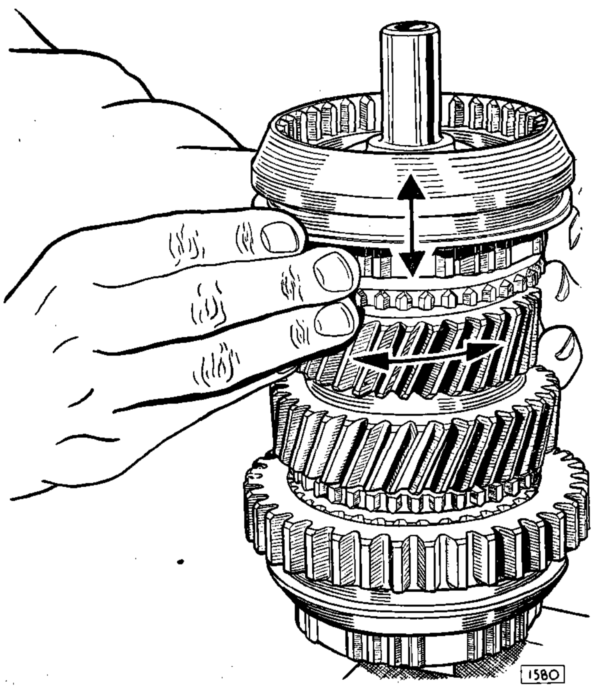


Fig. 19. Checking the 4th (top) gear interlock plunger. With the top gear engaged there should be approximately $\frac{3}{16}$" (4.76 mm.) axial movement without any drag. With top gear still engaged and with slight downward pressure exerted on synchro assembly the 3rd speed gear should be free to rotate.

pinion shaft in position tap in the rear bearing complete with circlip.

Lift the layshaft cluster into mesh with the thin rod and insert a dummy countershaft through the countershaft bore in front face of the casing, (see Fig. 20).

Engage top and first gears. On non-overdrive gearboxes fit the woodruff key and speedo drive gear

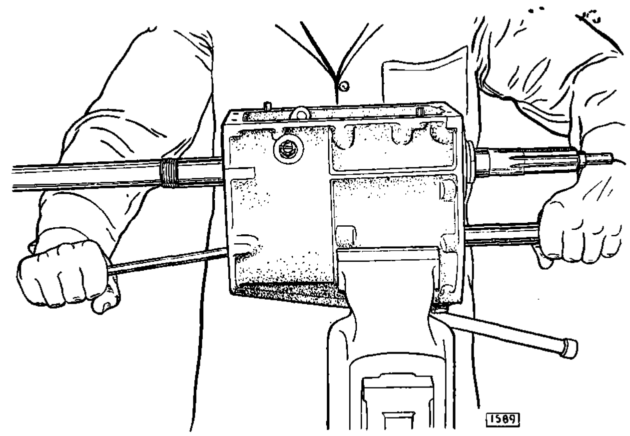


Fig. 20. Lifting the layshaft into mesh and inserting dummy countershaft.

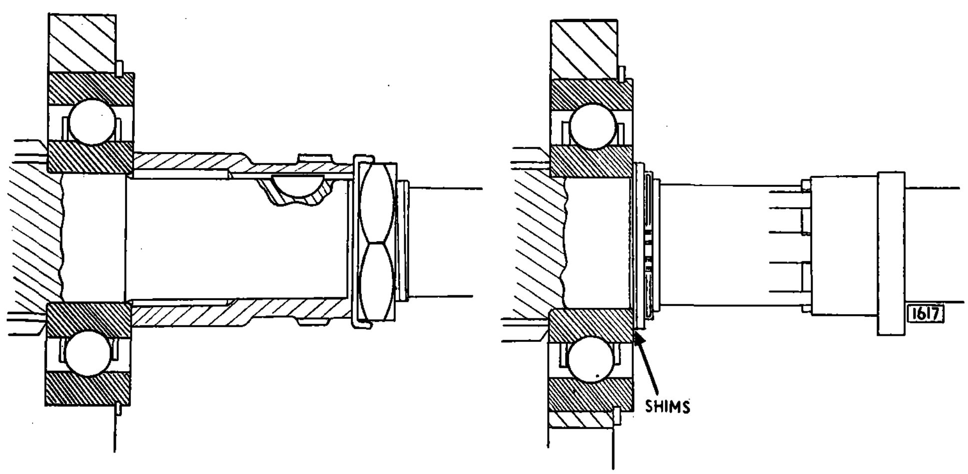
to the mainshaft. Fit the tab washer and locknut and secure. Place gearbox in neutral.

On gearboxes equipped with an overdrive, fit the shim(s), plain washer and circlip behind the rear bearing. Fit as many shims as are necessary to eliminate all end-float from the mainshaft.

Fit the clutch operating fork and insert shaft. Fit the locking screw and locknut. Fit the release bearing and spring clips. Engage slave cylinder with operating rod and slide on to studs. Fit the spring anchor plate to lower stud and secure with the nuts. Fit the return spring.

FITTING THE TOP COVER

Fit a new gasket on to top face of case. Offer up the top cover, noting that this is located by two dowels



STANDARD GEARBOX OVERDRIVE GEARBOX

Fig. 21. Showing the rear bearing retaining arrangement.

and secure in position with ten setscrews and spring washers. (Two long screws at rear and two short screws at front.) Fit the gearbox drain plug and fibre washer.

FITTING THE EXTENSION

Fit a new gasket to the rear face of the gearbox casing. Offer up the extension complete with counter and reverse shafts and tap into position, driving the dummy countershaft forward out of the casing. Secure the extension with seven setscrews and spring washers.

Fit a new fibre washer at the front end of the countershaft. Fit the speedo driven gear and bearing to the extension.

FITTING THE CLUTCH HOUSING

Fit a new oil seal into the clutch housing, lip of oil seal facing the gearbox.

Fit the clutch housing and secure with the eight bolts and three tab washers and locking wire.

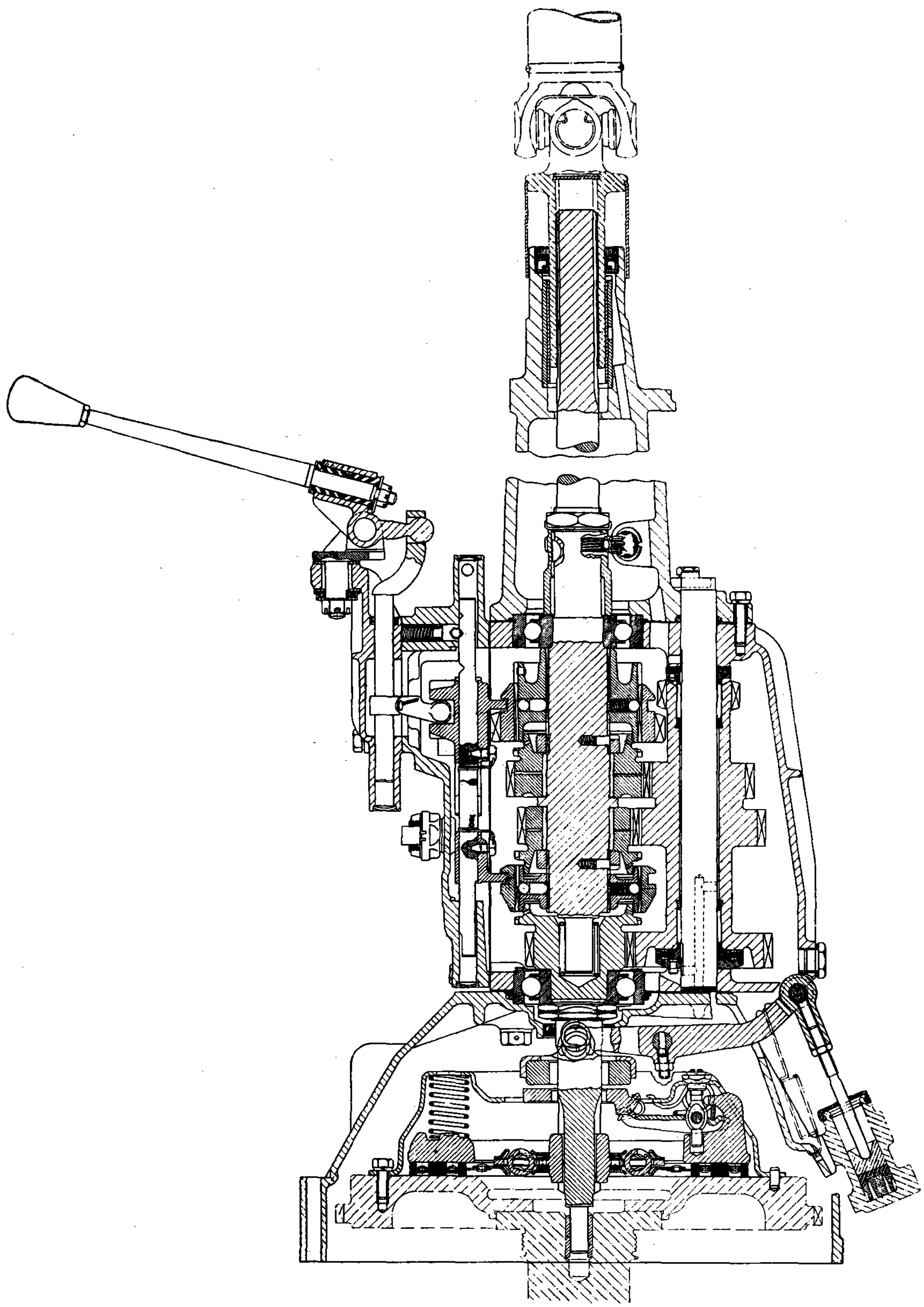


Fig. 22. Sectioned drawing of the gearbox.

OVERDRIVE

METHOD OF OPERATION

The Laycock de Normanville overdrive unit (fitted as an optional extra) comprises a hydraulically controlled epicyclic gear housed in a casing which is directly attached to an extension at the rear of the gearbox.

When brought into operation, the overdrive reduces the engine speed in relation to the road speed. This permits high road speeds with low engine revolutions resulting in fuel economy and reduced engine wear.

The synchromesh gearbox driven (or input) shaft is extended and carries at its end the inner member of a uni-directional clutch. The outer member of this clutch is carried in the combined annulus and output shaft. Also mounted on the input shaft are the planet carrier and a freely rotatable sun-wheel. Splined to a forward extension of the sun-wheel and sliding thereon is a cone clutch member, the inner lining of which engages the outside of the annulus, while the outer lining engages a cast-iron brake ring sandwiched between the front and rear parts of the unit housing.

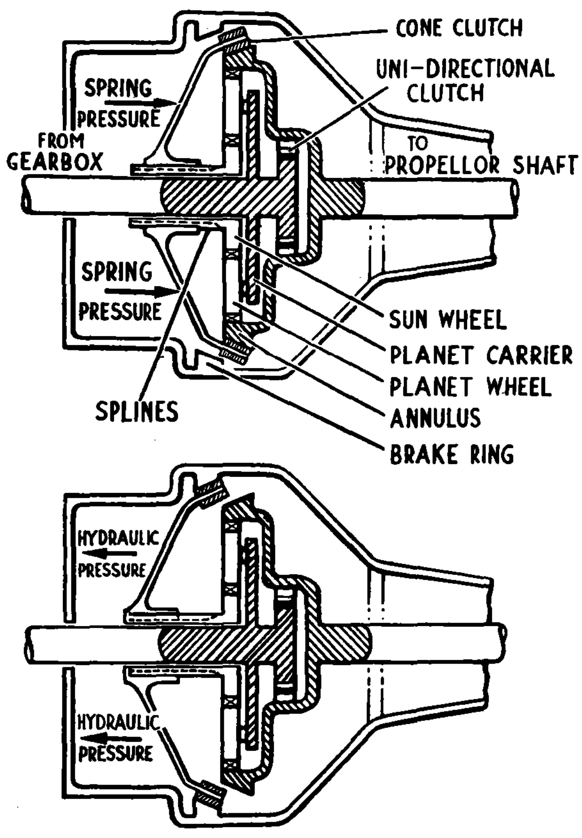


Fig. 23. Principle of operation.

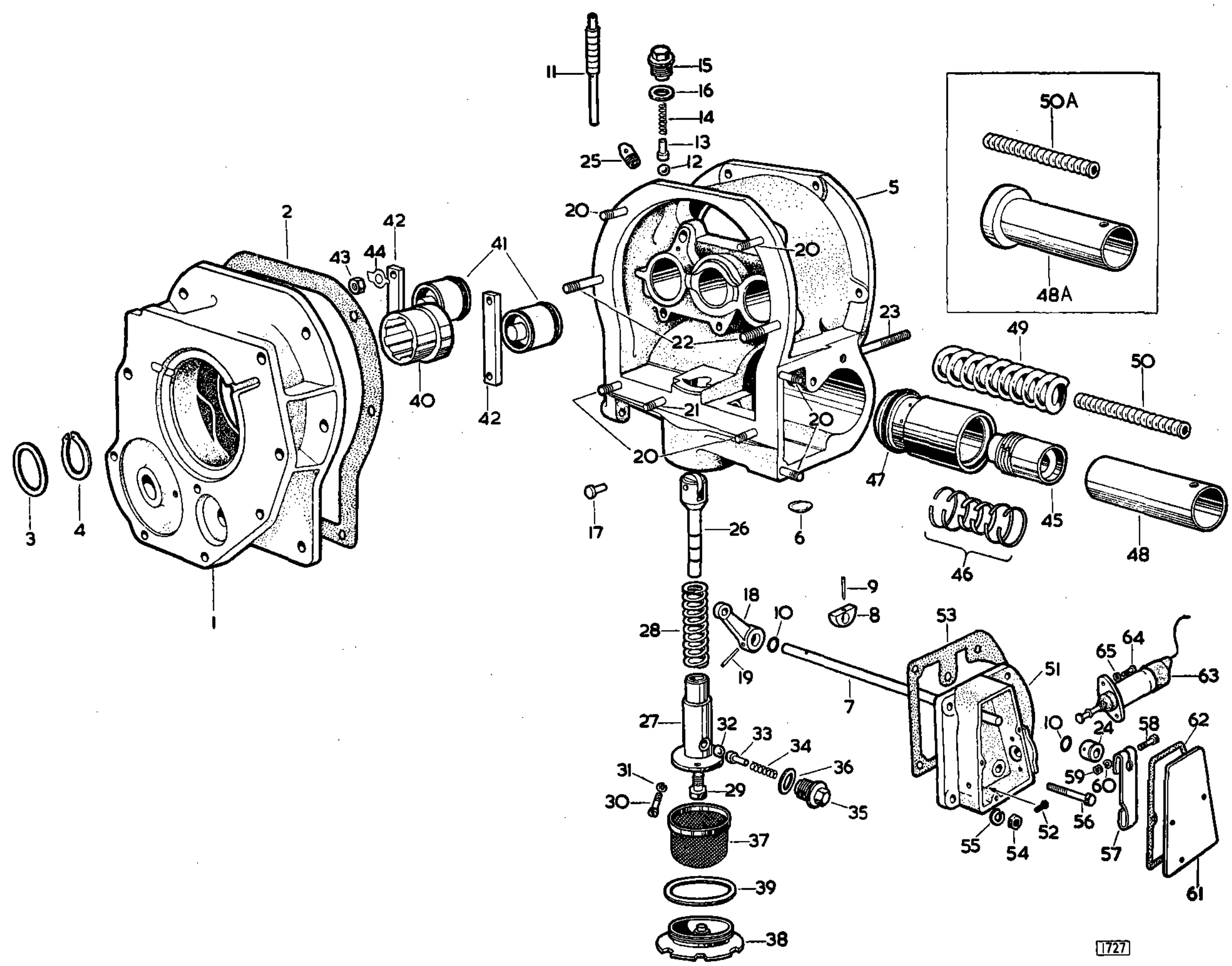
A number of compression springs are used to hold the cone clutch in contact with the annulus, locking the sun-wheel to the latter so that the entire gear train rotates as a solid unit, giving direct drive. In this condition the drive is taken through the uni-directional clutch, the cone clutch taking overrun and reverse torque since without it there would be a free-wheel condition.

The spring pressure can be overcome through the medium of two pistons, working in cylinders formed in the unit housing, supplied with oil under pressure from a hydraulic accumulator. This hydraulic pressure causes the cone clutch to engage the stationary brake ring and bring the sun-wheel to rest, allowing the annulus to overrun the uni-directional clutch and give an increased speed to the output shaft, i.e. " overdrive ".

When changing from overdrive to direct gear, if the accelerator pedal is released, as in change down for engine braking, the cone clutch being oil immersed, takes up smoothly. If the accelerator pedal is not released when contact between the cone clutch and brake ring is broken, the unit still operates momentarily in its overdrive ratio since engine speed and road speed remain unchanged. But the load on the engine is released and it begins to accelerate, speeding up the sun-wheel from rest, until, just at the instant when its speed synchronises with the speed of the annulus, the whole unit revolves solidly and the uni-directional clutch takes up the drive once more. The movement of the cone clutch is deliberately slowed down so that the uni-directional clutch is driving before the cone clutch contacts, ensuring a perfectly self-synchronised change.

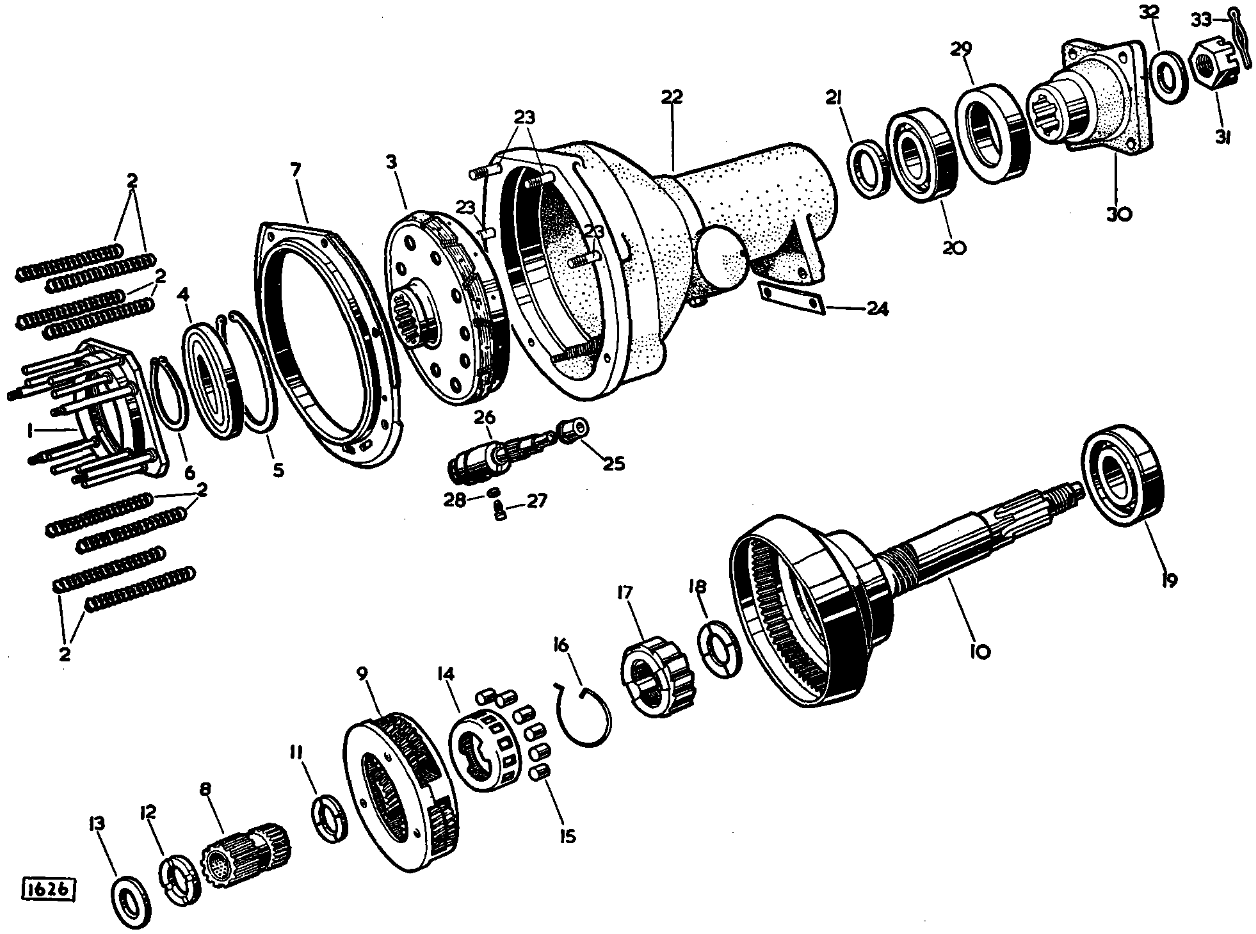
CONSTRUCTION

The driven shaft of the synchromesh gearbox is extended to carry first a cam operating the oil pump, and then a steady bearing with two opposed plain bushes carried in the front housing. Next is the sun-wheel of the epicyclic gear carried on a Clevite bush, and beyond this the shaft is splined to take the planet carrier and uni-directional clutch. The end of the shaft is reduced and carried in a plain bush in the output shaft. The latter is supported in the rear housing by two ball bearings. The clutch member slides on the splines of the sun-wheel extension to contact either the annulus or a cast-iron brake ring forming part of the unit housing. To the hub of the cone clutch member is



1. Extension for attachment to gearbox
2. Gasket
3. Bearing spacing washer
4. Circlip
5. Front casing
6. Welch washer plug
7. Operating valve shaft
8. Operating valve cam lever
9. Cam lever pin
10. ' O ' ring seals
11. Operating and restrictor valve
12. Operating valve ball.
13. Ball plunger
14. Plunger spring
15. Valve and pressure take-off plug
16. Copper washer
17. Pump guide peg
18. Valve setting lever
19. Setting lever pin
20. Stud
21. Stud
22. Long gearbox stud
23. Rear casing stud
24. Operating valve shaft collar
25. Breather plug
26. Pump plunger
27. Pump body
28. Pump plunger spring
29. Pump plug
30. Pump securing screw
31. Spring washer
32. Non return valve ball
33. Ball plunger
34. Plunger spring
35. Screwed plug
36. Sealing washer
37. Gauze filter
38. Drain plug
39. Sealing washer
40. Pump operating eccentric
41. Cone clutch operating piston
42. Piston bridge piece
43. Nut
44. Tab washer
45. Accumulator piston assembly
46. Set of six piston rings, four narrow, two wide
47 Piston housing
48. 3.8 litre spacer tube
48a. 2.4 and 3.4 litre spacer tube
49. 3.8 litre piston spring (large)
50. 3.8 litre piston spring (small)
50a. 2.4 and 3.4 litre piston spring
51. Solenoid mounting bracket assembly
52. Rubber buffer for solenoid plunger
53. Gasket
54. Nut
55. Spring washer
56. Bolt, holding accumulator spring in tension
57. Solenoid lever
58. Pinch bolt
59. Nut
60. Spring washer
61. Cover plate
62. Gasket
63. Operating solenoid
64. Bolt
65. Spring washer

Fig. 24. Exploded view of front casing assembly.



1. Clutch thrust ring assembly
2. Springs *
3. Sliding member
4. Ball bearing
5. Circlip
6. Circlip
7. Brake ring
8. Sun wheel assembly
9. Planetary carrier assembly
10. Annulus assembly
11. Thrust washer (phosphor bronze)
12. Thrust washer (phosphor bronze)
13. Thrust washer (steel)
14. Cage for uni-directional clutch
15. Rollers
16. Spring
17. Inner member for uni-directional clutch
18. Thrust washer
19. Ball bearing
20. Ball bearing
21. Spacing washer
22. Rear casing assembly
23. Stud
24. Packing
25. Pilot bush
26. Speedometer drive assembly
27. Locking screw
28. Spring washer
29. Oil seal
30. Flange
31. Nut
32. Plain washer
33. Split pin

* In the instance of the 3.8 litre model there are twelve springs (4 inner and 8 outer)

Fig. 25. Exploded view of rear casing assembly.

secured a ball bearing housed in a flanged ring. This ring carries on its forward face a number of pegs acting as guides to compression springs by which the ring, and with it the clutch member is held against the annulus. The springs prevent free-wheeling on overrun and are of sufficient strength to handle reverse torque. Also secured to the ring are four studs picking up two bridge pieces against which bear two pistons operating in cylinders formed in the unit housing. The cylinders are connected through a valve to an accumulator in which pressure is maintained by the oil pump. Both accumulator and operating pistons are fitted with special three-piece cast-iron rings. (Later operating pistons are fitted with one 'O' ring in place of the cast-iron rings.)

When the valve is open oil under pressure is admitted to the cylinders and pushes the pistons forward to overcome the springs and move the clutch member forward to engage the overdrive clutch.

Closing the valve cuts off the supply of oil to the cylinders and allows it to escape. Under the influence of the springs the clutch member moves back to engage direct drive position. The escape of oil from the cylinders is deliberately restricted so that the clutch takes about half a second to move over.

The planet pinions are of compound design, the larger diameter engaging the sun-wheel and the smaller diameter the annulus. Gear teeth are helical, the helix angles of each pair of mating gears being arranged to give an almost complete balance of end thrust. End thrust on the sun-wheel is taken by alternate bronze and steel thrust washers, lubricated by oil under pressure. These washers are stationary when in overdrive and only take a running load during the brief period of clutch slip when engaging overdrive. The sun-wheel and pinions are cyanide case-hardened and the annulus heat-treated. The pinions have needle roller bearings and run on case-hardened pins.

The outer ring of the uni-directional clutch is pressed and rivetted into the annulus member. The clutch itself is of the caged roller type, loaded by a clock-type spring made of round wire.

The hydraulic system is supplied with oil by a plunger type pump operated by a cam on the gearbox driven shaft. The pump body is pressed into the front housing and delivers oil through a non-return valve to the accumulator cylinder, in which a piston moves back against a compression spring until the required pressure is reached when relief holes are uncovered. From the relief holes the oil is led through drilled passages to an annular groove between the two steady bushes on the gearbox driven shaft. Radial holes in the shaft collect the oil and deliver it along an axial drilling to other radial holes in the shaft from which it is fed to the sun-wheel bush, thrust washers, planet carrier and planet pins.

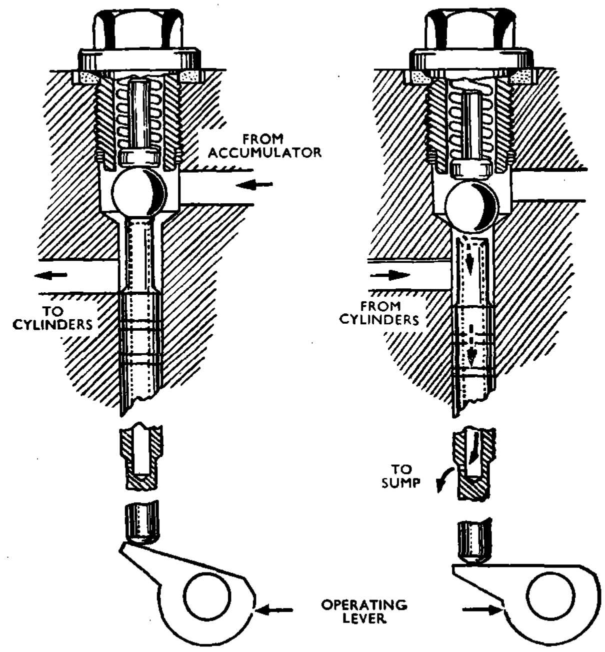


Fig. 26. Principle of the operating valve.

From the accumulator, oil under pressure is supplied to the operating valve chamber. This forms an enlargement at the top of a vertical bore and contains a ball valve, the ball seating downwards and preventing oil from circulating to the operating cylinders. The valve is a hollow spindle sliding in the bore, its top end reduced and carrying a seating for the ball so that when the valve is lifted it seats against the ball, which is then lifted, admitting oil to the operating cylinders and moving the pistons forward to engage the overdrive clutch.

When the valve is lowered the ball is allowed to come on to its seating in the housing, cutting off pressure to the cylinders. Further movement of the valve brings it out of contact with the ball, allowing the oil from the cylinder to escape down the inside of the valve to discharge into the sump. The cone member then moves back under the influence of the clutch springs.

DATA

	Dimensions—New	Clearances—New
Pump		
Plunger diameter	.3742″/.3746″	.0002″/.0016″
Bore for plunger in pump body	.3748″/.3758″	
Plunger spring fitted load at top of stroke	9.493 lb. at 1.137″	
Valve spring load	$2\frac{5}{8}$ lb. @ $\frac{19}{32}$ long	
Pin for roller	.2497″/.2502″ dia.	.0008″/.0023″
Bore for pin in roller	.2510″/.2520″	
Gearbox Mainshaft		
Diameter at steady bushes	1.1544″/1.1553″	.0029″/.0048″
Steady bush internal diameter	1.1582″/1.1592″	
Shaft diameter at sun-wheel bush	1.1544″/1.1553″	
Sun-wheel bush internal diameter	1.1582″/1.1592″	.0029″/.0048″
Shaft diameter at rear steady bush	.6235″/.6242″	
Rear steady bush internal diameter	.6250″/.6260″	.0008″/.0025″
Gear Train		
End float of sun-wheel		.008″/.014″
Piston Bores		
Accumulator bore .. .. 2.4 and 3.4 litre	1.1245″/1.1255″	
3.8 litre	1.4995″/1.5005″	
Operating piston bores	1.3745″/1.3755″	
Miscellaneous		
Clutch movement from direct to overdrive	.080″/.120″	

Hydraulic Pressure

2.4 litre	350/370 lbs. per sq. in. (24.62—26.01 kg./cm².)
3.4 litre	420/440 lbs. per sg. in. (37.97—39.37 kg./cm².)
3.8 litre	540/560 lbs. per sq. in. (37.97—39.37 kg./cm².)

OPERATING INSTRUCTIONS

When brought into operation, the overdrive reduces the engine speed in relation to the road speed. This permits high road speeds with low engine revolutions resulting in considerable fuel economy and reduced engine wear.

Operation

The overdrive operates in top gear only and is brought into operation by means of a switch mounted on the facia.

Driving

Use of the clutch pedal when changing into or out of overdrive is unnecessary but to ensure maximum smoothness of operation, particularly when changing down from overdrive to top gear, the accelerator pedal should be slightly depressed.

For driving in towns, heavy traffic or hilly country when the maximum flexibility and low speed performance is required the overdrive manual switch should be placed in the 'OUT' position which will bring the drive into the normal top gear ratio.

For normal driving in open country the overdrive should be brought into operation when the required cruising speed has been obtained.

The following table gives the relationship between engine revolutions per minute to road speed in miles and kilometres per hour for top gear and overdrive top gears :

ROAD SPEED		ENGINE REVOLUTIONS PER MINUTE			
		2.4 litre Axle Ratio 4.55 : 1		3.4 and 3.8 litre models Axle Ratio 3.77 : 1	
Kilometres per hour	Miles per hour	Top Gear 4.55 : 1	Overdrive 3.54 : 1	Top Gear 3.77 : 1	Overdrive 2.93 : 1
16	10	588	457	487	379
32	20	1175	914	974	758
48	30	1763	1371	1461	1136
64	40	2351	1828	1948	1515
80	50	2939	2286	2435	1894
96	60	3526	2743	2922	2273
112	70	4116	3200	3409	2652
128	80	4702	3657	3896	3030
144	90	5290	4114	4383	3409
160	100	—	4571	4870	3788
176	110	—	—	5357	4167
192	120	—	—	—	4546

Note : The figures in the above table are theoretical and make no allowance for changes in tyre radius due to the effect of centrifugal force.

ROUTINE MAINTENANCE

Oil Level—Important

The oil for lubrication and operation of the overdrive unit is fed from the gearbox casing and therefore checking the gearbox oil level will also check the level of oil in the overdrive unit, but as this unit is hydraulically controlled extra attention should be paid to exercising absolute cleanliness when replenishing with oil. It is also important that the oil level is not allowed to fall appreciably otherwise the operation of the overdrive may be affected.

Oil Changing

The oil for the overdrive unit is common with that in the gearbox but draining the gearbox casing will not drain oil from the overdrive unit. A large brass drain plug is provided in the base of the overdrive unit and when draining the gearbox this plug should also be removed utilizing the Churchill tool No. J.3.

Whilst this drain plug is removed the overdrive oil pump filter should be cleaned. This oil filter is accessible through the drain plug aperture and can be withdrawn by hooking the end of a piece of malleable wire in the centre hole but without damaging the gauze.

Thoroughly wash the filter gauze and allow to dry ; when refitting engage the flange of the oil pump inside the overdrive unit with the top edge of the filter and engage the small hole in its base with the small button on the inside face of the drain plug. Fully tighten the drain plug utilizing the Churchill tool No. J.3.

Refill the gearbox and overdrive with oil through the gearbox filler and level plug hole. **Recheck the level after the car has been run** as a certain amount of oil will be retained in the hydraulic system of the overdrive.

Particular attention should be paid to maintaining absolute cleanliness when filling the gearbox and overdrive with oil as any foreign matter that enters may seriously affect the operation of the overdrive.

Every 2,500 miles (4,000 km.)

Check the oil level of the gearbox and overdrive and top up if necessary through the filler and level plug hole in the side of the gearbox casing.

Every 10,000 miles (16,000 km.)

Drain and refill the gearbox units. Two drain plugs, one for the gearbox and one for the overdrive unit, are situated at the base of their respective castings.

Both must be removed to drain the transmission completely. A common filler and level hole is situated on the left-hand side of the gearbox.

After draining the oil, remove the overdrive oil pump filter and clean the filter gauze by washing in petrol. The filter is accessible through the drain plug aperture being situated between the base of the oil pump and drain plug.

After refilling the gearbox and overdrive with oil, recheck the level after the car has been run, since a certain amount of oil will be retained in the hydraulic system of the overdrive unit.

Recommended Lubricants

Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent Caltex Texaco
Mobiloil A	Castrol XL	X-100 30	Esso Extra Motor Oil 20W/30	Energol 30	NOL 30	Havoline 30

Gearbox and Overdrive Oil Capacity

Imp. Pints	U.S. Pints	Litres
4	$4\frac{3}{4}$	$2\frac{1}{4}$

DISMANTLING AND RE-ASSEMBLING

If trouble should arise necessitating dismantling the unit further than is described in the previous section it will be necessary to remove the overdrive unit from the car. The engine, gearbox and overdrive unit are removed together. The removal instructions are given on page F.9. Remove the gearbox and clutch housing from the engine. Detach the clutch housing from the gearbox casing.

BEFORE COMMENCING ANY DISMANTLING OPERATIONS IT IS IMPORTANT THAT THE HYDRAULIC PRESSURE IS RELEASED FROM THE SYSTEM. DO THIS BY OPERATING THE OVERDRIVE 10-12 TIMES.

REMOVING THE OVERDRIVE FROM THE GEARBOX

1. The overdrive unit is separated from the gearbox at the joint between the gearbox rear extension and the overdrive front casing which are attached by seven studs **two of which are extra long.**
2. Remove the five nuts on the short studs before those on the longer studs are touched.
3. Slacken the two nuts on the long studs by equal amounts to release the compression of the clutch springs.
4. Remove the two nuts when the overdrive unit can be withdrawn off the mainshaft.

DISMANTLING THE OVERDRIVE

1. Remove the clutch springs from their pins, noting that the four inner springs **are shorter than the four outer springs.**
   In the instance of the overdrive fitted to 3.8 litre models the clutch springs number twelve ; four short, situated in the centre and the remaining eight around the outside.
2. The two bridge pieces against which the operating pistons bear can now be removed. Each is secured by two $\frac{1}{4}''$ nuts locked by tab washers. Withdraw the two operating pistons.
3. The pump valve can be dismantled without removing the solenoid bracket from the housing and there is no need to disturb the latter unless it is necessary to remove the accumulator piston and spring.
4. Remove the six nuts securing the two halves of the housing and separate them, removing the brake ring which is spigotted into the two pieces. Lift out the planet carrier assembly. Remove the clutch sliding member complete with the thrust ring and bearing, the sun-wheel and thrust washers. Take out the inner member of the uni-directional clutch, the rollers, cage, etc.
5. If it is necessary to remove the planet gears from the carrier, the three Mills pins securing the planet bearing shafts must be extracted before the latter can be knocked out.
6. To remove the annulus, first take off the coupling flange at the rear of the unit, remove the speedometer gear, and drive out the annulus from the back. The front bearing will come away on the shaft leaving the rear bearing in the housing.

INSPECTION

Each part should be thoroughly inspected after the unit is dismantled and cleaned to ensure what parts should be replaced. It is important to appreciate the difference between parts which are worn sufficiently to affect the operation of the unit and those which are merely " worn-in ".

1. Inspect the front casing for cracks, damage, etc. Examine the bores of the operating cylinders and accumulator for scores and wear. Check for leaks from the plugged ends of the oil passages. Ensure that the blanking plug beneath the accumulator bore is tight and not leaking. Inspect the support bushes in the centre bore for leaks.
2. Examine the clutch sliding member assembly. Ensure that the clutch linings are not burned or worn. Inspect the pins for clutch springs and bridge pieces and see that they are tight in the thrust ring and not disturbed. Ensure that the ball bearing is in good condition and rotates freely. See that the sliding member slides easily on the splines of the sun-wheel.
3. Inspect the clutch springs for distortion.
4. Inspect the teeth of the gear train for damage. If the sun-wheel or planet bushes are worn the gears will have to be replaced since it is not possible to fit new bushes in service because they have to be bored to the pitch line of the teeth.
5. Inspect steel and bronze thrust washers.
6. Inspect the uni-directional clutch. See that the rollers are not chipped and that the inner and outer members of the clutch are free from damage. Make sure that the outer member is tight in the annulus. Ensure that the spring is free from distortion.
7. Inspect the ball bearings on the output shaft and see that there is no roughness when they are rotated slowly.

8. Inspect the mainshaft splines for nicks and burrs. See that the oil holes are open and clean.

9. Inspect the oil pump for wear on the pump plunger and roller pin. Ensure that the plunger spring is not distorted. Inspect the valve seat and ball and make sure that they are free from nicks and scratches.

10. Inspect the operating valve for distortion and damage and see that it slides easily in its bore in the front casing.

RE-ASSEMBLING THE OVERDRIVE

The unit can be re-assembled after all the parts have been thoroughly cleaned and checked to ensure that none are damaged or worn.

1. Assemble the annulus into the rear casing, not forgetting the spacing washer which fits between a shoulder on the shaft and the rear ball bearing. This washer is available in different thicknesses for selective assembly and should allow no end float of the annulus (output shaft) and no pre-loading of the bearings.

   Selective washers are furnished in the following sizes :

Jaguar Part No.	Size
C.5981	.146"±.0005" (3.70 mm.±0.013 mm.)
C.5694	.151"±.0005" (3.83 mm.±0.013 mm.)
C.5695	.156"±.0005" (3.95 mm.±0.013 mm.)
C.5696	.161"±.0005" (4.07 mm.±0.013 mm.)
C.5697	.166"±.0005" (4.20 mm.±0.013 mm.)

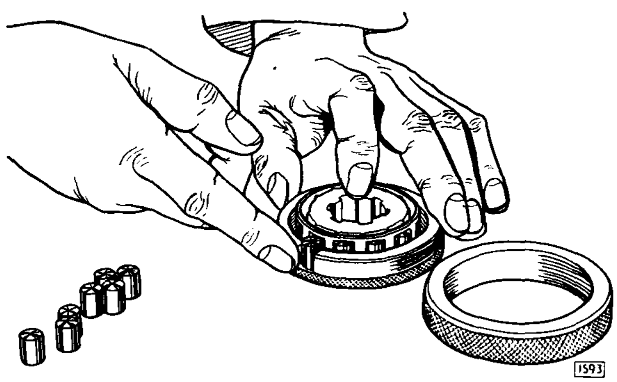


Fig. 27. Assembly of the uni-directional clutch (Tool No. L.178).

2. Replace the thrust washer and uni-directional clutch inner member with its rollers and cage. A fixture (Fig. 27) is needed for retaining the rollers in position when assembling the clutch. Ensure that the spring is fitted correctly, so that the cage urges the rollers up the ramps on the inner member.

3. Fit the pump cam on to gearbox mainshaft, offer up the front housing to the gearbox rear extension and secure temporarily with two nuts. In order to determine the amount of end float of the sun-wheel which should be .008" to .014" (.20 to .35 mm.), an extra thrust washer of known thickness should be assembled with the two normally used in front of the sun-wheel.

4. Fit the planet carrier, with its planet gears, over the sun-wheel with the marked teeth of the planets radially outwards as shown in Fig. 28 and with the assembly in this position offer it up to the annulus.

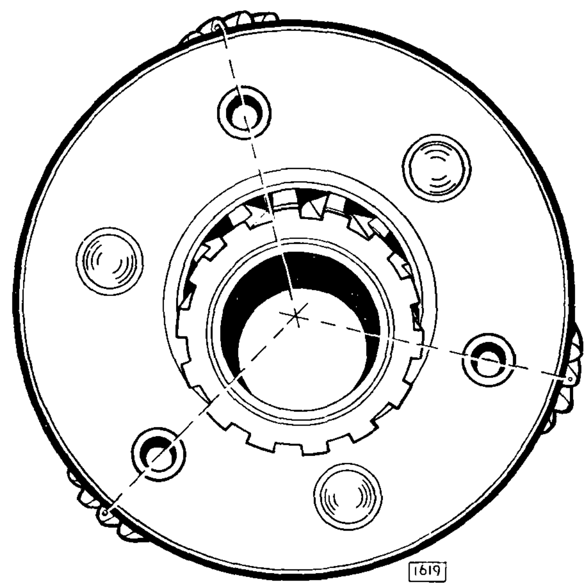


Fig. 28. Assembly of the planet gears—note the positions of the marked teeth.

5. Assemble the brake ring to the front casing, then offer up the front and rear assemblies, leaving out the clutch sliding member with its springs, etc. The gap between the flanges of the brake ring and rear casing should be measured. This gap will be less than the thickness of the extra thrust washer by the amount of end float of the sun-wheel. If this is between the limits specified the unit may be stripped down again and re-assembled without the extra thrust washer. The clutch sliding member, bridge pieces, etc., must then be replaced.

6. If the indicated end float is more or less than that required it must be adjusted by replacing the steel thrust washer at the front of the sun-wheel by one of less or greater thickness, as required. Washers of varying thicknesses are stocked for this purpose. Seven sizes are available, as follows :

Jaguar Part No.	Size
C.5943	.113"—.118" (2.87 mm.—2.99 mm.)
C.5944	.107"—.104" (2.71 mm.—2.64 mm.)
C.5945	.101"—.102" (2.55 mm.—2.58 mm.)
C.5946	.095"—.096" (2.41 mm.—2.44 mm.)
C.5947	.089"—.090" (2.25 mm.—2.28 mm.)
C.5948	.083"—.084" (2.10 mm.—2.13 mm.)
C.5949	.077"—.078" (1.95 mm.—1.98 mm.)

7. Care must be taken to ensure that the thrust washers at the front and rear of the sun-wheel are replaced in their correct positions. At the front of

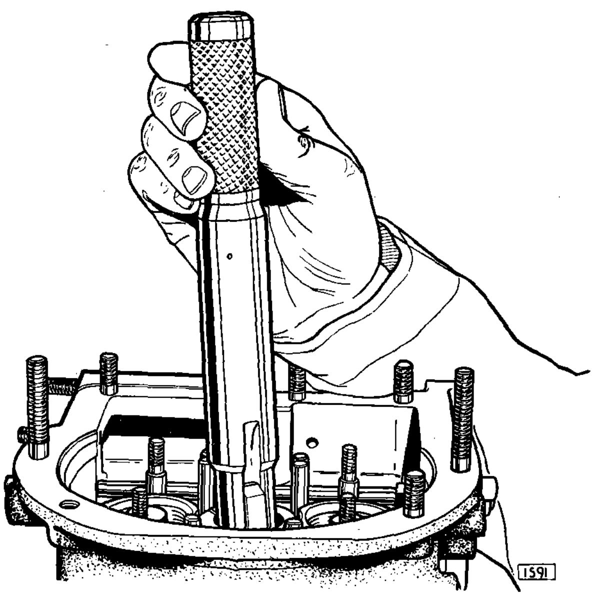


Fig. 29. Aligning the splines (Tool No. L.185A).

the sun-wheel the steel washers fit next to the head of the support bush in the housing and the bronze washer between the steel one and the sun-wheel. At the rear the steel washer is sandwiched between the two bronze washers. The latter are similar and their positions interchangeable. It is essential when assembling the gear train to ensure that the planets are turned to their correct relative positions as shown in Fig. 28.

REFITTING THE OVERDRIVE TO THE GEARBOX

1. Place the overdrive unit upside down in a vice.
2. Fit the oil pump operating cam on the gearbox mainshaft with the long plain end facing the gearbox, and with the back of the cam towards the bottom of the casing.
3. Ensure that the splines in the uni-directional clutch and planet carrier are in alignment. These splines are visible at the bottom of the bore in the overdrive unit. If alignment is necessary, use the dummy mainshaft as shown in Fig. 29.

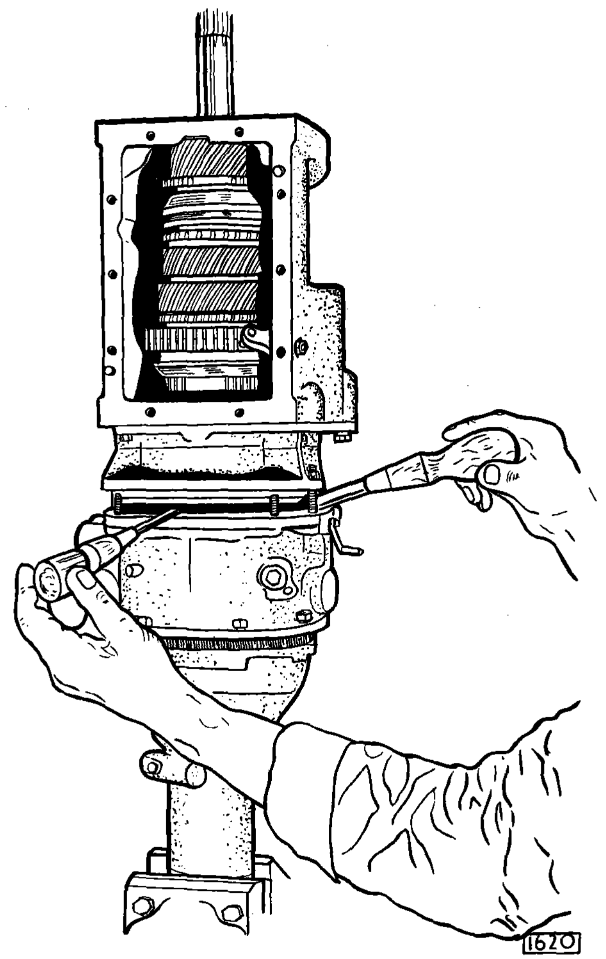


Fig. 30. When fitting the overdrive to the gearbox, compress the oil pump plunger and align the operating cam with the plunger roller.

4. Engage a gear, turn the gearbox up on end and enter the mainshaft into the overdrive unit. Turn the constant pinion shaft until the splines engage.
5. Ensure that clutch springs are over their respective bosses on the gearbox rear extension. Press the gearbox down to test the cushioning of springs.

6. Fit two nuts to the long studs and tighten up until there is approximately $\frac{3}{4}''$ (19.05 mm.) gap between the overdrive casing and the gearbox rear extension, meanwhile **ensuring that the oil pump cam does not drop down off the splines on the mainshaft.**
7. Enter two screwdrivers into the gap between the overdrive casing and the gearbox rear extension, with one, compress the oil pump plunger, and with the other, lever the cam down into alignment with the plunger roller (Fig. 30).
8. Tighten the two nuts on the long studs by equal amounts until the remaining five nuts can be started. Fully tighten the seven nuts by turning by equal amounts.

COMPONENTS

BEFORE COMMENCING ANY DISMANTLING OPERATIONS IT IS IMPORTANT THAT THE HYDRAULIC PRESSURE IS RELEASED FROM THE SYSTEM. DO THIS BY OPERATING THE OVERDRIVE 10—12 TIMES.

With the ignition switched on and the gear lever in top gear position operate the overdrive switch when the solenoid will be heard to energise.

THE OPERATING VALVE

Having gained access to the unit by removing the gearbox cowling unscrew the valve plug and remove the spring and plunger. The ball valve will then be seen inside the valve chamber (Fig. 31).

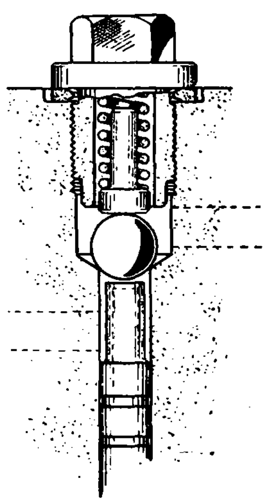


Fig. 31. The operating valve.

The ball should be lifted $\frac{1}{32}''$ (0.79 mm.) off its seat when the overdrive control is operated. If the ball does not lift by this amount the fault lies in the control mechanism. Located on the right-hand side of the unit, and pivoting on the valve operating cross shaft which passes right through the housing is a valve setting lever. In its outer end is a $\frac{3}{16}''$ (4.76 mm.) diameter hole which corresponds with a similar hole in the housing when the unit is in overdrive (i.e. when the ball is lifted $\frac{1}{32}''$ (0.79 mm.) off the valve seat). If the two holes do not line up it will be necessary to adjust the control mechanism.

To adjust, remove the solenoid bracket cover plate on the opposite side of the overdrive front casing. Slacken the clamp bolt securing the valve operating lever to the valve operating cross shaft. Rotate the shaft until the $\frac{3}{16}''$ (4.76 mm.) diameter rod can be inserted through the valve setting lever into the corresponding hole in the casing (Fig. 33) and tighten the clamp bolt. Check lift of ball after adjustment.

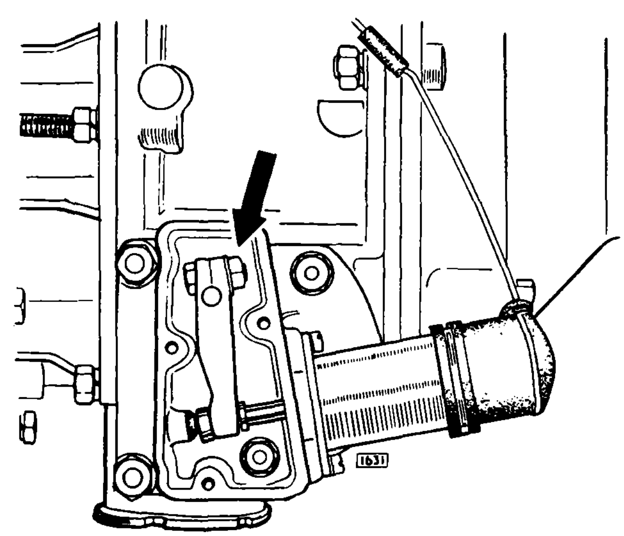


Fig. 32. Valve operating lever clamp bolt.

A small magnet will be found useful for removing the ball from the valve chamber. The valve can be

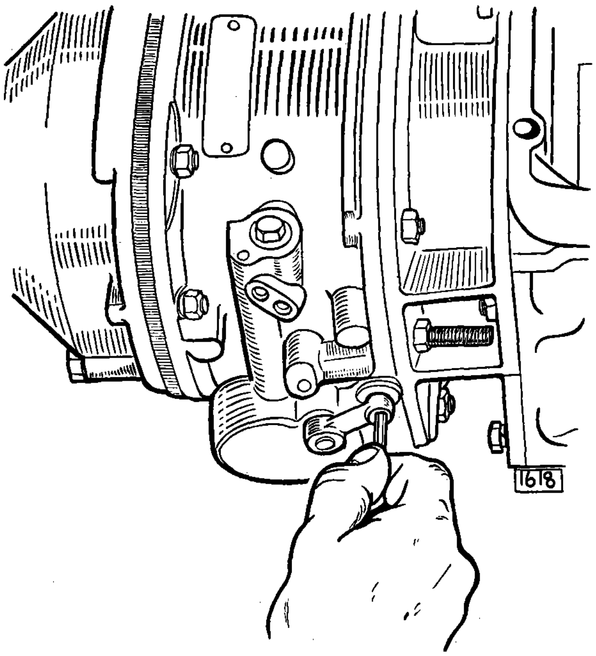


Fig. 33. Aligning the hole in the valve setting lever with the corresponding hole in the housing.

withdrawn by inserting the point of a pencil into the top, but care must be taken not to damage the ball seating at the end of the valve.

Near the bottom of the valve will be seen a small hole breaking through to the centre drilling. This is the jet for restricting the exhaust of oil from the operating cylinders. Ensure that this jet is not choked.

If the ball valve is not seating correctly the ball should be tapped sharply on to its seat using a copper drift for the purpose.

THE HYDRAULIC SYSTEM

If the unit fails to operate and the ball valve is found to be seating and lifting correctly check that the pump is functioning.

Jack up both rear wheels of the car, then with the engine ticking over and the valve plug removed, engage top gear. Watch for oil being pumped into the valve chamber. If none appears, then the pump is not functioning.

The pump (Fig. 34) is of the plunger type and delivers oil via a non-return valve to the accumulator. Possible sources of trouble are (1) failure of the non-return valve due to foreign matter on the seat or to a broken valve spring and (2) breakage of the spring holding the pump plunger in contact with the cam.

The pump is self-priming but failure to deliver oil after the system has been drained and refilled indicates that the air bleed is choked, causing air to be trapped inside the pump.

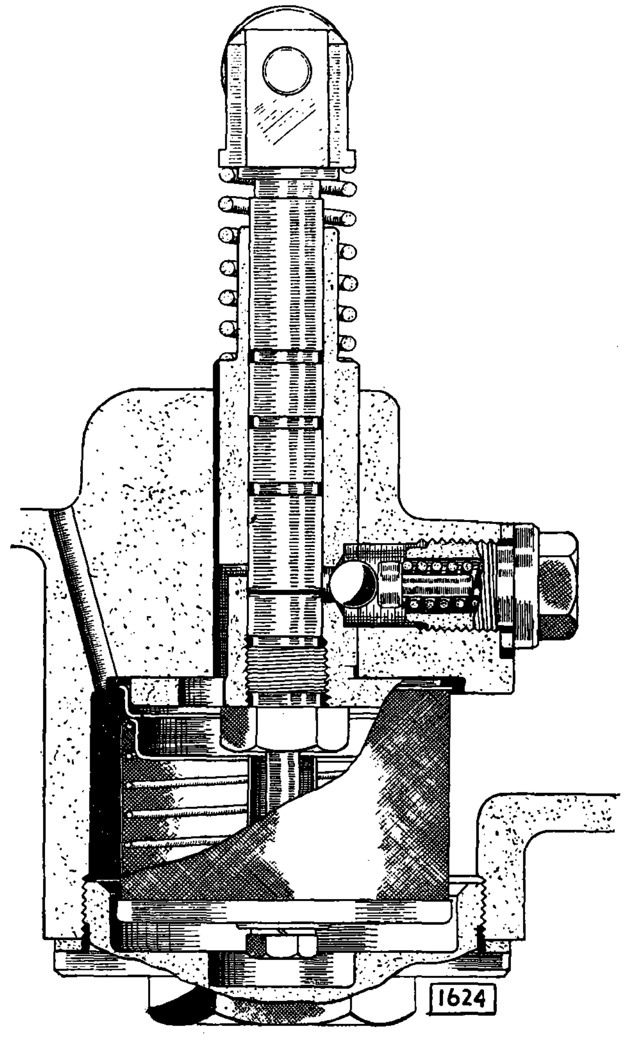


Fig. 34. The oil pump.

In the unlikely event of this happening it will be necessary to remove the pump and clean the flat on the pump body and the bore of the casting into which it fits.

THE PUMP VALVE

Access to the pump is gained through a cover on the left-hand side of the unit. Proceed as follows :—

1. Remove drain plug and drain off oil.
2. Remove cover from solenoid bracket.
3. Remove solenoid body.
4. Slacken off clamping bolt in operating lever and remove lever complete with solenoid plunger.
5. Remove distance collar from valve operating shaft.

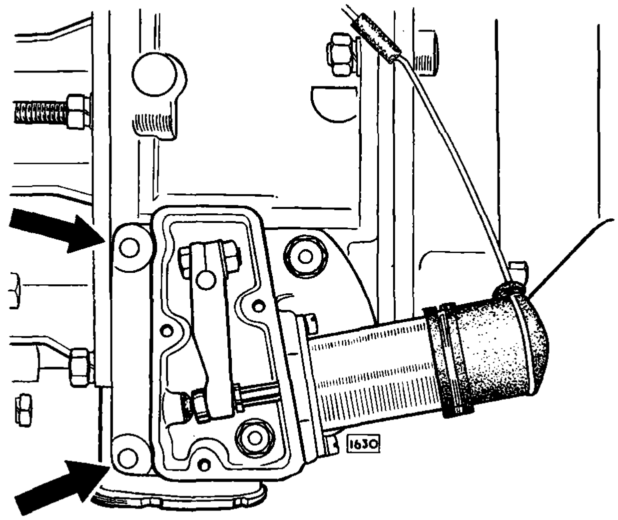


Fig. 35. Removing the solenoid bracket—remove the nuts from the studs before unscrewing the two setscrews.

6. The solenoid bracket is secured by two $\frac{5}{16}$" (7.94 mm.) diameter studs and two $\frac{5}{16}$" (7.94 mm.) diameter bolts, the heads of which are painted red (see Fig. 35). REMOVE THE NUTS FROM THE STUDS BEFORE TOUCHING THE BOLTS. THIS IS IMPORTANT. The two bolts should now be slackened off together, releasing the tension on the accumulator spring.
7. Remove the solenoid bracket.
8. Unscrew the valve cap and take out the spring, plunger and ball.

Re-assembly is the reverse of the above operations. Ensure that the soft copper washer between the valve cap and pump housing is nipped up tightly to prevent oil leakage.

Reset the valve operating lever, proceeding as follows: Before clamping up the valve operating lever and replacing the solenoid bracket cover, rotate the valve operating shaft until a $\frac{3}{16}$" (4.76 mm.) diameter pin can be inserted through the valve setting lever into the corresponding hole in the casing (Fig. 33). Leave the pin in position, locking the unit in the " overdrive " position. Lift the solenoid plunger up to the full extent of its stroke (i.e. to its energised position) and clamp up the operating lever.

Remove the pin through the setting lever and operate the lever manually to check that the control operates easily.

Check that when the solenoid is energised, the hole in the valve setting lever corresponds with the hole in the casing. After ensuring that the setting is correct, replace the cover of the solenoid bracket.

THE PUMP

Dismantling

1. Remove drain plug and drain off oil.
2. Remove pump valve as described above.
3. Remove the filter after unscrewing the securing bolt.
4. Take out the two cheese head screws securing the pump body flange and extract the pump body A special extractor tool (Fig. 36) is available for this purpose. This screws into the bottom of the pump body in place of the screwed plug.

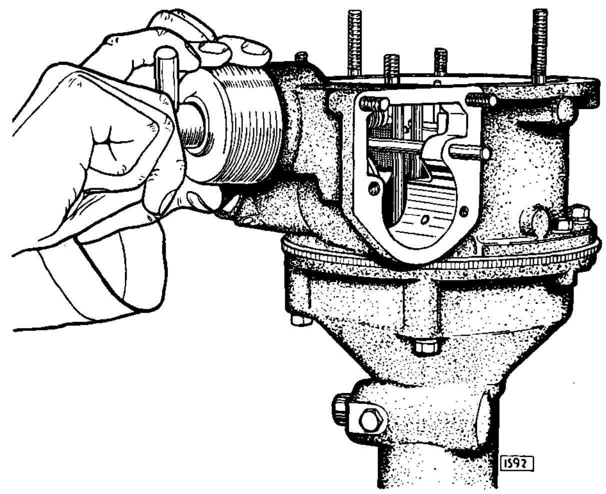


Fig. 36. Extracting the oil pump (Tool No. L.183A).

Assembling

Replace the plug in the bottom of the pump body ensuring that it is screwed home tightly. Line up the pump body so that the inlet port and holes for

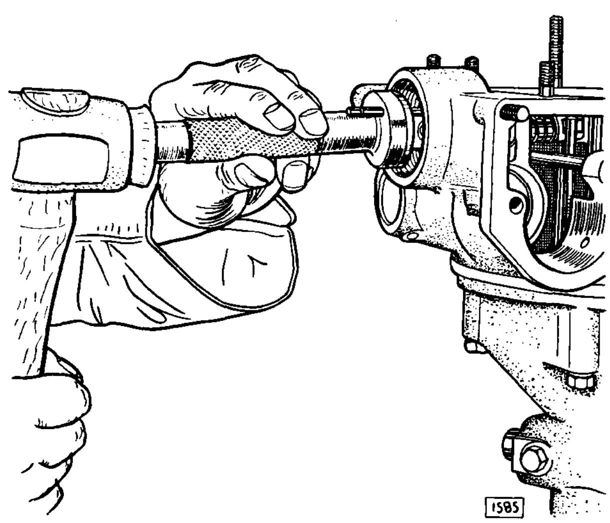


Fig. 37. Replacing the oil pump (Tool No. L.184).

the securing screw register with the corresponding holes in the housing and tap the pump body home.

The pump plunger is prevented from rotation when in position by a guide peg carried in the front casing. When assembling the pump, the plunger should be inserted with the flat on its head facing the rear of the unit. It is possible to guide it past the guide peg by means of a screwdriver inserted through the side of the casing.

HYDRAULIC PRESSURE

The required hydraulic pressures are as follows :—

2.4 litre	350—370 lbs. per sq. in. (24.62—26.01 kg./cm^2).
3.4 litre	420—440 lbs. per sq. in. (29.53—30.93 kg./cm^2.)
3.8 litre	540—560 lbs. per sq. in. (37.97—39.37 kg./cm^2).

Hydraulic test equipment is available from V. L. Churchill & Co. Ltd. (see page F.35). The pipe union should be screwed into the overdrive casing after removing the operating valve plug.

Low pressure often indicates leakage or a broken accumulator spring.

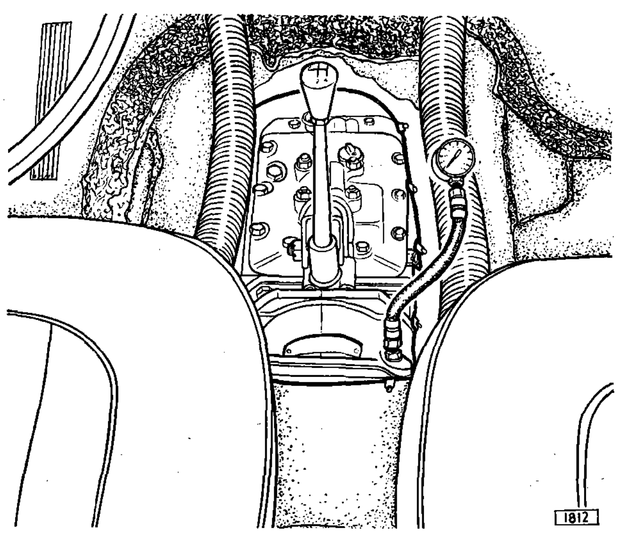


Fig. 38. Checking the overdrive hydraulic pressure utilising the Churchill tool No. L.188

THE ACCUMULATOR PISTON AND SPRING

Removal

1. Proceed as described in operations 1 to 7 in the paragraph headed " The Pump Valve ".
2. The accumulator spring or springs in the instance of the 3.8 litre model, followed by the piston housing assembly and piston can now be withdrawn (see Fig. 39).

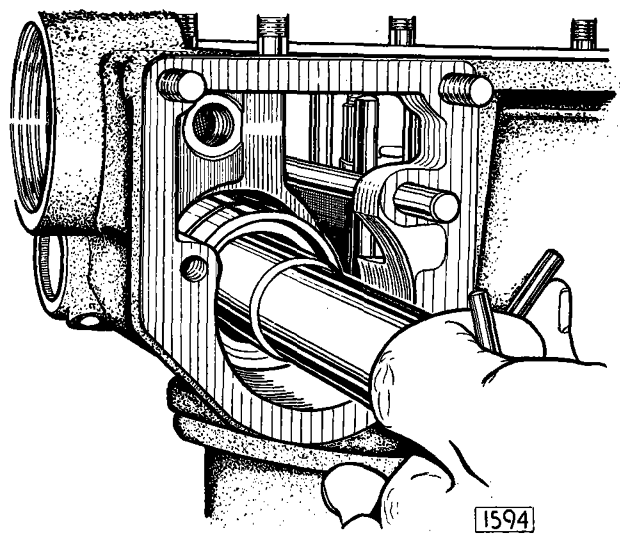


Fig. 39. Extracting the accumulator piston housing.

3. Withdraw the piston from the piston housing. It is important to appreciate that correct fitting of the piston rings is of vital importance to the efficient working of the unit. Check that the rings are not gummed up due to use of an unsuitable lubricant or have excessive clearance in the

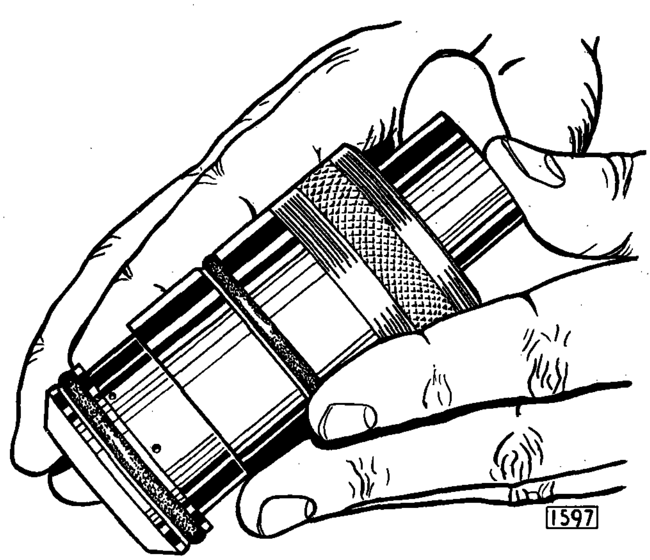


Fig. 40. Fitting the accumulator piston

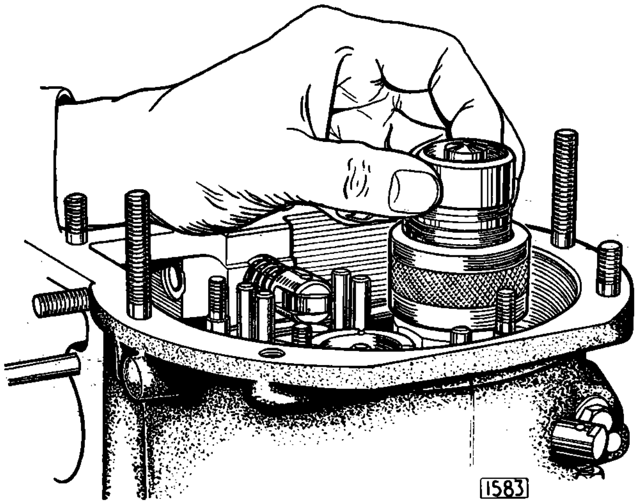


Fig. 41. Fitting an operating piston (Tool No. L.180).

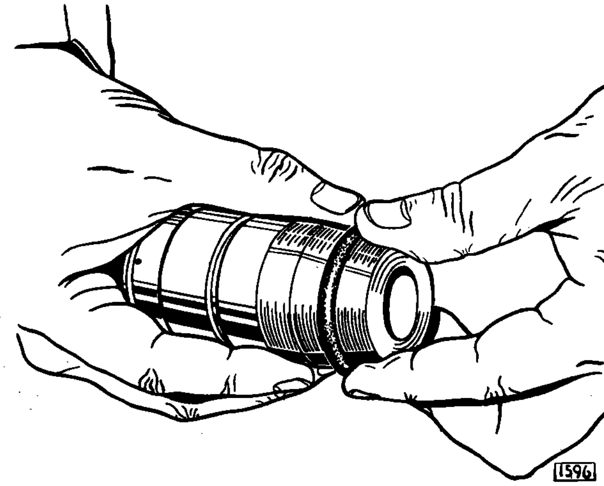


Fig. 42. Fitting an ' O ' ring to the accumulator piston.

grooves. Check also that the rubber ' O ' rings on the piston housing are not damaged. It is advisable to renew all ' O ' rings each time the unit is stripped down.

THE CONTROL SYSTEM

The solenoid, which actuates the overdrive, is controlled by two switches ; a manual switch, mounted in the facia panel and a top-gear switch mounted on the gearbox cover which will only close when top gear is selected.

To enable a change into overdrive to be made :

(1). The car must be in top gear.

(2). The driver must operate the manual switch.

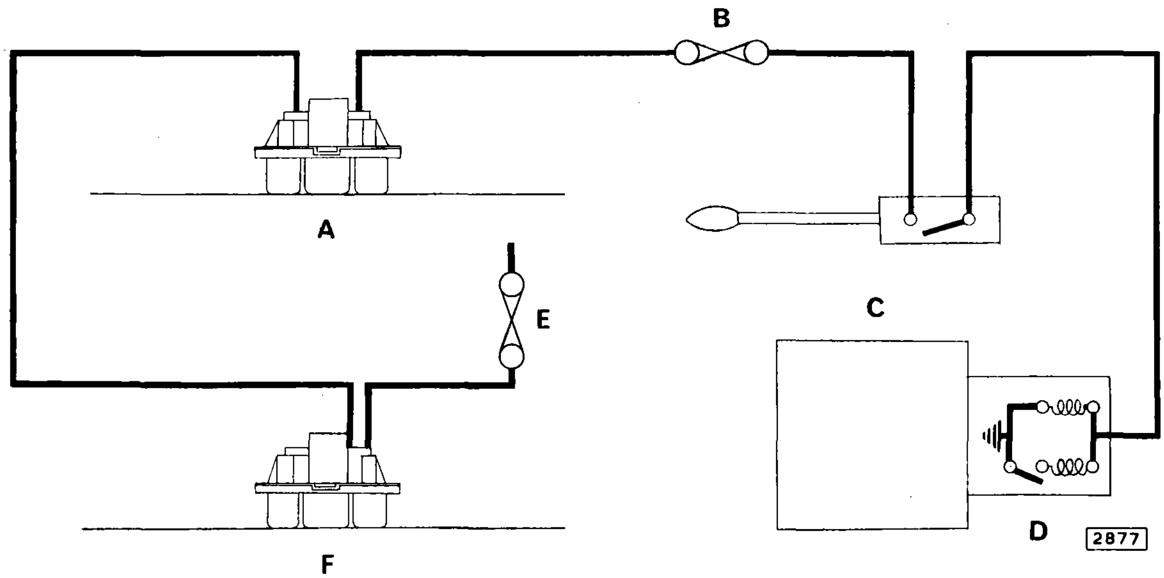


Fig. 43. Circuit diagram.

Wiring Circuit

This is a simple circuit where the control switch is connected in series between the top gear switch and the solenoid. On later cars control switch operates a red warning light situated in the quadrant behind the steering wheel.

Operation of the solenoid is effected when the switches are closed.

Operating Solenoid

The solenoid is made up of a soft iron plunger, a holding coil of high resistance, a closing coil of low resistance and a pair of normally closed contacts. These contacts are connected in series with the closing coil.

When the contacts of the relay close or when both the manual switch and the top gear switch are closed, both coils in the solenoid become energised and actuate the soft iron plunger. Movement of the plunger opens the solenoid internal switch and cuts the low resistance closing coil, the magnetism due to the high resistance coil alone being sufficient to keep the plunger in the overdrive position.

Note : The normal current consumption of the system should be approximately 1.0—1.5 amperes. A defective solenoid will be accompanied by a current of approximately 18—20 amperes.

FAULT FINDING

When an overdrive unit does not operate properly it is advisable first to check the level of oil and, if below the low level mark, top up with fresh oil and test the unit again before making any further investigations.

Faulty units should be checked for defects in the order listed below.

Should the electrical control not operate, the electrical circuits should be checked from the diagram.

Overdrive does not engage

1. Insufficient oil in the gearbox.
2. Electric control not operating.
3. Leaking operating valve due to foreign matter on ball seat or broken valve spring.
4. Pump not working due to choked filter.
5. Pump not working due to broken pump spring.
6. Leaking pump non-return valve due to foreign matter on ball seat or broken valve spring.
7. Insufficient hydraulic pressure due to leaks or broken accumulator springs.
8. Damaged gears, bearings or shifting parts within the unit requiring removal and inspection of the assembly.

Overdrive does not release.

IMPORTANT : If the overdrive does not release, do NOT reverse the car, otherwise extensive damage may be caused.

1. Electric control not operating.
2. Blocked restrictor jet in operating valve.
3. Sticking clutch.
4. Damaged parts within the unit necessitating removal and inspection of the assembly.

Clutch slip in overdrive.

1. Insufficient oil in gearbox.
2. Worn clutch lining.
3. Insufficient hydraulic pressure due to leaks.

Clutch slip in reverse or freewheel condition on overrun

1. Worn clutch lining.
2. Blocked restrictor jet in operating valve.
3. Insufficient pressure on clutch due to broken clutch springs.

SERVICE TOOLS

The following tools for servicing the overdrive unit are obtainable from V. L. Churchill & Co. Ltd., Great South West Road, Bedfont, Feltham, Middlesex.

Part No.	Description
L.176A	Drive Shaft Oil Seal Remover.
L.177A	Drive Shaft Oil Seal Replacer and cone clutch and spring thrust housing dismantling tool.
L.178	Freewheel Assembly Ring.
L.179	Piston and Ring Fitting Tool (2.4/3.4 litre models).
L.180	,, ,, ,, ,, ,, (3.8 litre model).
L.181	Accumulator 'O' Ring Fitting Tool (2.4/3.4 litre models).
L.217	,, ,, ,, ,, ,, (3.8 litre model).
L.182-1	Accumulator Piston Housing Remover (2.4/3.4/3.8 litre models).
L.183A	Pump Barrel Remover.
L.184	Pump Barrel Replacer.
L.185A	Dummy Drive Shaft.
L.186	Mainshaft Bearing Replacer.
L.188	Hydraulic Test Equipment.
J.3	Drain Plug Remover.

SUPPLEMENTARY INFORMATION TO SECTION F "GEARBOX AND OVERDRIVE"

covering

ALL-SYNCHROMESH GEARBOX AND "A" TYPE COMPACT OVERDRIVE

GEARBOX AND OVERDRIVE

Commencing Chassis Number

	R.H. Drive	L.H. Drive
2.4 Litre	119200	127822
3.4 Litre	169341	180188
3.8 Litre	234125	224150

Commencing at the above chassis numbers, Mark 2 cars are fitted with all synchromesh gearbox. This gearbox cannot be used as a replacement for the earlier unit.

Description

The gearbox is of the four speed type with a baulk-ring synchromesh on all four forward gears. With the exception of the reverse, the detents for the gears are incorporated in the synchro assemblies, the three synchro balls engaging with grooves in the operating sleeve. The detent for reverse gear is a spring loaded ball which engages in a groove in the selector rod.

Two interlock balls and a pin located at the front of the selector rods prevent the engagement of two gears at the same time.

The gears are pressure fed at approximately 5 lb. per sq. in. from a pump driven from the rear of the main-shaft on standard transmission cars and pressure fed by overdrive oil pump on overdrive cars.

DATA

Identification Number JC 001 onwards

Ratios :—

1st Gear	3.04 : 1
2nd Gear	1.973 : 1
3rd Gear	1.328 : 1
4th Gear	1.00 : 1
Reverse	3.49 : 1

1st gear—end float on mainshaft .005″ to .07″ (.13 -.18 mm.)

2nd gear—end float on mainshaft .005″-.008″ (.13 -.20 mm.)

3rd gear—end float on mainshaft .005″-.008″ (.13 -.20 mm.)

Countershaft gear unit end float .004″-.006″ (.10 -.15 mm.)

	Gearbox Ratios All Models	Overall Ratios		Overall Ratios (Overdrive models)	
		2.4 litre	3.4 and 3.8 litre	2.4 litre	3.4 and 3.8 litre
Gearbox prefix	J.C. (Standard Transmission)				
	J.C.N. (Overdrive)				
First & Reverse	3.04 : 1	12.98 : 1	10.76 : 1	13.83 : 1	11.46 : 1
Second	1.973 : 1	8.42 : 1	6.98 : 1	8.98 : 1	7.44 : 1
Third	1.328 : 1	5.67 : 1	4.7 : 1	6.04 : 1	5.0 : 1
Top (4th)	1 : 1	4.27 : 1	3.54 : 1	4.55 : 1	3.77 : 1
Overdrive	0.778 : 1			3.54 : 1	2.93 : 1
Axle Ratio		4.27 : 1	3.54 : 1	4.55 : 1	3.77 : 1

ROUTINE MAINTENANCE

EVERY 2,500 MILES (4,000 KM.)

Gearbox Oil Level

Check the level of the oil in the gearbox with the car standing on level ground.

A combined level and filler plug is fitted on the left hand side of the gearbox. Clean off any dirt from around the plug before removal.

The level of oil should be to the bottom of the filler and level plug.

Overdrive Oil Level—Important

The oil for the lubrication and operation of the overdrive is fed from the gearbox casing and therefore checking the gearbox oil level will also check the level of oil in the overdrive unit, but as this unit is hydraulically controlled, extra attention should be paid to exercising absolute cleanliness when replenishing with oil. It is also important that the oil level is not allowed to fall appreciably otherwise the operation of the overdrive will be affected.

EVERY 10,000 MILES (16,000 KM.)

Changing the Gearbox Oil

The draining of the gearbox oil should be carried out at the end of a run when the oil is hot and therefore will flow more freely. The drain plug is situated at the front of the gearbox casing.

After all the oil has been drained, replace the drain plug and refill the gearbox with the recommended grade of oil through the combined filler and level plug hole situated on the left hand side of the gearbox casing; the level should be to the bottom of the hole.

Overdrive Oil Changing

The oil for the overdrive is common to that of the gearbox, but draining the oil from the gearbox will not drain the overdrive unit.

When draining the gearbox, remove the filter plug (situated in the side of the overdrive), the filter and the magnetic washers. Thoroughly wash the filter and magnetic washers.

When dry, refit the filter, magnetic washers and filter plug. Fully tighten the filter plug and refill the gearbox and overdrive unit through the gearbox filler and level plug hole.

Recheck the level after the car has been run, as a certain amount of oil will be retained in the hydraulic system of the overdrive.

Particular attention should be paid to maintaining absolute cleanliness when filling the gearbox and overdrive with oil as any foreign matter that enters will seriously affect the operation of the overdrive.

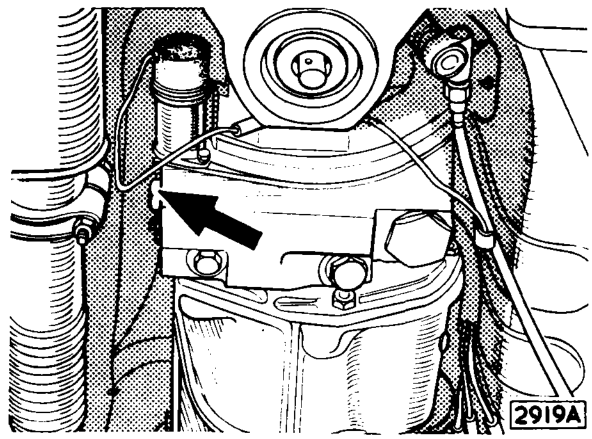


Fig. 44. Overdrive filter plug.

RECOMMENDED LUBRICANTS

Mobil	**Castrol**	**Shell**	**Esso**	**B.P.**	**Duckham**	**Regent Caltex/ Texaco**
Mobilube GX.90	Castrol Hypoy	Spirex 90 E.P.	Esso Gear Oil G.P.90/140	Gear Oil S.A.E. 90 E.P.	Hypoid 90	Multigear Lubricant B.P.90

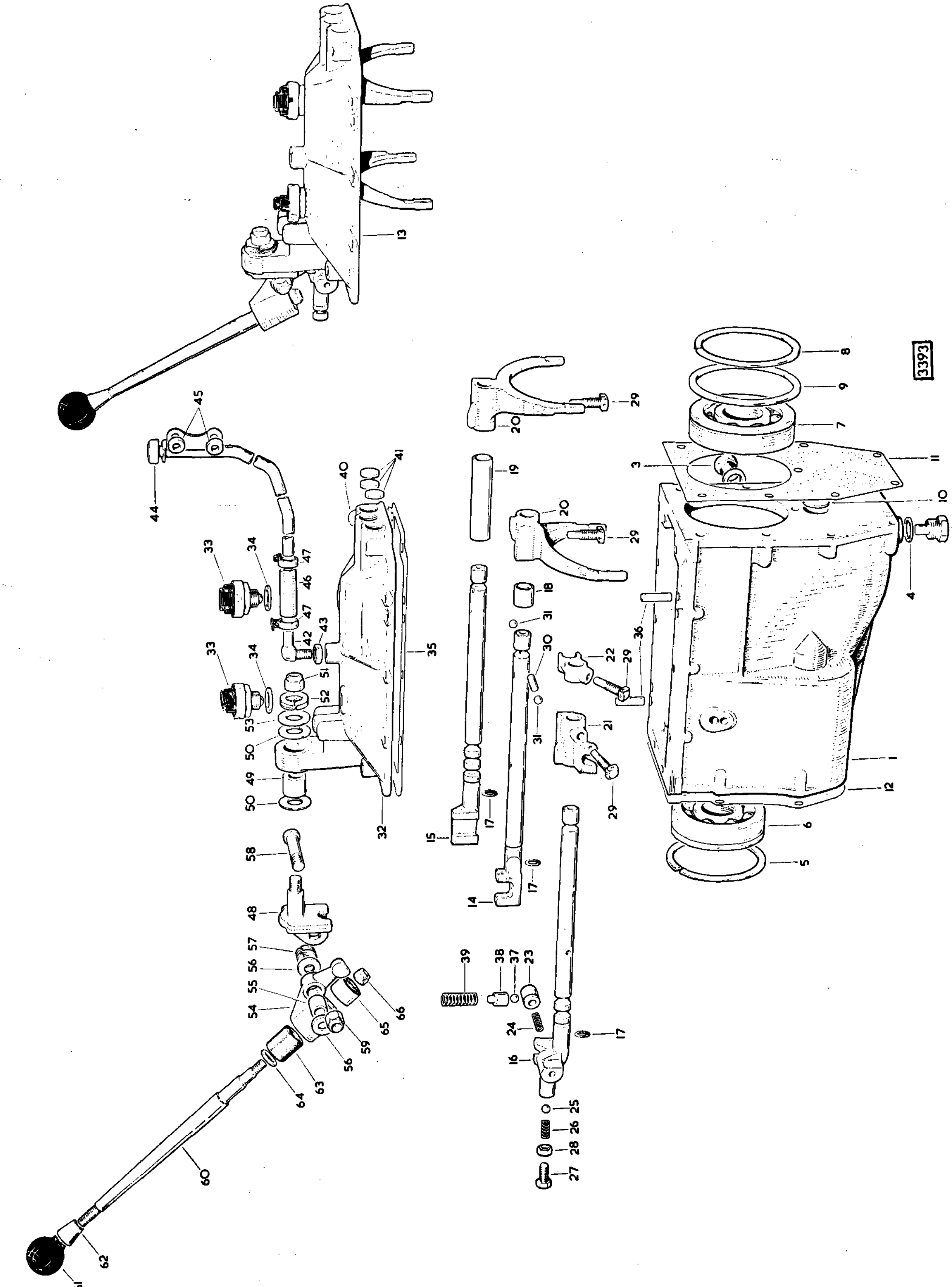


Fig. 45. Exploded view of gearbox and top cover.

1. Gearbox casing
2. Oil drain plug
3. Oil filter plug
4. Fibre washer
5. Circlip
6. Ball bearings
7. Ball bearing
8. Circlip
9. Collar
10. Fibre washer
11. Gasket
12. Gasket
13. Remote control
14. Striking rod, 1st/2nd gears
15. Striking rod, 3rd/top gears
16. Striking rod, reverse gear
17. "O" ring
18. Stop
19. Stop
20. Change speed fork
21. Change speed fork
22. Locating arm
23. Plunger
24. Spring
25. Ball
26. Spring
27. Set screw
28. Nut
29. Dowel screw
30. Roller
31. Ball
32. Top cover
33. Switch
34. Gasket
35. Gasket
36. Dowel
37. Ball
38. Plunger
39. Spring
40. Spring
41. Welch washer
42. Breather elbow
43. Nut
44. Gearbox breather assembly
45. Distance piece
46. Hose
47. Clip
48. Pivot jaw
49. Bush
50. Fibre washer
51. Self-locking nut
52. Spring washer
53. "D" washer
54. Selector lever
55. Bush
56. Fibre washer
57. Spring washer
58. Pivot pin
59. Self-locking nut
60. Change speed lever
61. Knob
62. Cone
63. Upper bush
64. Washer
65. Lower bush
66. Self-locking nut

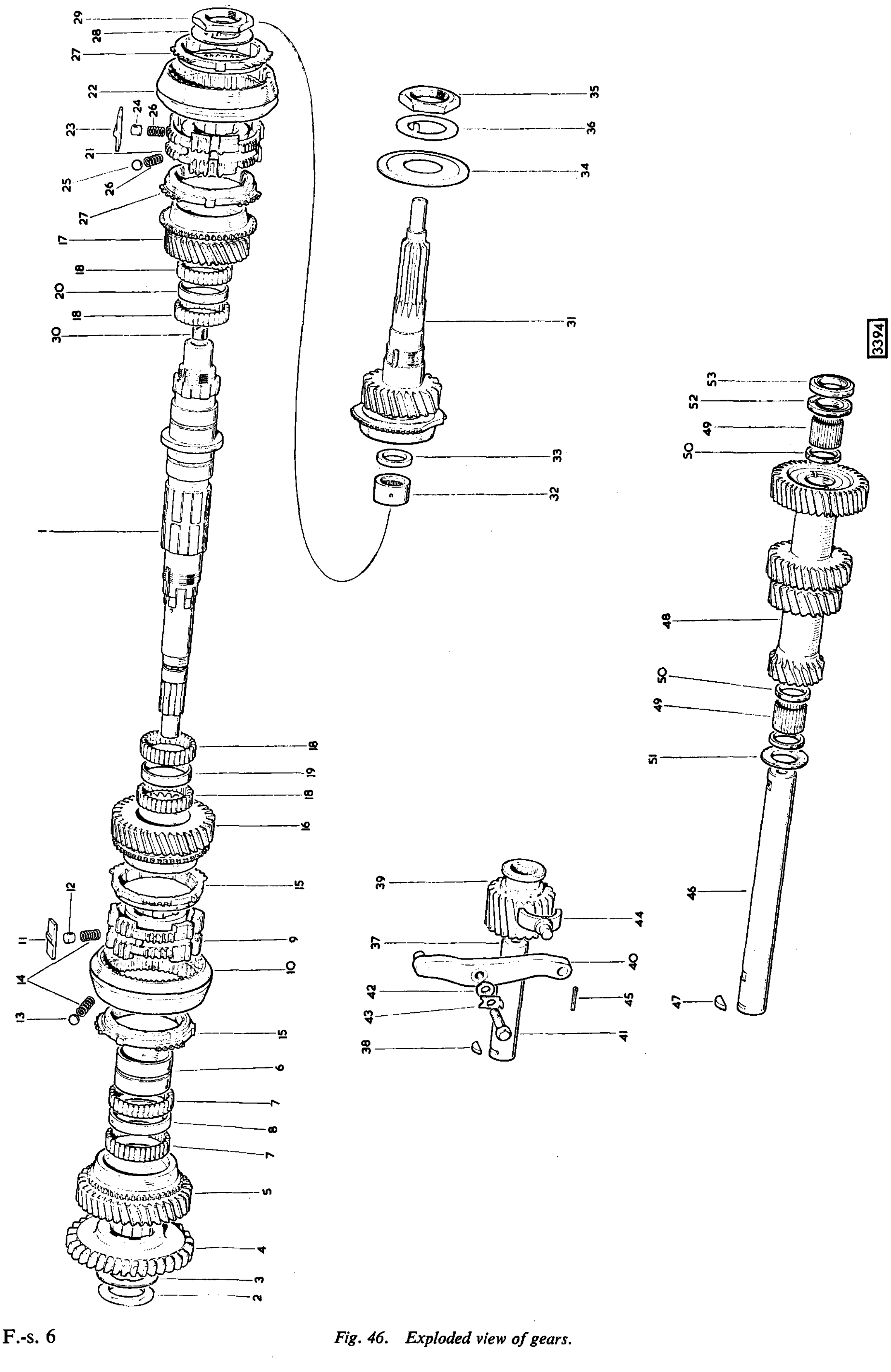


Fig. 46. Exploded view of gears.

1. Mainshaft
2. Nut
3. Tab washer
4. Reverse gear
5. 1st speed gear
6. Bearing sleeve
7. Needle roller
8. Spacer
9. Synchro hub
10. Operating sleeve
11. Thrust member
12. Plunger
13. Detent ball
14. Spring
15. Synchro ring
16. 2nd speed gear
17. 3rd speed gear
18. Needle roller
19. Spacer
20. Spacer
21. Synchro hub
22. Operating sleeve
23. Thrust member
24. Plunger
25. Detent ball
26. Spring
27. Synchro ring
28. Nut
29. Tab washer
30. Plug
31. Constant pinion shaft
32. Roller bearing
33. Spacing
34. Oil thrower
35. Nut
36. Tab washer
37. Reverse spindle
38. Key
39. Reverse idler gear
40. Lever assembly
41. Set screw
42. Fibre washer
43. Tab washer
44. Reverse slipper
45. Split pin
46. Countershaft
47. Key
48. Gear unit (cluster)
49. Needle roller
50. Retaining ring
51. Thrust washer (rear)
52. Thrust washer (front)
53. Thrust washer (outer)

GEARBOX—TO REMOVE AND REFIT

In order to remove the gearbox (and overdrive if fitted) it is necessary to remove the gearbox and engine as an assembly, as described on page B19 of Section "B" Engine.

GEARBOX—TO DISMANTLE

Removal of Clutch Housing

Detach the springs and remove the carbon thrust bearing.

Unscrew the two nuts and remove the clutch slave cylinder.

Unscrew the Allen screw, push out the fulcrum pin and detach the clutch fork.

Tap back the locking tabs, break the locking wire, remove the eight set screws and detach the clutch housing.

Removal of Top Cover

Place the gear lever in neutral.

Remove the eight set screws and two nuts and lift off the cover.

Removal of Rear Extension (Standard Transmission Cars)

Engage first and reverse gears to lock the unit. Tap back the lockwasher and remove the flange nut. Withdraw the flange.

Withdraw the four setscrews and remove the rear cover.

Remove the speedometer pinion and bush assembly after unscrewing the retaining bolt.

Remove the six setscrews and withdraw the extension.

Collect the distance piece, oil pump driving pin and oil filter.

Removal of Overdrive and Rear Cover

Remove the four short setscrews retaining the overdrive to the adaptor plate and the two long setscrews at the base of the unit.

Remove the seven setscrews retaining the adaptor plate and lift off the plate.

Note : No oil pump or filter is employed on cars fitted with overdrive.

Removal of Oil Pump (Standard Transmission Cars)

From the inside face of the rear extension break the staking and withdraw the three countersunk setscrews securing the oil pump gear housing. Withdraw the housing by entering two of the screws into the tapped holes in the housing ; screw in the two screws evenly until the housing is free.

Mark the gears with marking ink so they can be replaced the same way up in the housing.

Removal of Countershaft

Remove the fibre plug from in front of the countershaft. Drive out the countershaft from the front of the casing.

Important : Ensure that the rear washer, pegged to the casing, drops down in a clockwise direction looking from the rear, to avoid trapping the washer with reverse gear when driving the mainshaft forward. This can be most easily effected by pushing the washer down with a piece of stiff wire bent at right angles.

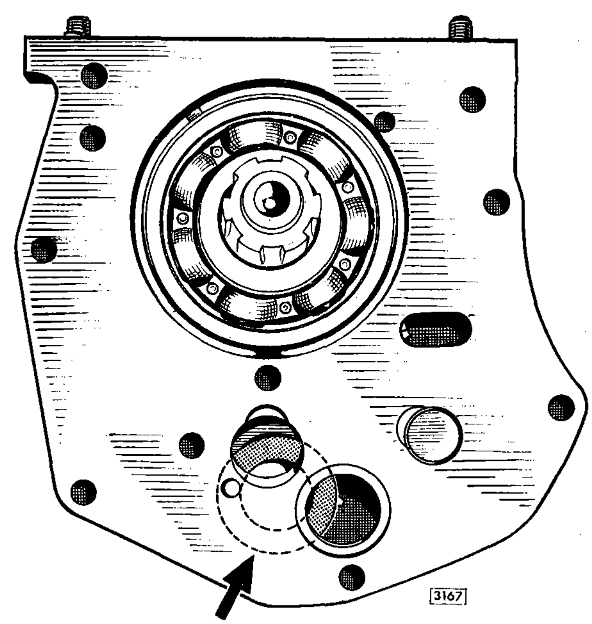


Fig. 47. Ensure that the rear washer (indicated by arrow) drops down in a clockwise direction.

Removal of Constant Pinion Shaft

Rotate the constant pinion shaft until the cutaway portions of the driving gear are facing the top and bottom of the casing otherwise the gear will foul the cluster gear on the countershaft.

With the aid of two levers, ease the constant pinion shaft and front bearing assembly from the casing.

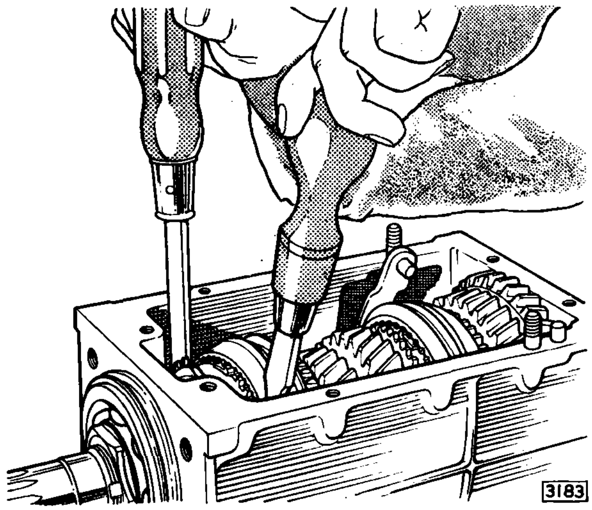


Fig. 48. With the aid of two levers, ease the constant pinion shaft forward.

Removal of Mainshaft

Rotate the mainshaft until one of the cut away portions in the 3rd/top synchro hub is in line with the countershaft, otherwise the hub will foul the constant gear of the countershaft.

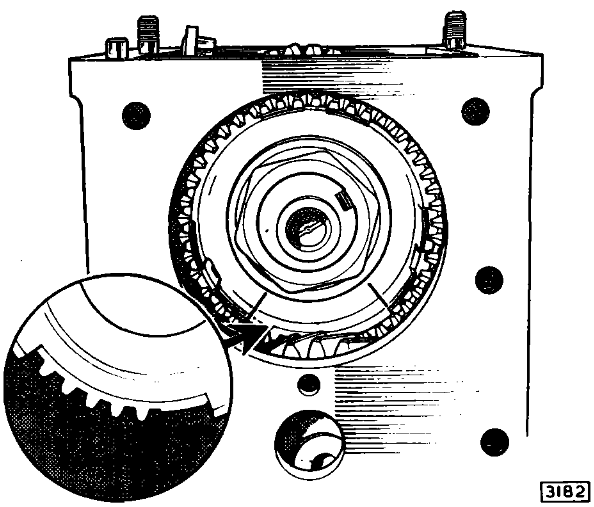


Fig. 49. Rotate the mainshaft until one of the cut away portions of the 3rd/top synchro hub is in line with the countershaft.

Tap or press the mainshaft through the rear bearing ensuring that the reverse gear is kept tight against the first gear.

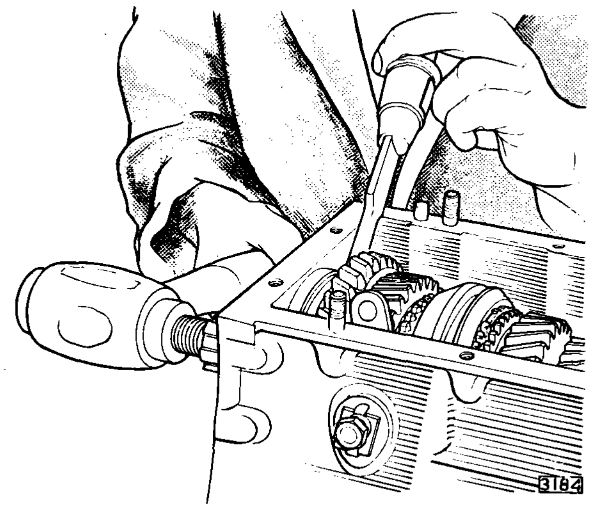


Fig. 50. Tapping the mainshaft through the rear bearing.

Remove the rear bearing from the casing and fit a hose clamp on the mainshaft to prevent the reverse gear from sliding off the shaft.

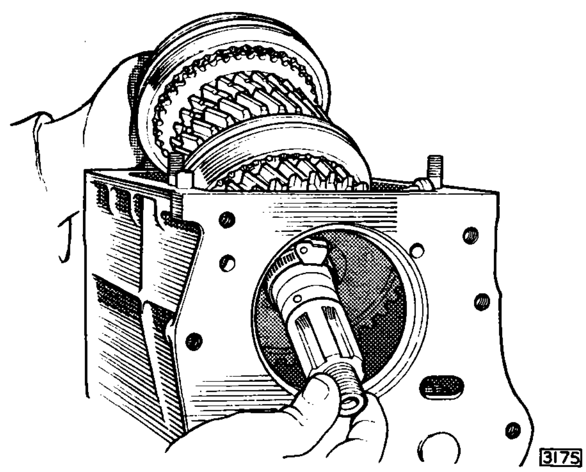


Fig. 51. Removal of the mainshaft. Note the hose clamp fitted to retain reverse gear.

Slacken the reverse lever bolt to allow the lever to be moved freely back and forth.

Lift out the main shaft forward and upward.

Lift out the cluster gear and collect the needle roller bearings and retaining rings.

Withdraw the reverse idler shaft and lift out the gear. Note the locking key on the shaft.

Dismantling the Constant Pinion Shaft Assembly

Remove the roller bearing and spacer from inside the constant pinion shaft.

Tap back the tab washer and remove the large nut, tab washer and oil thrower.

Tap the shaft sharply against a metal plate to dislodge the bearing.

Dismantling the Mainshaft

Note: The mainshaft needle roller bearings are graded in diameter and must be kept in sets for their respective positions.

Remove the hose clip and withdraw reverse gear.

Withdraw first gear and collect the 120 needle rollers, spacer and sleeve.

Withdraw the 1st/2nd synchro assembly and collect the two loose synchro rings.

Remove the 2nd gear and collect the 106 needle rollers. The spacer remains on the mainshaft.

Tap back the tab washer and remove the nut retaining 3rd/top synchro assembly on the mainshaft. Withdraw the assembly and collect the two loose synchro rings.

Withdraw the 3rd gear and collect the 106 needle rollers.

Dismantling the Synchro Assembly

Completely surround the synchro assembly with a cloth and push out the synchro hub from the operating sleeve. Collect the synchro balls and springs, the thrust members, plungers and springs.

Dismantling the Top Cover

Unscrew the self-locking nut and remove the double coil spring, washer, flat washer and fibre washer securing the gear lever to the top cover.

Withdraw the gear lever and collect the remaining fibre washer.

Remove the locking wire and unscrew the selector rod retaining screws.

Withdraw the 3rd/top selector rods and collect the selector, spacing tube and interlock ball. Note the loose interlock pin at the front of the 1st/2nd selector rod.

Withdraw the reverse selector rod and collect the reverse fork, stop spring and detent plunger.

Withdraw the 1st/2nd selector rod and collect the fork and short spacer tube.

GEARBOX REASSEMBLY

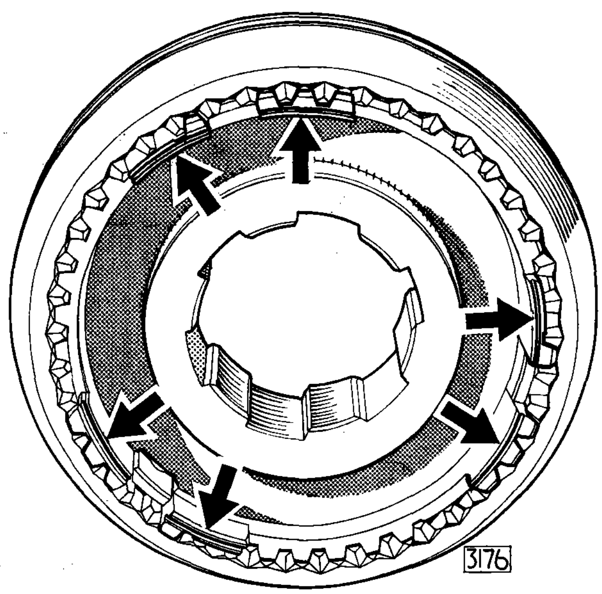


Fig. 52. Identification grooves—3rd/top, synchro assembly.

ASSEMBLING THE SYNCHRO ASSEMBLIES

The assembly procedure for the 1st/2nd and 3rd/Top synchro assemblies is the same.

Note: Although the 3rd/Top and 1st/2nd synchro hubs are similar in appearance they are not identical and to distinguish them a groove is machined on the edge of the 3rd/Top synchro hub (see Fig. 52).

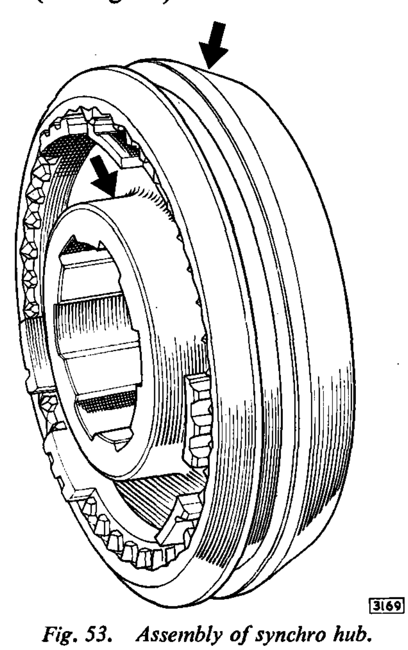


Fig. 53. Assembly of synchro hub.

Assemble the synchro hub to the operating sleeve with—

(1) The wide boss of the hub on the opposite side to the wide chamfer end of the sleeve (see Fig. 55).

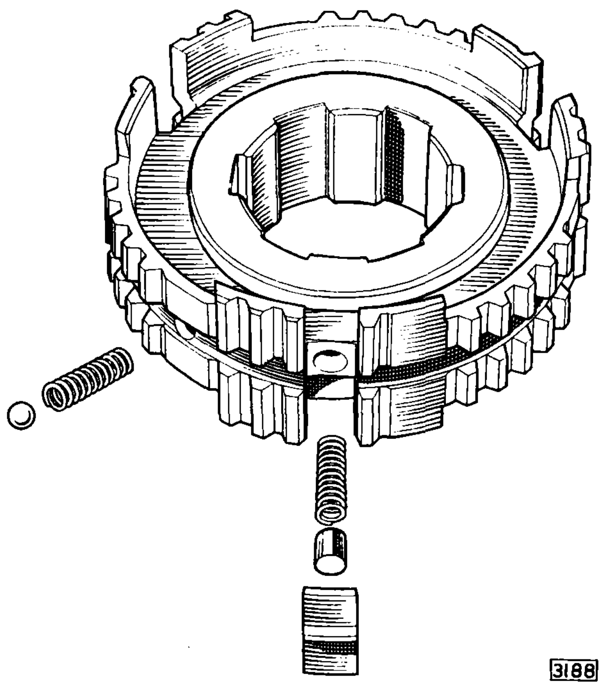


Fig. 54. Showing the relative positions of the detent ball, plunger and thrust member.

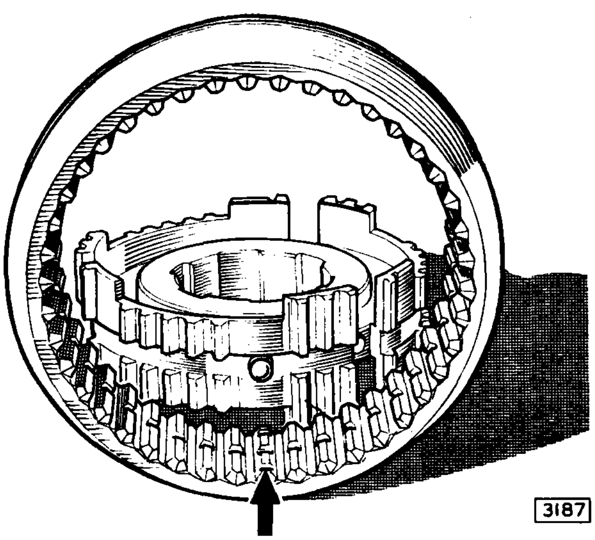


Fig. 55. Fitting the synchro hub in the sleeve.

(2) The three balls and springs in line with the teeth having three detent grooves (see Fig. 55).

Pack up the synchro hub so that holes for the ball and springs are exactly level with the top of the operating sleeve (see Fig. 56).

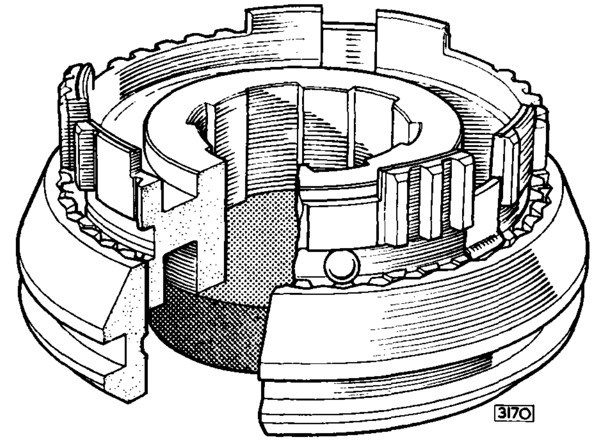


Fig. 56. Fitting the springs, plungers and thrust members.

Fit the three springs, plungers and thrust members to their correct positions with grease; press down the thrust members as far as possible. Fit the three springs and balls to the remaining holes with grease.

Compress the springs with a large hose clip or a piston ring clamp as shown in Fig. 57, and carefully lift off the synchro assembly from the packing piece.

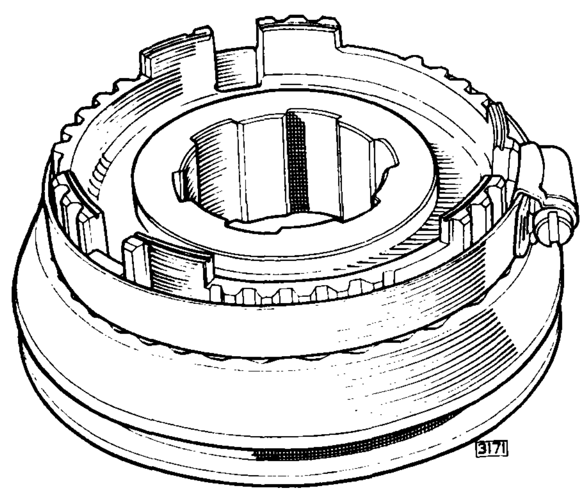


Fig. 57. Compressing the springs.

Depress the hub slightly and push down the thrust members with a screwdriver until they engage the neutral groove in the operating sleeve (see Fig. 58).

Finally tap the hub down until the balls can be heard and felt to engage the neutral groove (see Fig. 59).

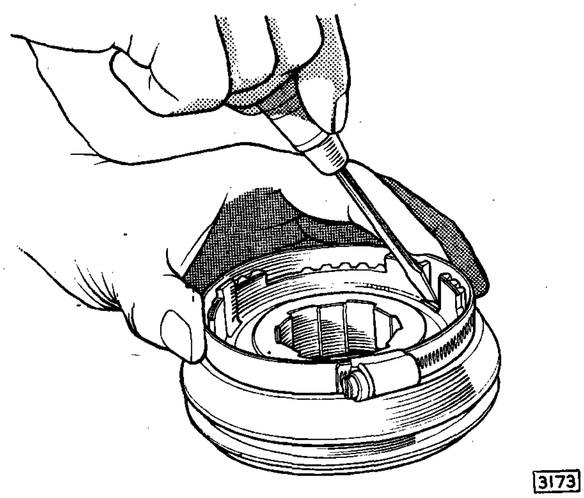


Fig. 58. Pushing down the thrust members.

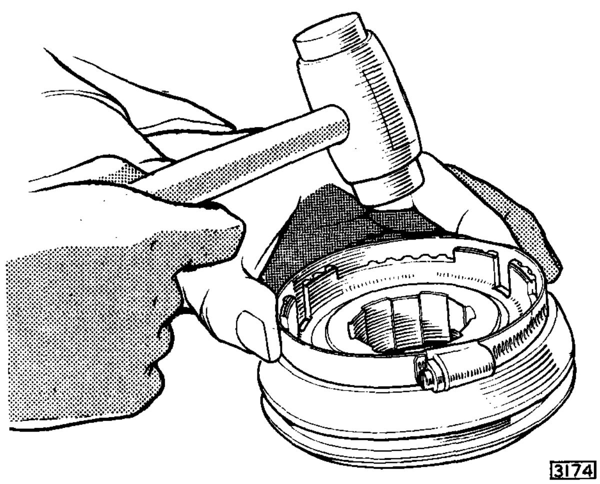


Fig. 59. Tapping the hub into position.

Assembling the Cluster Gear

Fit one retaining ring in the front end of the cluster gear. Locate the 29 needle roller bearings in position with grease and fit the inner thrust washer ensuring that the peg on the washer locates in a groove machined on the front face of the cluster gear.

Fit a retaining ring, 29 needle roller bearings and a second retaining ring to the rear end of the cluster gear.

Checking the Cluster Gear End Float

Fit the reverse idler gear, lever and idler shaft.

Fit the pegged rear thrust washer to its boss on the casing with grease.

Locate the outer thrust washer to the front of the cluster gear with grease, lower the cluster gear carefully into position. Insert a dummy shaft and check the clearance between the rear thrust washer and the cluster gear. The clearance should be .004″-.006″ (.10 -.15 mm.) and is adjusted by means of the outer front thrust washer. This washer is available in the following selective thicknesses :-

Part No.			Thickness
C.1862/3	..	..	.152″ (3.86 mm.)
C.1862 ..	..	..	.156″ (3.96 mm.)
C.1862/1	..	..	.159″ (4.04 mm.)
C.1862/2	..	..	.162″ (4.11 mm.)
C.1862/4	..	..	.164″ (4.17 mm.)

Reassembly of the Constant Pinion Shaft Assembly

Reassembly is the reverse of the removal procedure but care must be taken to ensure that the bearing is seated squarely on the constant pinion shaft.

Reassembly of Mainshaft

The reassembly of the mainshaft is the reverse of the dismantling instructions but the following instructions should be noted.

(i) The end float of the gears on the mainshaft is given in "Data" at the beginning of this section and if found to be excessive the end float can only be restored by the fitting of new parts.

(ii) The needle rollers which support the gears on the mainshaft are graded on diameter and rollers of one grade only must be used for an individual gear. The grades are identified by /1, /2, and /3 after the part number.

(iii) Fit a hose clip to prevent the reverse gear from sliding off when assembling the mainshaft to the casing.

Assembling the Gears to the Casing

Withdraw the dummy shaft from the cluster gear and, at the same time, substitute a thin rod, keeping both the dummy shaft and rod in contact until the dummy is clear of the casing. The thin rod allows the cluster gear to be lowered sufficiently in the casing for insertion of the mainshaft.

Fit a new paper gasket to the front face of the casing.

Enter the mainshaft through the top of the casing and pass the rear of the shaft through the rear bearing hole.

Enter the constant pinion shaft and front bearing assembly through the bearing hole at the front of the casing, with the cutaway portion of the driving gear at the top and bottom.

Tap the assembly into position entering the front end of the mainshaft in the spigot bearing of the constant pinion shaft.

Clamp the constant pinion shaft in position and with a hollow drift, tap the rear bearing into position.

Withdraw the thin rod from the front bore of the cluster gear approximately halfway and lever the cluster gear upwards, rotating the mainshaft and constant pinion shaft gently until the cluster gear meshes. Carefully insert the countershaft from the rear and withdraw the rod. Fit the key locating the countershaft in the casing.

Refitting the Rear Extension

Refit the gears to the oil pump the same way as removed, having previously coated the gears and the inside of the pump body with oil. Secure the pump housing with the three countersunk screws and retain by staking.

Fit a new paper gasket to the rear face of the casing.

Fit the distance piece and driving pin to the oil pump in the rear extension.

Offer up the rear extension and secure with seven screws.

Fit the speedometer driving gear to the mainshaft.

Fit the speedometer driven gear and bush with the hole in the bush in line with the hole in the casing and secure with the retaining bolt.

Fit a new gasket to the rear cover face.

Fit a new oil seal to the rear cover with the lip facing forward.

Fit the rear cover to the extension noting that the setscrew holes are offset.

Fit the four bolts to the companion flange, slide on the flange and secure with flat washer and split pin.

Refitting the Overdrive

Fit the adaptor plate to the gearbox with a new gasket and seven setscrews.

Rotate the gearbox mainshaft to position the cam with its highest point uppermost. The lower point will now coincide with the overdrive pump rollers. DO NOT turn the mainshaft until after the overdrive has been fitted. Engage first gear.

Fit a new paper joint to the front face of the overdrive. Align the splines of the uni-directional clutch and planet carrier with a dummy shaft (Churchill Tool No. L.185).

Withdraw the dummy shaft. Fit the overdrive to the gearbox carefully ensuring that the pump roller "rides" on the cam and that the overdrive pushes right up to the adaptor by hand. If it will not, the splines will have been misaligned and the unit must be removed and the splines aligned once more.

When the overdrive has been fitted, tighten up the four nuts on the front casing flange and also the two nuts on the long studs which go through the rear casing.

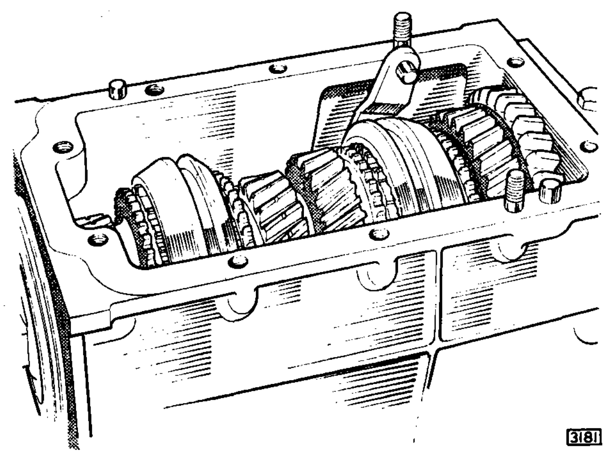


Fig. 60. Re-assembled gearbox prior to refitting of top cover.

Re-assembling the Top Cover

Re-assembly of the top cover is the reverse of the dismantling instructions. When assembling the selector rods do not omit to fit the interlock balls and pin.

Renew the "O" rings on the selector rods.

To adjust the reverse plunger fit the plunger and spring.

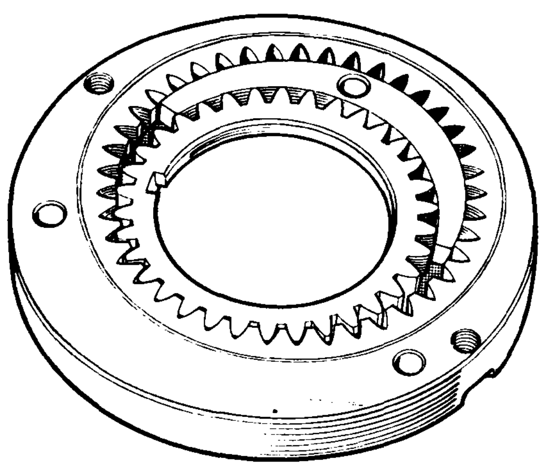


Fig. 61. The oil pump.

Fit the ball and spring and start the screw and locknut; press the plunger inwards as far as possible and tighten the screw to lock the plunger.

Slowly slacken the screw until the plunger is released and the ball engages with the circular groove in the plunger. Hold the screw and tighten the locknut.

Fitting the Top Cover

Fit a new paper gasket.

Ensure that the gearbox and the top cover are in the neutral position.

Ensure that the reverse idler gear is out of mesh with the reverse gear on the mainshaft by pushing the lever rearwards.

Engage the selector forks with the grooves in the synchro assemblies.

Secure the top cover with the nuts and bolts noting that they are of different lengths.

Refitting the Clutch Housing

Refitting the clutch housing is the reverse of the removal procedure.

Fit a new oil seal to the clutch housing with the lip of the seal facing the gearbox. The oil seal has a metal flange and should be pressed in fully.

The two clutch housing securing bolts adjacent to the clutch fork trunnions are secured with locking

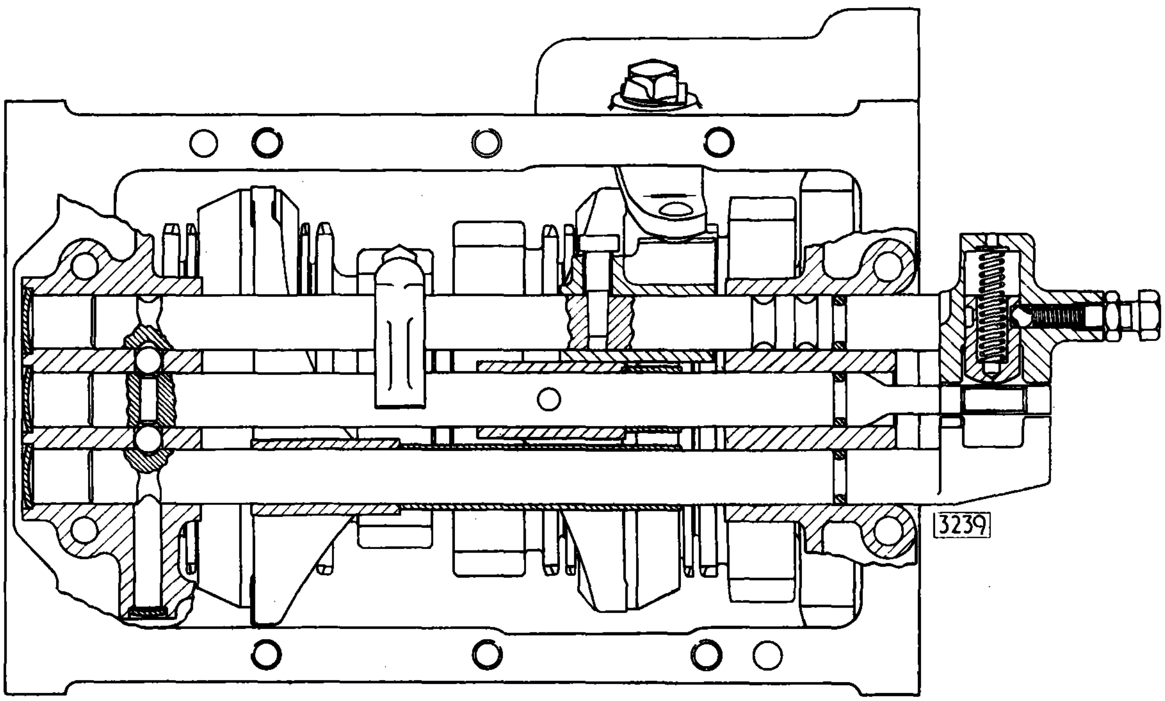


Fig. 62. Plan view of gearbox showing selector arrangement.

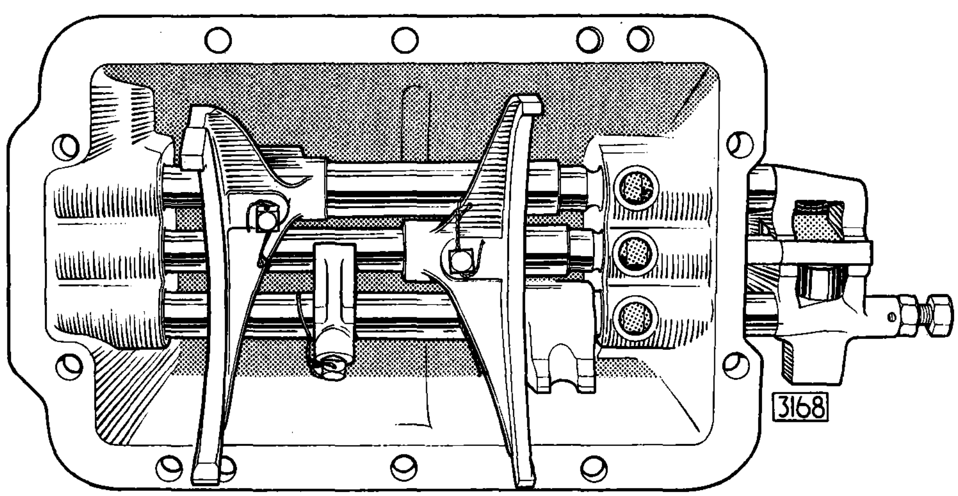


Fig. 63. View of the underside of the top cover.

wire; the remainder are secured with tab washers.

Note : After refitting the gearbox, run the car in top gear as soon as possible to attain the necessary mainshaft speed to prime the oil pump.

Overdrive: 'A' Type Compact Unit

The 'A' Type Compact overdrive is fitted to all Mark 2 models having the four speed all synchro-mesh gearbox.

The operation, construction, routine maintenance, etc., are similar to those given for the earlier models, but dismantling and re-assembly procedures of the new unit are different.

Removal

Remove the four short studs which pass through the front flange of the casing and the two long studs at the bottom of the unit which pass right through the main and rear casings. There is no spring tension to release and after removal of the units from these studs the unit can be withdrawn off the mainshaft, leaving the adaptor in place.

The overdrive can be divided into four main assemblies.

1. Front casing and brake ring.
2. Clutch sliding member.
3. Planet carrier and gear train.
4. Rear casing and annulus.

Dismantling

IMPORTANT: **Scrupulous cleanliness must be maintained throughout all service operations, even minute particles of dust or dirt, or lint from cleaning cloths may cause damage or, at best, interfere with correct operation.**

Prepare a clean area in which to lay out the dismantled unit and some clean containers to receive the small parts.

Hold the overdrive with the front casing uppermost in a vice fitted with suitable soft jaws.

Release the tabwashers locking the four nuts retaining the operating piston bridge pieces; remove the nuts, washers and bridge pieces.

Loosen the solenoid by the two screws to allow the front casing to be removed.

Remove the four nuts which secure the front and rear casings. Separate the casings. The brake ring is spigotted into each half and may remain attached to the front half. If not, a few taps with a mallet around its flange will remove the brake ring from the rear casing.

Lift out the clutch sliding member with the thrust ring, bearing and sunwheel.

Lift out the planet carrier and gear train.

The overdrive is now divided into its four main assemblies.

Front Casing and Brake Ring

Remove the operating valve plug and lift out the spring, plunger and ball. Insert a piece of stiff wire in the central bore of the operating valve and draw it down taking care to avoid damaging the seating at the bottom of the valve. Ensure that the small hole, which breaks through into the central bore near the top of the valve, is not choked. This hole provides the exhaust of oil from the operating cylinders.

Remove the operating pistons by gripping the centre boss with a pair of pliers and rotate gently whilst pulling.

Solenoid—Removal

Remove the rectangular plate by withdrawing the four retaining setscrews. Remove the two screws securing the solenoid and pull off the solenoid.

Ease the plunger from the yoke of the valve operating lever.

Accumulator—Removal

Remove the large nut from the bottom of the unit. The length of thread on the plug is sufficient to allow all compression to be released from the spring before the plug is completely unscrewed. The spring, support pin and washer will come away with the plug.

The accumulator piston has a groove inside the bore and a piece of stiff wire can be hooked into this to enable the piston to be withdrawn.

The Pump Non-Return Valve—Removal

Remove the centre plug in the bottom of the unit. Unscrew the valve body using Churchill Tool No. L.213, and remove the spring, support pin and $\frac{7}{32}$" ball.

The Pump—Removal

Remove the pump locating screw.

Extract the pump using Churchill Tool No. L.183A

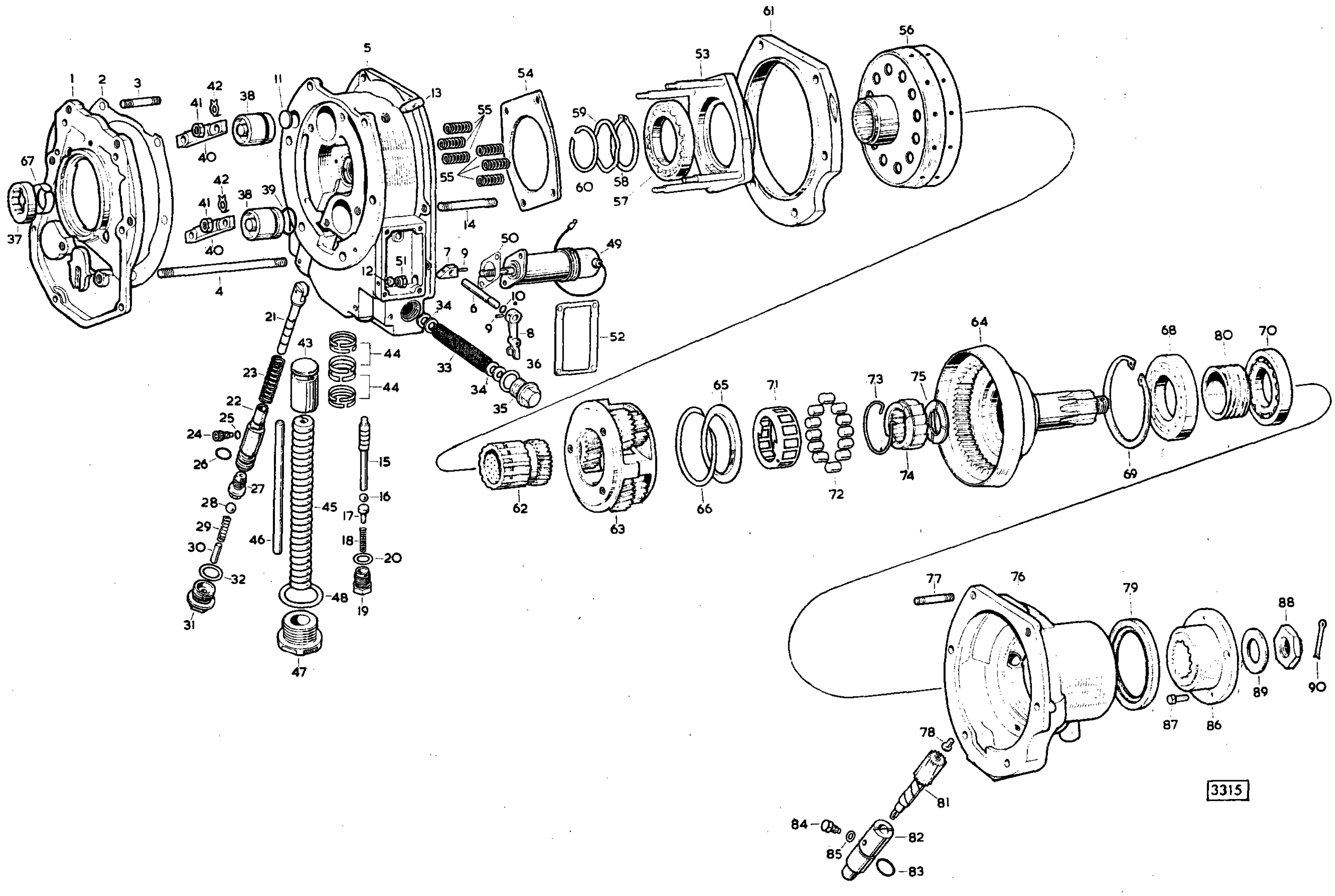


Fig. 64. Exploded view of overdrive unit.

1 Adaptor plate
2 Gasket
3 Stud
4 Stud
5 Front casing
6 Main operating valve shaft
7 Cam
8 Lever
9 Roll pin
10 'O' ring
11 Welch washer
12 Rubber stop
13 Breather
14 Stud
15 Main operating valve
16 Ball $\frac{5}{16}$" dia.
17 Plunger
18 Spring
19 Plug
20 Copper washer
21 Oil pump plunger
22 Body
23 Spring
24 Screw
25 Fibre washer
26 'O' ring
27 Non-return valve body
28 Ball $\frac{7}{32}$" dia.
29 Spring
30 Support rod
31 Plug
32 Copper washer
33 Filter
34 Magnetic ring
35 Plug
36 Washer
37 Oil pump operating cam
38 Operating piston
39 'O' ring
40 Bridge piece
41 Nut
42 Tab washer
43 Accumulator piston
44 Piston ring
45 Spring
46 Support rod
47 Plug
48 Washer
49 Solenoid
50 Gasket
51 Nut
52 Gasket
53 Thrust ring
54 Retaining plate
55 Springs
56 Sliding member
57 Ball bearing
58 Circlip
59 Corrugated washer
60 Snap ring
61 Brake ring
62 Sunwheel
63 Planetary carrier
64 Annulus
65 Oil thrower
66 Spring ring
67 Spring clip
68 Ball bearing
69 Circlip
70 Ball bearing
71 Cage for uni-directional clutch
72 Roller
73 Cage spring
74 Inner member
75 Thrust washer
76 Rear casing
77 Stud
78 Thrust button
79 Oil seal
80 Speedometer driving gear
81 Speedometer driven gear
82 Bearing assembly
83 'O' ring
84 Screw
85 Copper washer
86 Flange
87 Bolt
88 Slotted nut
89 Washer
90 Split pin

and adaptor L.183A-2. The plunger and spring will also come out when the body is withdrawn.

Oil Filter—Removal

Unscrew the plug situated immediately below the solenoid cover plate. Withdraw the cylindrical gauze filter and magnetic washers.

Clutch Sliding Member and Sunwheel

Remove the circlip from the sunwheel and slide off the corrugated washer and sliding member.

Planet Carrier Assembly

At this stage, inspect all gear teeth for any signs of damage or chipping and assess the assembled bearings for any excessive clearance.

Note : Planet gears are not available separately for servicing and a complete planet carrier assembly should be fitted if damage or wear necessitates replacement.

Rear Casing and Annulus

Remove the circlip and oil thrower. Remove the uni-directional clutch by placing the special assembly ring (Churchill Tool No. L.178) centrally over the front face of the annulus and lifting the inner member of the uni-directional clutch up into it. This will ensure that the rollers will not fall out of the retaining cage. If further dismantling is desirable, remove the assembly ring and allow the rollers to come out. The hub will readily come from the cage exposing the spring. Remove the bronze thrust washer fitted between the hub of the uni-directional clutch and the annulus.

Annulus—Removal

Remove the speedometer dowel screw; withdraw the drive bush and pinion. Remove the coupling flange and oil seal.

Press the annulus forward out of the rear casing. The front and rear bearings will remain in the rear casing with the speedometer drive gear sandwiched between them.

Remove the circlip and drive out the speedo drive gear and rear bearing. Drive out the front bearing.

INSPECTION

Front Casing and Brake Ring

Inspect the front casing for cracks or damage. Examine the bores of the operating cylinders and accumulator for scores or wear.

Check for the signs of leaks from the plugged ends of the oil passages. Ensure that the sealing disc in the front face of the casing is tight and not leaking.

Inspect the centre bush for wear or damage.

Check the operating pistons for signs of scores and replace the sealing ring if there is any sign of damage or distortion.

Check the pump roller and its bronze bush for any undue wear.

Check the pump plunger for wear and scores.

Check the pump body bore for wear and scores. Check the valve seat and ball to ensure they are free from nicks and scratches.

Check the pump spring for distortion.

Check the accumulator piston for signs of wear and scores. Check that there are no broken piston rings.

Check the accumulator spring for distortion or collapse.

Inspect the operating valve for distortion or damage. See that it slides easily in the bore of the front casing. Check that the ball seat is clean and free from scratches. Check that the restriction jet is clear. Check the ball and spring for distortion.

Clean the filter thoroughly in petrol. Remove all metallic particles from the magnetic rings.

Check the brake rings for signs of wear, scoring or cracks.

Clutch Sliding Member

Inspect the clutch linings on the sliding member for signs of excessive wear or charring. If this is evident, the *complete* sliding member must be replaced.

Inspect the pins for the bridge pieces on the thrust ring and see that they are not distorted but are a tight fit.

Inspect the ball race and check for noisy rotation. This can be a source of noise when running in direct gear.

Check the clutch springs for any sign of distortion or collapse.

Planet Carrier and Gear Train

The gears and bearings should have been inspected as detailed previously under "Dismantling Planet Carrier Assembly".

Inspect the teeth on the sunwheel for signs of damage or chipping. If the bush is worn, a complete new gear must be fitted.

Rear Casing and Annulus

Ensure that the rollers of the uni-directional clutch are not chipped and that the inner and outer members are not worn or damaged. Check that the cage, particularly the two ears, is not damaged. Check that the spring is not distorted or broken.

Inspect the gear teeth of the annulus for damage.

Inspect the conical surface for signs of wear. Check the bronze spigot bearing fitted in the annulus under the uni-directional clutch. If damaged, a new annulus and bearing must be fitted as a complete assembly.

Check the ball races for smooth running.

Inspect the rear oil seal. If removed, a new seal must always be fitted.

Check the teeth of the speedometer pinion for wear.

RE-ASSEMBLY

Front Casing and Brake Ring

Insert the pump plunger, spring and body in the central hole in the bottom of the casing, taking care to locate the flat of the plunger against the thrust button which is situated below the centre bush. Tap the pump body home until the annular groove lines up with the locating screw hole in the casing. Insert the screw ensuring that the dowel locates in the groove.

Reseat the non-return valve by lightly tapping with a copper drift and screw in the non-return valve body using Churchill Tool No. L.213. Fit the ball spring, support pin, copper washer and plug. Tighten the plug ensuring that the spring is located in the plug recess.

Accumulator

Carefully insert the piston into the casing using Churchill Tool No. L.304. Insert the spring, support pin, metal washer, and fit the fibre washer and plug.

Operating Pistons

When inserting the pistons, carefully ease the rubber sealing rings into the cylinder bores. The centre bosses of the pistons face towards the front of the unit.

Operating Valve

Insert the operating valve into the casing ensuring that the hemispherical end engages on the flat of the small cam on the operating shaft. Drop in the $\frac{5}{16}''$ ball, plunger and spring. Screw in and tighten the operating valve plug.

Oil Filter

Fit the two magnetic washers, filter, further two magnetic washers and filter plug.

Rear Casing and Annulus

Press the front bearing into the rear casing using Churchill Tool No. L.303. Fit the retaining circlip. Support the inner race of the bearing using Tool No. L.303 and then press the annulus until the bearing abuts on the locating shoulder. Fit the speedometer driving gear. Using the same tool, press the rear bearing on to the tail shaft and into the casing simultaneously. Press in the rear oil seal using Churchill Tool No. L.305 until it is flush with the end of the rear casing. Fit the bolts and press on the coupling flange. Fit the washer and slotted nut. Tighten to a torque figure of 1200 - 1560 lb. in. and fit the split pin.

Ensure that the 'O' ring is serviceable and insert the speedometer pinion gear and bush. Turn the annulus to engage the gear and align the holes in the casing and bush. Fit the locating screw and copper washer.

Assembling and Fitting the Uni-Directional Clutch

Assemble the spring into the roller cage of the uni-directional clutch. Fit the inner member into the cage and engage it into the other end of the spring. Engage the slots of the inner member with the tongues of the roller cage and check that the spring rotates the cage to urge the rollers, when fitted, up the inclined faces of the inner member. The cage is spring loaded anti-clockwise when viewed from the front.

Place this assembly, front and downwards, into the special assembly ring, Churchill Tool No. L.178, and fit the rollers through the slots in the tool, turning the clutch clockwise until all the rollers are in place.

Fit the thrust washer and replace the uni-directional clutch using the special tool to enter the rollers into the outer member in the annulus. Fit the oil thrower and retaining circlip.

Planet Carrier and Gear Train

Special care must be taken when assembling the planet carrier assembly to the annulus and sunwheel.

Turn each gear respectively until a dot marked on one tooth of the large gear is positioned radially outwards. Insert the sunwheel to mesh with the planet gears, keeping the dots in the same position and insert this assembly into mesh with the internal gear in the annulus. Insert the dummy mainshaft, Churchill Tool No. L.185A, engaging in the planet carrier and uni-directional clutch splines.

Clutch Sliding Member

Press the thrust bearing into the thrust ring and then press this assembly on to the hub of the clutch sliding member taking care not to damage the linings. Secure the assembly in position by fitting the circlip on the hub of the sliding member. Slide this assembly on to the sunwheel splines until the inner lining is in contact with the annulus and then fit the corrugated washer and circlip.

Final Assembly

Fit the retaining plate over the bolts of the thrust ring bearing assembly. Smear a good quality jointing compound on to both faces of the brake ring flange and tap this home into the front casing. Insert the clutch return springs into the pockets in the front casing and then attach the front casing and brake ring to the rear casing. The clutch spring pressure will be felt as the two casings go together and the four nuts should be progressively tightened until the two faces meet. Fit the two bridge pieces, nuts and new tab washers.

Fit the solenoid plunger in the fork of the operating lever and, after fitting a new gasket to the solenoid flange, fasten the solenoid to the flange with two set screws.

Adjust the solenoid operating lever until a $\frac{3}{16}''$ diameter pin pushed through the hole in the lever registers in the hole in the casing. Then screw the nut on the plunger when, with the plunger pushed right home in the solenoid, the nut just contacts the fork in the lever. Remove the $\frac{3}{16}''$ diameter pin.

Re-check by energising the solenoid and noting the alignment of the holes. When the solenoid is energised, its consumption should be about 1 amp. If it is 15 to 20 amps. it is an indication that the solenoid plunger is not moving far enough to switch from the operating to the holding coil and the lever must be adjusted.

Secure the solenoid gasket and cover plate with four set screws and lockwashers.

Refitting Overdrive to Gearbox

Check that the cam is not unduly worn and that the flat spring ring on the gearbox mainshaft is not distorted and does not protrude above the crown of th splines.

Rotate the shaft to position the cam with its highest point uppermost. The lowest point will now coincide with the overdrive pump roller. The mainshaft should not be turned again until the overdrive has been fitted and it is advisable to engage bottom gear.

Remove the dummy mainshaft from the overdrive. The splines will now be correctly lined up and it is most important that the coupling flange is not turned until the unit has been fitted to the gearbox.

Fit a new paper joint to the front face of the overdrive. Fit the overdrive to the gearbox carefully ensuring that the pump roller "rides" on the cam which is chamfered for this purpose and that the overdrive pushes right up to the adaptor plate by hand pressure only. If it will not, this means that the splines have become misaligned. In this case, remove the overdrive and re-align the splines by rotating the inner member of the uni-directional clutch in an anti-clockwise direction. This can be done with a long screwdriver.

When the overdrive has been fitted, tighten up the four nuts on the front casing flange also the two nuts on the long studs which go through the rear casing.

DATA

	Dimensions New	Clearance New
Pump :		
Plunger diameter	.3742″/.3746″	.0002″/.0016″
Pump body bore	.3746″/.2758″	
Pump Roller Bush :		
Outside diameter of bush	.3736″/.3745″	.0005″/.0023″
Inside diameter of roller	.3750″/.3759″	
Inside diameter of bush	.2510″/.2518″	.0007″/.0020″
Outside diameter of pin	.2497″/.2502″	
Accumulator :		
Piston diameter	1.1232″/1.1241″	.0004″/.0023″
Bore diameter	1.1245″/1.1255″	
Operating Pistons :		
Piston diameter	1.3732″/1.3741″	.0004″/.0023″
Bore diameter	1.3745″/1.3755″	
Operating Valve :		
Valve diameter	.2494″/.2497″	.0003″/.0012″
Bore diameter	.2500″/.2506″	
Overdrive Mainshaft :		
Diameter at oil transfer bush	1.1544″/1.1533″	.0029″/.0048″
Inside diameter of bush	1.1582″/1.1592″	
Diameter at sunwheel	1.1544″/1.1533″	.0029″/.0048″
Inside diameter at sunwheel bush	1.1582″/1.1592″	
Diameter at spigot bearing	.6235″/.6242″	.0008″/.0025″
Inside diameter of spigot bearing	1.6250″/.6260″	

Clutch Movement from Direct to Overdrive .090″/.100″

SECTION G

PROPELLER SHAFTS

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

PROPELLER SHAFTS

DESCRIPTION

Hardy Spicer propeller shafts of the open type with needle roller universal joints are fitted.

Standard transmission cars are fitted with a fixed length propeller shaft with a universal joint at each end ; to cater for fore and aft movement of the rear axle a splined sleeve at the front of the shaft slides on a splined extension of the gearbox mainshaft.

Overdrive models are fitted with a normal propeller shaft having a universal joint at each end and a sliding spline at the front.

Automatic transmission models are fitted with a divided propeller shaft. The front shaft has a universal joint at the forward end and the rear end is supported in a ball bearing housed in a rubber mounted plate. The rear propeller shaft is of the normal type and incorporates a sliding spline to allow for fore and aft movement of the rear axle.

	R.H. Drive	L.H. Drive
2.4 Litre	119200	127822
3.4 Litre	169341	180188
3.8 Litre	234125	224150

Consequent upon the introduction of the all-synchromesh gearbox from the above chassis numbers and onwards, standard transmission cars are fitted with an identical propeller shaft to that used on overdrive models.

DATA

Dimension " A "		**2.4 litre**	**3.4 litre 3.8 litre**
Cars fitted with synchro-mesh gearbox only	.. .. ..	$37\frac{5}{8}''$ (95.55 cm.)	$36\frac{7}{8}''$ (93.65 cm.)
Overdrive model	.. ..	$34\frac{25}{32}''$ (88.35 cm.)	$34\frac{1}{32}''$ (86.45 cm.)
Automatic transmission model	—front shaft	$10\frac{1}{2}''$ (26.65 cm.)	$10\frac{1}{2}''$ (26.65 cm.)
	—rear shaft	$27\frac{3}{4}''$ (70.5 cm.)	$27\frac{1}{8}''$ (68.9 cm.)

Note : With effect from the following chassis numbers, the propeller shafts fitted to the 2.4 litre models are identical to those fitted to the 3.4/3.8 litre models. This change coincides with the introduction of a 4HA type rear axle on the 2.4 litre model.

	R.H. Drive	L.H. Drive
Standard transmission	103511	125693
Overdrive models	103507	125693
Automatic transmission models	103381	125693

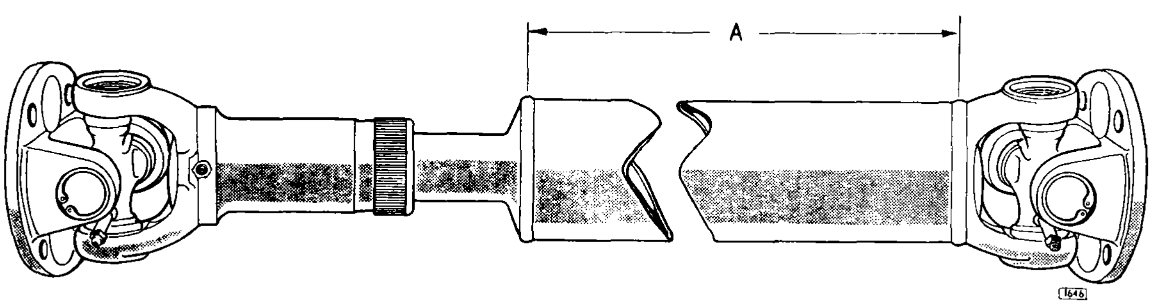


Fig. 1. Propeller shaft lengths

ROUTINE MAINTENANCE

EVERY 2,500 MILES (4,000 KM.)

Universal Joints

The two needle roller bearing universal joints (three joints on Automatic Transmission models) should be lubricated with the recommended grade of grease.

The nipples are accessible from underneath the car but it may be necessary to move the car slightly to bring the nipples to the required position.

Sliding Spline.

On cars fitted with automatic transmission or an overdrive the front end of the propeller shaft is fitted with a sliding joint which should be lubricated, with the recommended grade of grease, through the nipple situated at the rear of the universal joint yoke.

Recommended Lubricants

Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent Caltex Texaco
Mobilgrease MP	Castrolease LM	Retinax A	Esso Multi-purpose Grease H	Energrease L.2	LB.10	Marfak All-Purpose

PROPELLER SHAFTS (Later Cars)

The propeller shaft universal joints and sliding spline are of the "sealed for life" type and require no periodic lubrication.

1. Flange yoke.
2. Journal assembly.
3. Sleeve yoke assembly.
4. Journal spider.
5. Gasket.
6. Gasket retainer.
7. Needle bearing assembly.
8. Circlip.
9. Grease nipple.
10. Bolt.
11. Special washer.
12. Slotted nut.
13. Split pin.

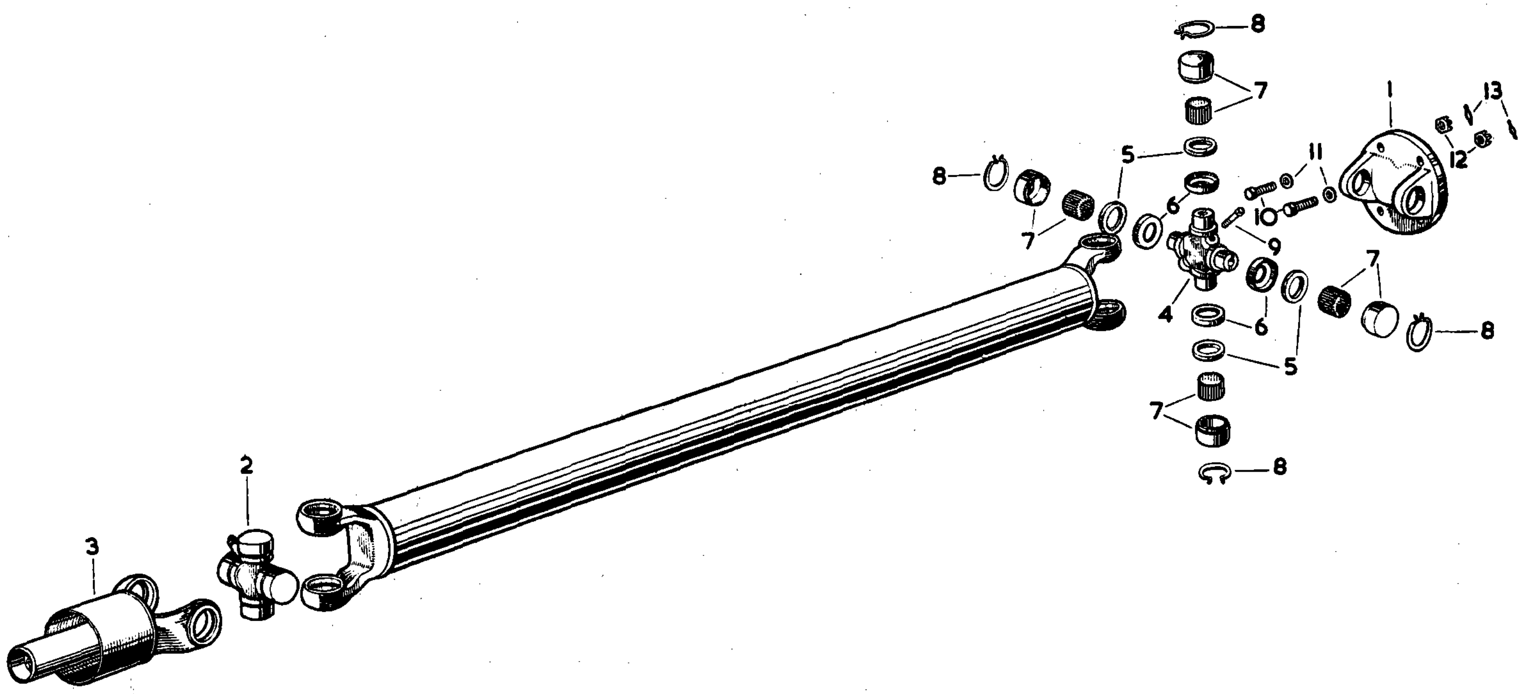


Fig. 2. Exploded view of propeller shaft assembly (Standard transmission propeller shaft illustrated). (Early Cars only).

PROPELLER SHAFT (Standard Transmission models)

Removal

Jack up one of the rear wheels clear of the ground to enable the propeller shaft to be rotated. Place blocks at each side of the other rear wheel.

Remove the split pins, nuts and washers from the four bolts attaching the propeller shaft to the rear axle flange.

Separate the two flanges and withdraw the propeller shaft from the splines at the rear of the gearbox mainshaft.

Refitting

Refitting is the reverse of the removal procedure.

PROPELLER SHAFT (Overdrive models)

Removal

Jack up one of the rear wheels clear of the ground to enable the propeller shaft to be rotated. Place blocks at each side of the other rear wheel.

Remove the split pins, nuts and washers from the flange attaching the propeller shaft to the gearbox flange. Remove the split pins, nuts and washers from the flange attaching the propeller shaft to the rear axle flange. Compress the sliding joint when the propeller shaft can be removed.

Refitting

Refitting is the reverse of the removal procedure.

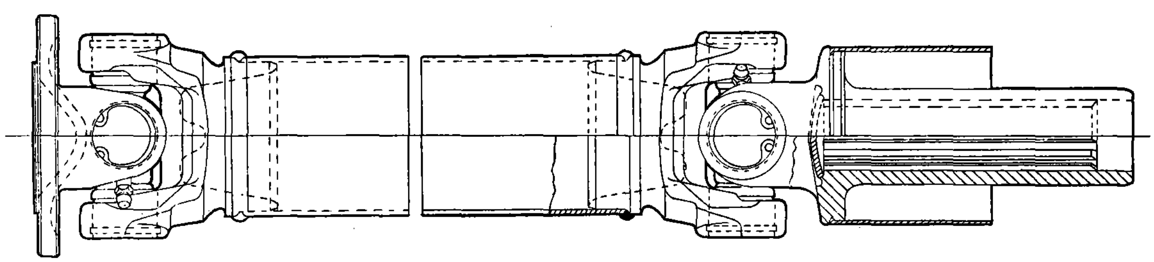


Fig. 3. Propeller shaft—Standard transmission model.

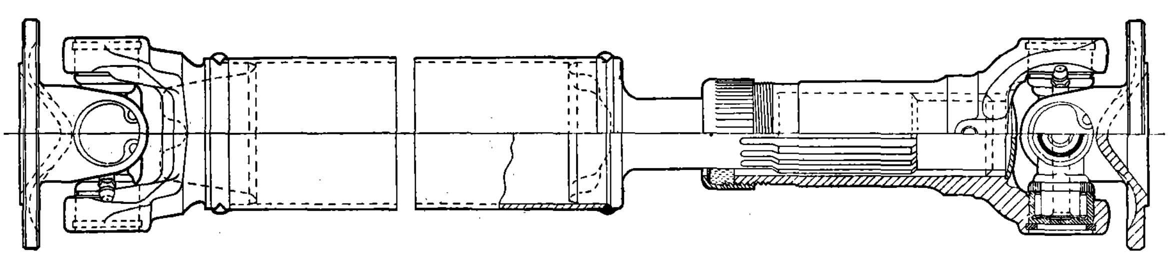


Fig. 4. Propeller shaft—Overdrive model.

PROPELLER SHAFTS (Automatic transmission models)

A divided propeller shaft is fitted to automatic transmission models. The rear of the front propeller shaft is supported in a ball bearing housed in a rubber mounted plate.

Removal of the Front Propeller Shaft

Remove the six set bolts securing the ventilated cover plate to the bottom of the torque converter housing. Place a piece of wood under the torque converter housing, taking care that it does not foul the torque converter.

Jack up under the piece of wood until the jack takes the weight of the engine and gearbox.

Mark the positions of the centre bearing and rear engine mounting brackets relative to the body floor so that the brackets can be refitted in their original positions.

Remove the six bolts and packing washers from the rear engine support bracket, care being taken to note the number and positions of the various packing washers fitted between the bracket and the body floor.

Remove the two nuts, plain shakeproof washers attaching the rear engine support bracket to the two mounting rubbers at the rear of the gearbox.

Jack up one of the rear wheels clear of the ground to enable the propeller shaft to be rotated.

Remove the four split pins, nuts and washers from the flange attaching the propeller shaft to the gearbox.

Remove the four split pins, nuts and washers from the flange attaching the front propeller shaft to the rear propeller shaft. Support the front end of the rear propeller shaft.

Remove the two set bolts and spring washers securing the propeller shaft centre bearing bracket to the body and remove the front propeller shaft.

Refitting the Front Propeller Shaft

Offer up the propeller shaft flange to the gearbox flange and secure with a bolt and nut.

Offer up the centre bearing mounting to the body and secure with two set bolts and spring washers.

Offer up the rear propeller shaft to the centre bearing flange and replace all the remaining nuts, washers and split pins in the flanges.

Refit the four washers and two nuts attaching the two rubbers on the rear of the gearbox to the mounting bracket.

Offer up the rear engine mounting bracket and refit the set bolts and spring washers with the packing washers interposed between the body and the engine rear mounting bracket.

Lower the jack under the converter housing and replace the cover plate and secure it with six set bolts and spring washers.

Note the procedure detailed under the heading "Divided Propeller Shaft Alignment".

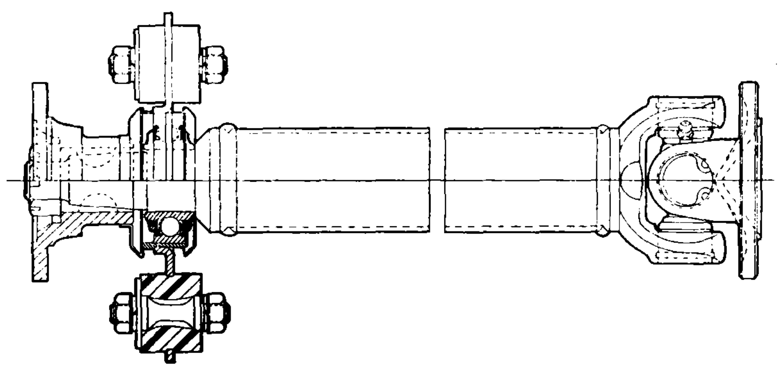


Fig. 5. Front propeller shaft and centre bearing—Automatic transmission model.

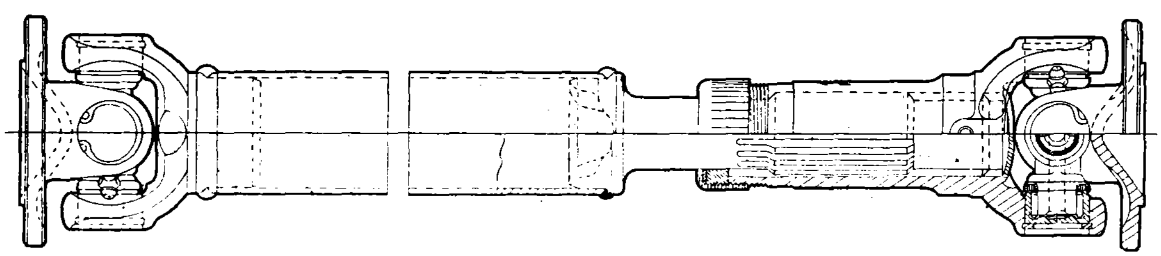


Fig. 6. Rear propeller shaft—Automatic transmission model.

Removal of the Rear Propeller Shaft

Remove the four split pins, nuts and washers attaching the rear propeller shaft to the front shaft.

Remove the four split pins, nuts and washers attaching the propeller shaft to the rear axle.

Compress the sliding joint and remove the propeller shaft.

Refitting the Rear Propeller Shaft

Offer up the rear propeller shaft to the rear axle flange and secure with four bolts, washers, nuts and split pins.

Offer up the sliding joint end of the propeller shaft to the front propeller shaft flange and secure with the four nuts, washers and split pins.

CENTRE BEARING

The centre bearing consists of a ball bearing pressed into a housing which has an oval shaped plate attached; this assembly is mounted on the tail of the propeller shaft with a dust shield interposed between the housing and the shaft tubing. The bearing is retained on the shaft by a flange coupling which is bolted to the companion flange on the rear propeller shaft.

Removal

Remove the front propeller shaft complete with centre bearing as described on page G.7.

Dismantling

The flange coupling is retained on the propeller shaft by two Woodruff keys and is secured by a slotted nut and split pin.

Remove the split pin and slotted nut. Draw off the flange coupling and remove the Woodruff keys.

Remove the outer dust cover. Drive the shaft through the bearing and housing. Press the bearing out of the housing.

Remove the two nuts and spring washers securing the body mounting bracket to the rubbers.

Press the rubbers out of the oval bearer plate. Remove the rubbers from the studs.

Reassembling

Reassembling is the reverse of the dismantling procedure.

Refitting

Refitting is the reverse of the removal procedure.

Note the procedure detailed under the heading "Divided Propeller Shaft Alignment".

DIVIDED PROPELLER SHAFT ALIGNMENT

The alignment of the divided propeller shaft is most important and if removal of the engine or front propeller shaft has taken place, the following checks should be made on replacement. Failure to do so may result in transmission shudder when taking up the drive from a standing start.

NOTE:

Before carrying out any checking or rectification work :—

(a) Ensure that the engine stabilizer at the rear of the cylinder head is disconnected. To disconnect the engine stabilizer remove the self-locking nut and flanged washer from the top of the stabilizer and screw the lower washer down the centre pin by engaging a thin bladed screwdriver in the slot in the washer through the centre hole of the rubber mounting.

(b) Check that the rear engine mounting rubbers are not distorted.

Note that the holes in the rear engine mounting cradle are slotted and the holes in the bracket attached to the extension case are enlarged to allow the positions of the rubbers to be adjusted.

Check 1

3.8 LITRE

To check the alignment it is advisable to make up a simple checking jig as shown in Fig. 9. The jig consists of 3 pieces of flat bar 8" × 1" × $\frac{3}{16}$" (20.5 × 2.5 × 4.75 cm.) which are welded exactly in line to a piece of tube $1\frac{1}{8}$" (28.5 cm.) outer diameter at the distances shown in the illustration.

Offer up the jig to the front and rear propeller shafts as illustrated in Fig. 7. With the two outer legs of the jig in contact with the front of the front propeller shaft and the rear of the rear shaft, check the clearance between the second leg and the rear of the front shaft. Clearance should be $\frac{9}{64}$" (3.6 mm.).

2.4/3.4 LITRE

The procedure is the same as for the 3.8 litre model except that no clearance should exist at the rear end

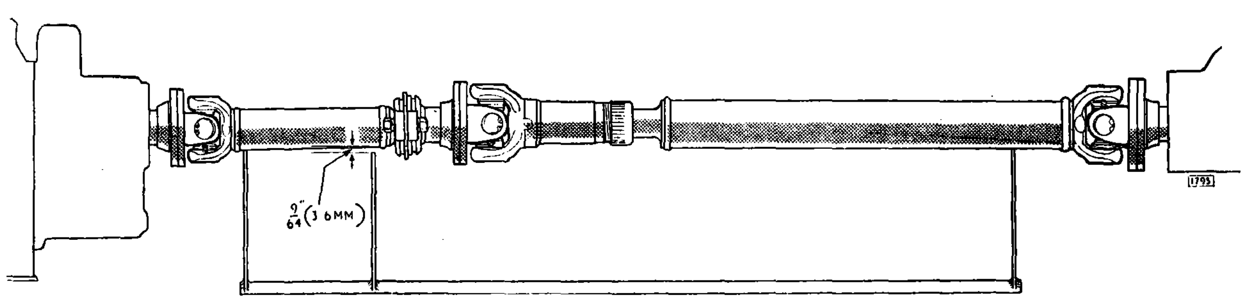


Fig. 7. Jig for checking the height of the front propeller shaft.

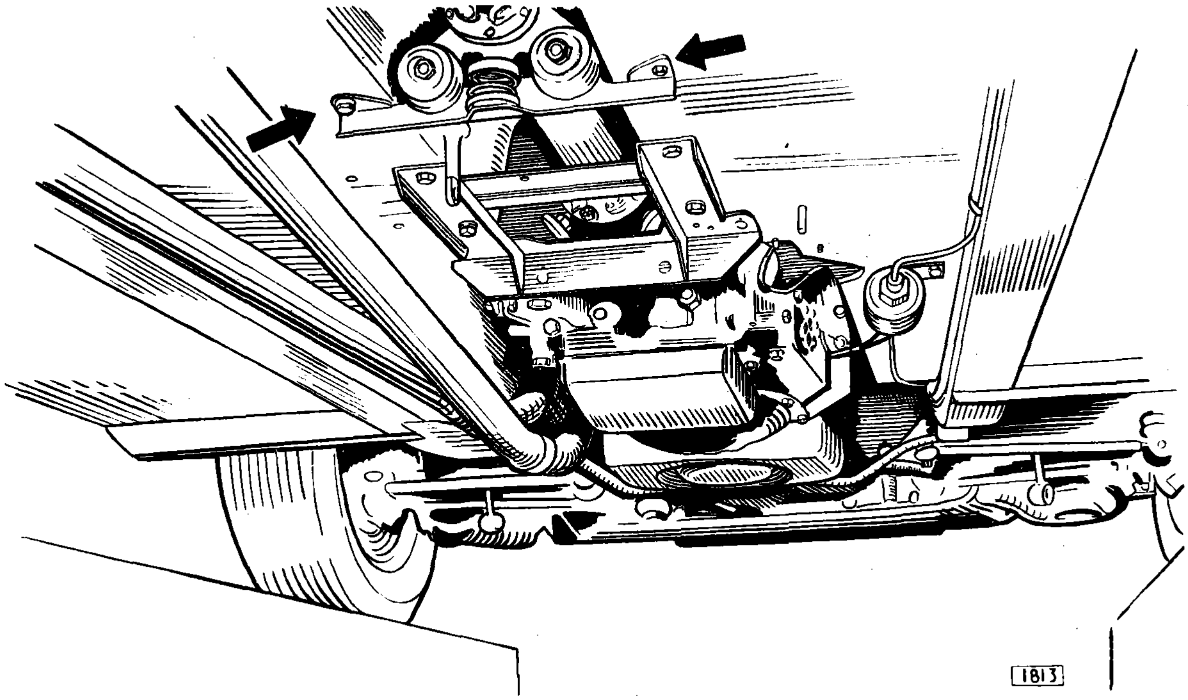


Fig. 8. Showing the location of the shim washers.

of the front shaft, that is, the ends of all three legs should contact the propeller shafts simultaneously.

Remedy

If any adjustment is necessary add or subtract shim washers between the centre bearing bracket mounting and body. Add shims to lower and remove to raise the propeller shaft bearing.

Check 2

Check that the front and rear propeller shafts are in a straight line.

The most convenient way to do this is to make up a simple jig as shown in Fig. 9. The jig consists of 3 pieces of flat bar 8" × 1" × $\frac{3}{16}$" (20.5 cm. × 2.5 cm. × 4.75 mm.) which are welded exactly in line on to a piece of tube of $1\frac{1}{8}$" (28.5 mm.) outer diameter at the distances shown in the sketch. The jig is then held against the front and rear propeller shafts, with the three bars vertical, when any mal-alignment will be evident (see Fig. 10).

An alternative method is to use three plumb bobs and sight along the three cords. Two cords should be positioned at the front and rear of the front propeller shaft tube and the remaining cord at the rear end of the rear propeller shaft tube.

Remedy

Alignment of the propeller shafts is carried out at the centre bearing bracket by elongating the two holes through which the set screws pass to secure the bracket to the body floor. The position of the centre bearing bracket can then be adjusted to allow the propeller shafts to be aligned.

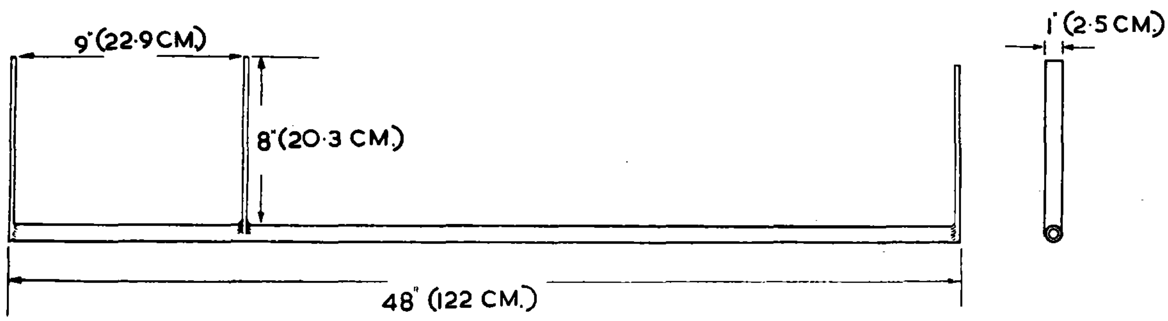


Fig. 9. Jig for checking the alignment of the front and rear propeller shafts.

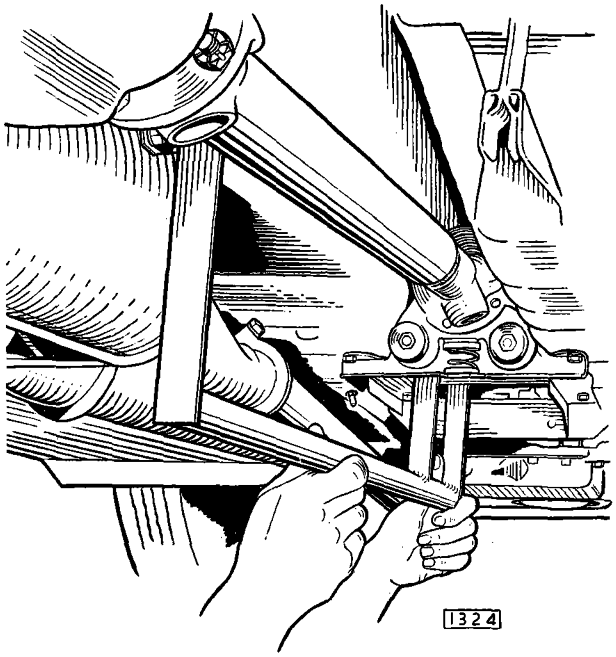


Fig. 10. Checking the alignment of the front and rear propeller shafts.

Adjustment of Engine Stabilizer

After having carried out the above procedure adjust the stabilizer as follows :—

1. Screw the lower flanged washer up the stabilizer pin **until the flange contacts the bottom of the stabilizer rubber mounting.** The washer is slotted on its upper face and can be screwed up the pin by engaging a thin bladed screwdriver in the slot through the centre hole of the rubber mounting.
2. Fit the upper flanged washer and tighten down with the self-locking nut.

Failure to observe the above procedure may cause engine vibration and/or fouling of the gearbox in its cowl owing to the engine being pulled up on its mountings.

THE UNIVERSAL JOINTS

Examine and check for Wear

The parts most likely to show signs of wear after long usage are the bearing races and spider journals. Should looseness in the fit of these parts, load markings or distortion be observed they should be renewed as a unit as worn needle bearings used with a new spider journal or new needle bearings with a worn spider journal will wear more rapidly, making another replacement necessary in a short time.

It is essential that the bearing races are a light drive fit in the yoke trunnion.

In the rare event of wear having taken place in the yoke cross holes, the holes will have become oval and the yokes must be removed.

In the case of wear of the cross holes in a fixed yoke, which is part of the tubular shaft, only in cases of emergency should these be replaced. They should normally be replaced by a complete assembly.

The other parts likely to show signs of wear are the splined sleeve yoke and splined shaft. A total of .004" (.1 mm.) circumferential movement, measured on the outside diameter of the spline, should not be exceeded. If wear has taken place above this limit the complete propeller shaft should be replaced.

To Dismantle

To remove the sliding joint from the splined shaft, unscrew the dust cap and pull back the cork washer.

Clean the paint and dirt from the rings and top of bearing races. Remove all the snap rings by pinching together with a pair of pliers and prising out with a screwdriver. If a ring does not snap out of its groove readily, lightly tap end of bearing race to relieve the pressure against the ring.

Hold the joint in the hand and with a soft nosed hammer tap the yoke lug as shown in Fig. 11.

The top bearing will gradually emerge and can finally be removed with the fingers (see Fig. 12).

If necessary, tap the bearing race from inside with a small diameter bar, taking care not to damage the bearing race (see Fig. 13).

Repeat this operation for the opposite bearing. The splined sleeve yoke or flange yoke can now be removed. Rest the two exposed trunnions on wood or lead blocks, then tap yoke with a soft nosed hammer to remove the two remaining bearing races. Wash all parts in petrol.

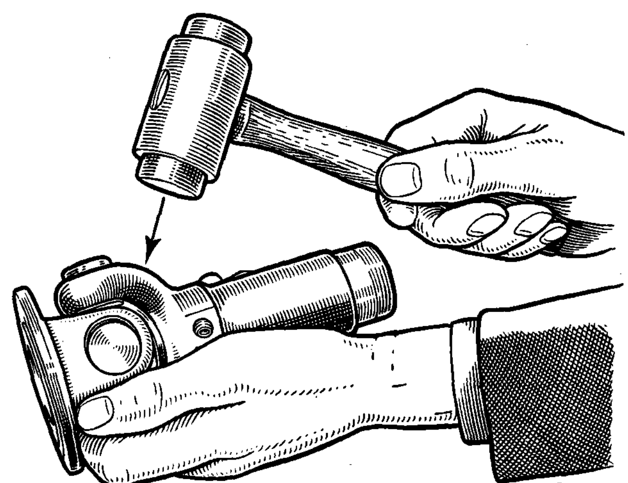


Fig. 11. Tapping the yoke to remove the bearing.

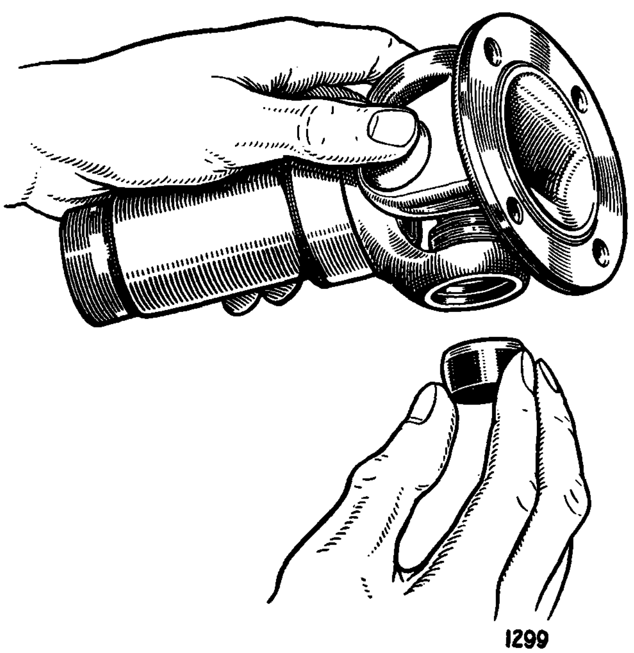


Fig. 12. Withdrawing the bearing from the universal joint.

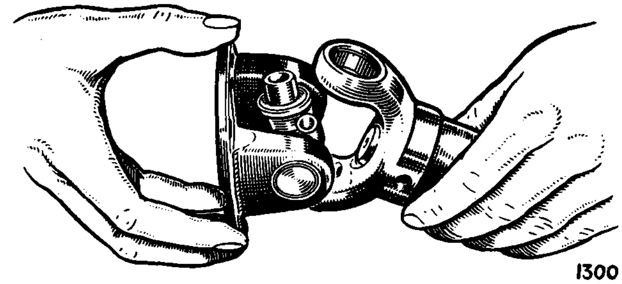


Fig. 14. Separating the universal joint yokes.

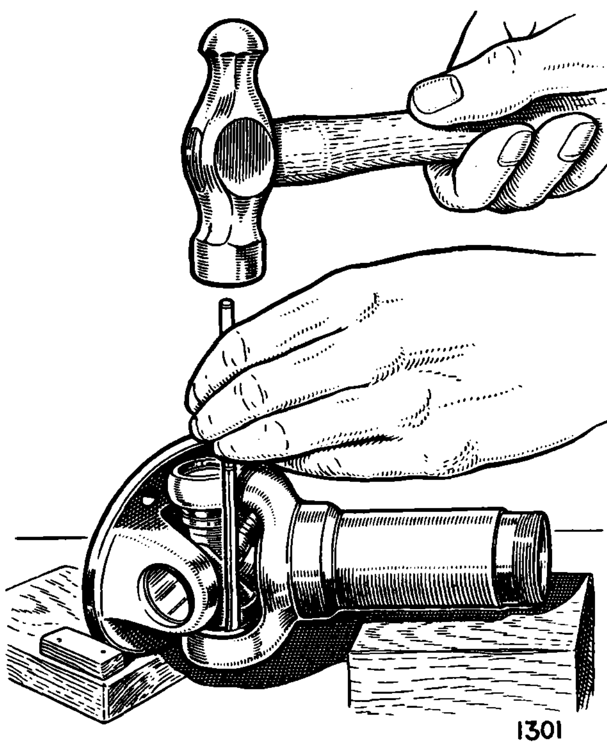


Fig. 13. Tapping out a bearing with a small diameter bar.

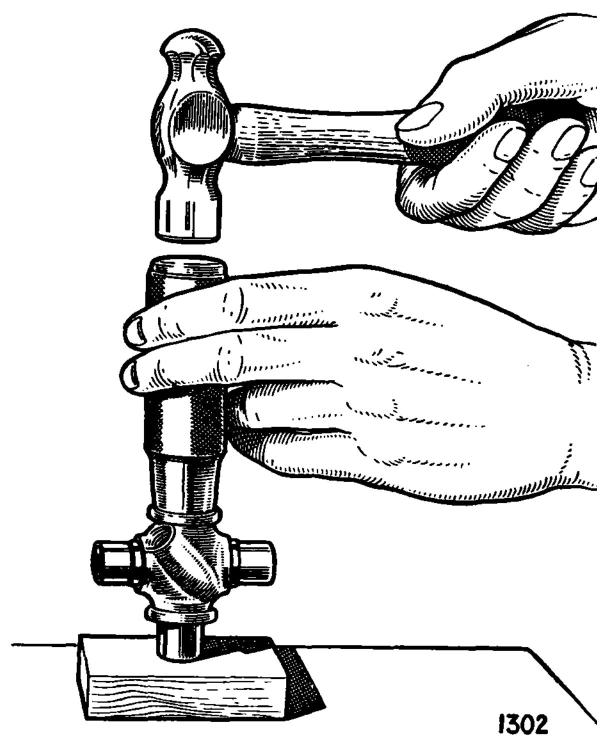


Fig. 15. Replacing a gasket retainer with a hollow drift (Early Cars).

Assembling

Insert journal in yoke holes and using a soft round drift with a flat face about $\frac{1}{32}$" (.8 mm.) smaller in diameter than the hole in the yoke, tap the bearing into position. Repeat this operation for the other three bearings. Fit new snap rings and ensure that they are correctly located in their grooves. If joint appears to bind tap lightly with a wooden mallet, to relieve any pressure of the bearings on the end of the journal. **When replacing the sliding joint it must be refitted with its fixed yoke in line with the fixed yoke at the end of the propeller shaft tube. Arrows are stamped on the two parts to facilitate alignment. (See Fig. 16.)**

Should any difficulty be encountered when assembling the needle rollers in the housing, smear the wall of the race with vaseline. On early cars it is advisable to install new cork gaskets and gasket retainers on the spider assembly, using a tubular drift as shown in Fig. 15.

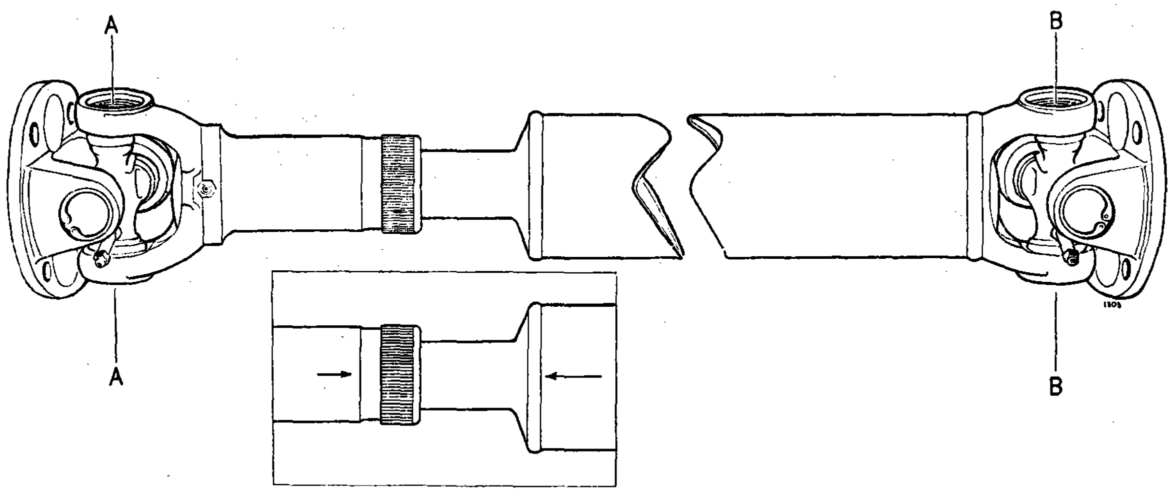


Fig. 16. When refitting the sliding joint to the drive shaft it is ESSENTIAL that the yokes A and B are in the same plane. The inset shows the arrows that are stamped on the two parts to facilitate alignment.

SECTION H

REAR AXLE

(including Thornton "Powr-Lok" Differential)

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

INDEX *(continued)*

Thornton " Powr-Lok " Differential

REAR AXLE

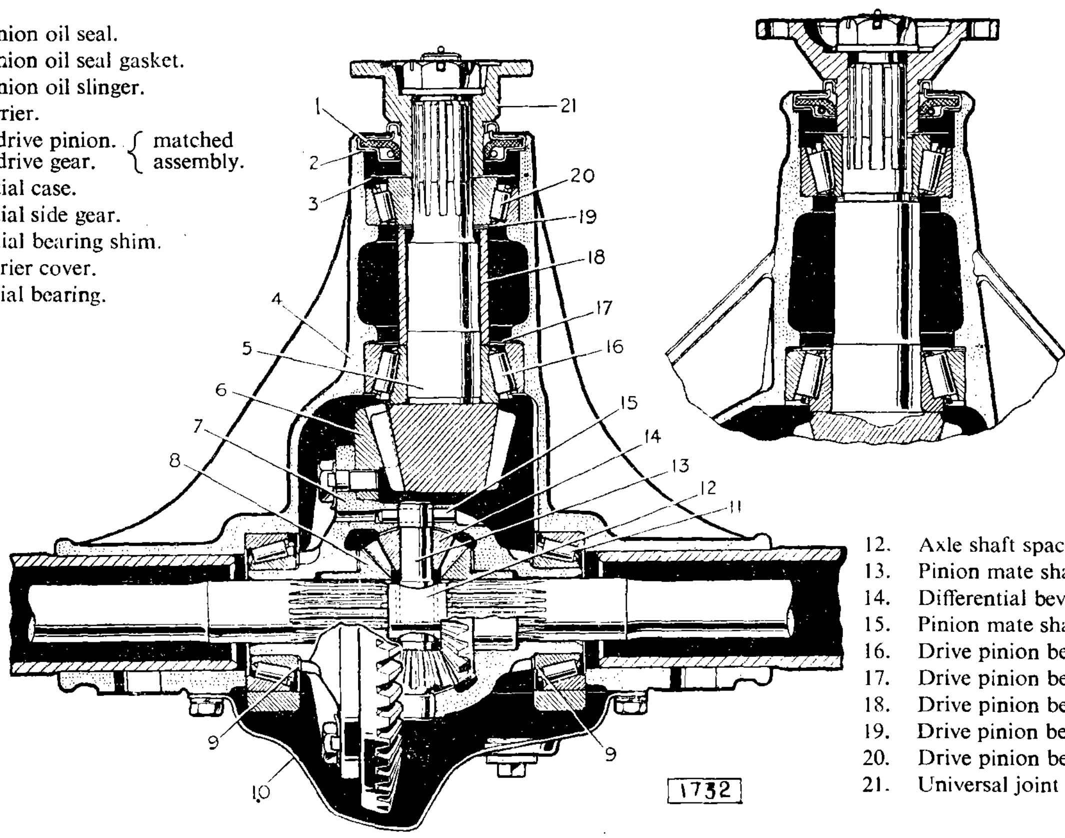
All the Mark 2 models are fitted with a Salisbury axle. The early 2.4 litre model was equipped with the 3.HA type while the later model had a 4.HA type similar to the 3.4 and 3.8 litre models.

DESCRIPTION

The rear axle assembly (Fig. 1) is of the semi-floating type with shim adjustment for all bearings and meshing of the hypoid drive gear and pinion matched assembly. The axle shafts are splined at the inner ends, which engage splines in the differential side gears, while the outer ends have tapers and keys to fit the rear wheel hubs. The hubs are supported by taper roller bearings pressed on to the axle shafts and located in the ends of the axle tubes. Outward thrust on either wheel is taken by the adjacent hub bearing, whilst inward thrust is transmitted through the axle shafts and slotted axle shaft spacer to the opposite bearing. Thus, each hub bearing takes thrust in one direction only. A cover on the rear of the gear carrier housing permits inspection without dismantling the axle.

The axle gear ratio is stamped on a tag attached to the assembly by one of the rear cover-screws. The axle serial number is stamped on the gear carrier housing.

1. Drive pinion oil seal.
2. Drive pinion oil seal gasket.
3. Drive pinion oil slinger.
4. Gear carrier.
5. Hypoid drive pinion. { matched
6. Hypoid drive gear. { assembly.
7. Differential case.
8. Differential side gear.
9. Differential bearing shim.
10. Gear carrier cover.
11. Differential bearing.



12. Axle shaft spacer.
13. Pinion mate shaft.
14. Differential bevel pinion mate.
15. Pinion mate shaft lock pin.
16. Drive pinion bearing (inner).
17. Drive pinion bearing shim (inner).
18. Drive pinion bearing spacer.
19. Drive pinion bearing shim (outer).
20. Drive pinion bearing (outer).
21. Universal joint flange.

Fig. 1. Sectioned view of the differential.

DATA

Axle Shaft End Float	.003″ to .005″ (.08 to .13 mm.)
Differential Bearing Preload	.005″ (.13 mm.) shim allowance
Pinion Bearing Preload	8 to 12 lbs/in. (.09 to .14 kg/m.)
Backlash	As etched on drive gear —minimum .004″ (.10 mm.)

Tightening Torque

—Drive Gear Bolts	
⅜″ (9.5 mm.) diameter bolts	50 to 60 lbs/ft. (6.9 to 8.3 kg/m.)
$\frac{7}{16}$″ (11.1 mm.) diameter bolts	70 to 80 lbs/ft. (9.7 to 11.1 kg/m.)
—Differential Bearing Cap Bolts	60 to 65 lbs/ft. (8.3 to 9.0 kg/m.)
—Pinion Nut	120 to 130 lbs/ft. (16.6 to 18.0 kg/m.)
Thornton " Powr-Lok " Differential Bolts	35 to 45 lbs/ft. (4.8 to 6.2 kg/m.)

Axle Ratios

2·4 litre (Type 3.HA and 4.HA)*	**3.4 litre, 3.8 litre** (Type 4.HA)
4.27 : 1 (47 × 11) Standard	3.54 : 1 (46 × 13) Standard
4.55 : 1 (50 × 11) Overdrive models	3.77 : 1 (49 × 13) Overdrive models

*Early 2.4 litre models were equipped with 3.HA axles but later production cars had the 4.HA type axle similar in construction to those fitted to the 3.4 and 3.8 litre models but retaining the individual ratios; the change was as follows :—

	Commencing Chassis numbers :— R.H. Drive	L.H. Drive
Standard transmission	103511	125693
Overdrive model	103507	125693
Automatic transmission	103381	125693

Special Tools

For efficient servicing of the rear axle, the special tools listed below and illustrated in this section are necessary.

The tools are manufactured and supplied by V. L. Churchill & Co. Ltd., P.O. Box No. 3, London Road, Daventry, Northants.

	Churchill Tool No.
Axle Shaft Extractor	SL.13
Pinion and Differential Bearing Cone Puller	SL.14 with SL.14-1
Gear Carrier Stretching Fixture	SL.1
Pinion Bearing Cup Extractor	SL.550-4 with 550 Handle
Bearing Cup Installation Tool	SL.550-4 with 550 Handle
Pinion Cone Setting Gauge	SL.3
Pinion Oil Seal Installation Collar	SL.4
Rear Hub Extractor (for disc wheel hubs)	JD.1
Rear Hub Extractor (for wire wheel hubs)	JD.7
Multi-purpose hand press	SL.14

Reconditioning Scheme

Although full servicing instructions for the rear axle are given in this section it is recommended that, wherever possible, advantage is taken of the factory reconditioning scheme particularly in view of the intricate adjustments and the number of special tools required.

Reconditioned axles are supplied on an exchange basis and comprise an axle complete less hubs and brake details ; rear axles for overhaul should therefore be returned in this condition.

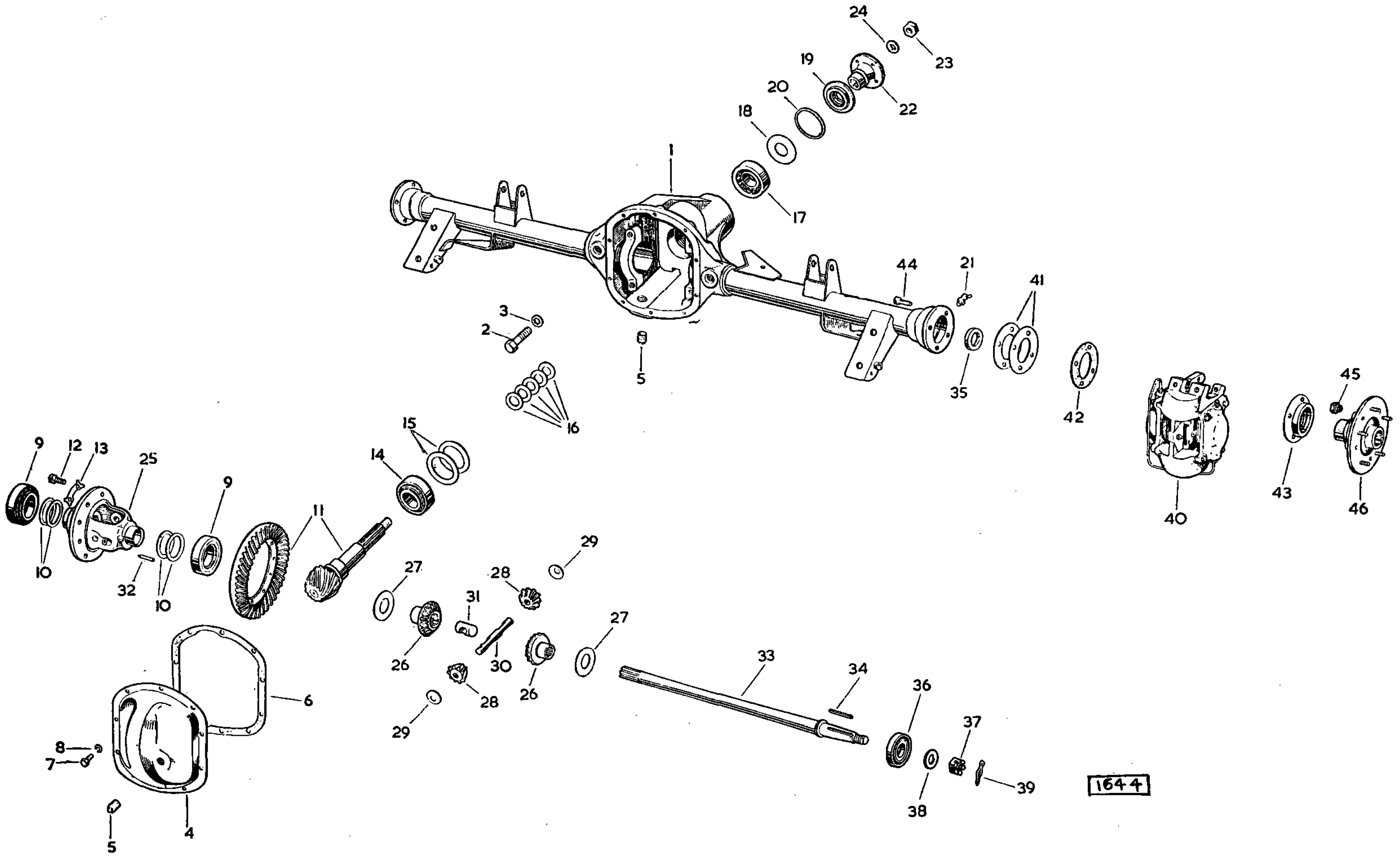


Fig. 2. Exploded view of the rear axle.

1. Carrier and tube assembly.
2. Setscrew.
3. Shakeproof washer.
4. Rear Cover.
5. Drain and filler plug.
6. Gasket.
7. Setscrew.
8. Lockwasher.
9. Roller bearing.
10. Shim.
11. Drive gear and pinion.
12. Setscrew.
13. Lockstrap.
14. Roller bearing.
15. Shim (inner)
16. Shim (outer).
17. Roller bearing.
18. Oil slinger.
19. Oil seal.
20. Gasket.
21. Grease nipple.
22. Universal joint flange.
23. Nut.
24. Washer.
25. Differential case.
26. Side gear.
27. Thrust washer.
28. Differential pinion mate gear.
29. Thrust washer.
30. Pinion mate gear shaft.
31. Spacer.
32. Pinion mate shaft lock pin.
33. Axle shaft.
34. Key.
35. Oil seal.
36. Taper roller bearing.
37. Slotted nut.
38. Washer.
39. Split pin.
40. Rear brake assembly.
41. Shim.
42. Gasket.
43. Retainer.
44. Bolt.
45. Self-locking bolt.
46. Rear hub.

ROUTINE MAINTENANCE

EVERY 2,500 MILES (4,000 km.)
Checking the Oil Level.

Check the level of the oil in the rear axle when the car is standing on level ground. A combined level and filler plug is fitted to the cover plate. Top up, if necessary, to the bottom of this plug with the recommended grade of lubricant. Since hypoid oils of different brands may not mix satisfactorily, draining and refilling is preferable to topping up if the brand of oil in the axle is unknown.

EVERY 5,000 MILES (8,000 km.)
Rear Wheel Bearings—Lubrication.

Lubricate the rear wheel bearings sparingly with recommended lubricant through the nipples provided. The nipples are situated at the ends of the axle tubes. A bleed hole is provided in the axle casing opposite the nipple to indicate when sufficient lubricant has been applied.

EVERY 10,000 MILES (16,000 km.)
Changing the Oil.

Drain and refill with the recommended grade of lubricant. The drain plug is situated at the base of the differential. The oil will drain more readily if the operation is carried out at the end of a journey when the oil is hot and will therefore flow more freely.

Axle Shaft End-Float, Checking.

It is desirable at this mileage to check and correct, if necessary, the axle shaft end float.

Recommended Lubricants

	Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent CALTEX TEXACO
Rear Axle	Mobilube GX 90	Castrol Hypoy	Spirax 90 E.P.	Esso Gear Oil GP.90/140	Gear Oil SAE 90EP	Hypoid 90	Multigear Lubricant E.P. 90
Rear wheel bearings	Mobilgrease MP	Castrolease LM	Retinax A	Esso Multi-Purpose Grease H	Energrease L2.	LB 10	Marfak All-Purpose

Capacities

	Imperial pints	U.S. pints	Litres
2.4 litre	$2\frac{1}{4}$	$2\frac{3}{4}$	1.3
3.4 litre	$2\frac{3}{4}$	$3\frac{1}{4}$	1.6

REAR AXLE

Removal

Jack up the car under the rear axle and place blocks forward of the road spring front mounting. Remove wheel spats, nave plates and road wheels. Release handbrake.

Disconnect the handbrake cables by removing the clevis pins at brake calipers.

Disconnect hydraulic pipes from the brake calipers and blank off open connections to ensure cleanliness when reassembling.

Remove the two bolts securing the brake caliper to caliper mounting plate and detach the caliper. Note the shims fitted between the caliper and mounting plate ; these must be refitted in their original positions otherwise the centralisation of the caliper will be upset.

Withdraw the split pin and slotted nut with washer securing each hub to axle shaft and draw off hubs with suitable extractor (see Fig. 3).

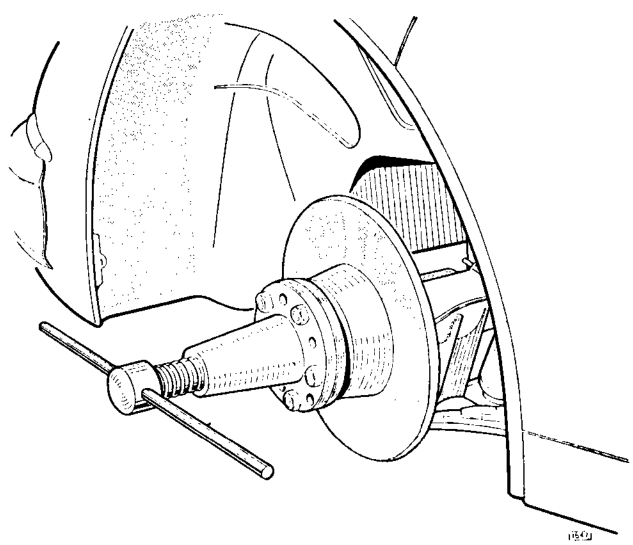


Fig. 3. Withdrawing the rear hub with an extractor

Remove split pins and four slotted nuts securing rear axle companion flange to propeller shaft. Withdraw bolts, spring propeller shaft out of register and place clear.

Remove the clips securing hydraulic pipes to the rear axle. Remove the bolt securing the three-way connection to the rear axle casing and tie up the hydraulic pipe to the body underframe.

Remove the two bolts securing the handbrake compensator assembly to the rear axle and remove compensator assembly and cables.

Remove the two nuts, the inner and outer washers and the rubber buffers from the damper attachment bracket on the rear axle. Compress the hydraulic damper clear of the rear axle.

Release the torque arms by removing the self-locking nuts from the bolts securing the arms to the rear axle ; remove the plain washers and drift out the bolts.

Remove the nuts securing the panhard rod to the rear axle and withdraw the rubber buffers and washers.

Lower the axle as far as possible on the jack before removing the spring eye bolts.

Remove the nuts securing the road spring eye bolts and drift out the bolts.

Slide axle assembly clear of the exhaust tail pipe (s). Lower to floor and withdraw from underneath the car.

Refitting

Refitting is the reverse of the removal procedure, but it will be necessary to check the centralisation of the brake calipers and bleed the hydraulic system, as described in section L " Brakes ".

Check the setting of the panhard rod as described in Section K " Rear Suspension ".

AXLE SHAFTS

Removal

Jack up car and remove wing valance and road wheel.

At the rear of the brake calipers remove clevis pins securing handbrake cable to operating lever. Disconnect hydraulic pipes and blank off open connections to ensure cleanliness when reassembling.

Remove the two bolts securing the brake caliper to caliper mounting plate and detach the caliper. Note the shims fitted between the caliper and mounting plate ; these must be refitted in their original positions otherwise the centralisation of the caliper will be upset. Remove split pin and slotted nut and with a suitable extractor, withdraw the hub and disc from the axle shaft.

Before proceeding further check the combined end float of the axle shafts which should be .003″ to .005″ (.08 to .13 mm.) ; if necessary adjust end float when refitting by adding or subtracting shims between caliper mounting plate and end of axle tube.

Detach the oil seal retainer and brake caliper mounting plate from the end of the axle tube by removing four nuts and bolts. Preserve any shim pack that may be present between the brake caliper mounting bracket and the axle tube.

Withdraw the axle shaft with its taper roller bearing from the end of the axle tube, using Tool No. SL.13 (see " Special Tools " on page H.5).

Examine the hub bearing and if a replacement is necessary withdraw the inner race from the axle using Tool No. SL.14-7 with SL.14-1 (see " Special Tools " on page H.5).

Examine the oil seal which is pressed inside the axle tube and if necessary withdraw and fit a replacement.

Refitting

Refitting is the reverse of the removal procedure but it is important to observe the following points :—

Wash the hub bearing so that the axle shaft end float may be determined accurately. Install the shaft with the taper roller inner race taking care not to damage the oil seal. Assemble the bearing outer race, making absolutely sure that the race enters the housing squarely. Examine the hub oil seal and replace if necessary.

Check the axle shaft end float, as shown in Fig. 5, with a dial indicator, after gently tapping with a raw-hide mallet on each axle shaft to ensure that the bearing cups are butting against the caliper mounting plate.

Add or subtract adjusting shims available in thicknesses of .003", .005", .010" and .030" (.08, .13, .25 and .76 mm.) until the correct axle shaft end float of .003" to .005" (.08 to .13 mm.), which is just perceptible by hand, is obtained. Adding shims increases end float, subtracting shims decreases end float. Remove or install approximately an equal thickness of shims at each end of the axle in order to retain the axle shaft spacer in a central position.

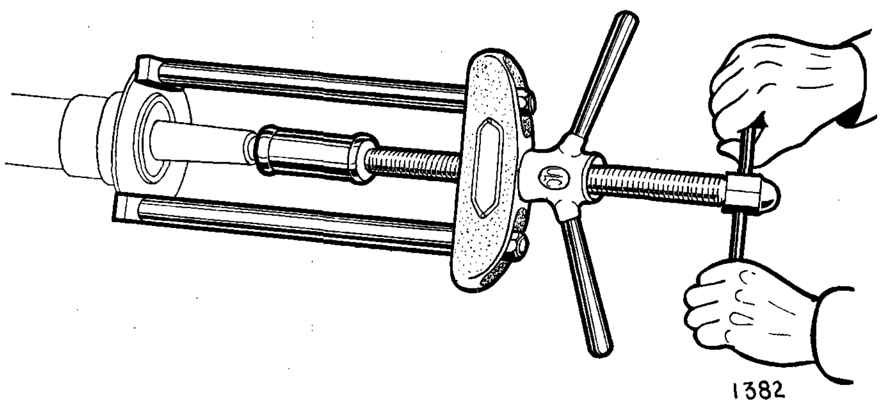


Fig. 4. Axle shaft removal.

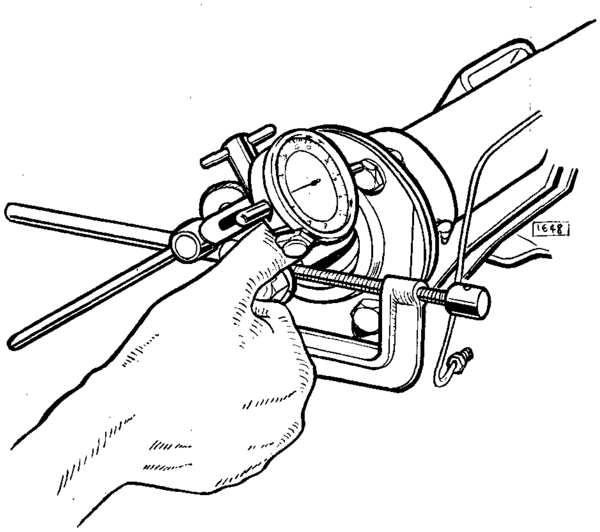


Fig. 5. Checking the axle shaft end float.

Refit hubs and caliper assemblies ; reconnect hydraulic pipes and handbrake cables. Check the centralisation of the discs within the brake calipers and " bleed " hydraulic system as described in Section L " Brakes ".

Refit road wheels and wing valances. Grease hub bearings with the recommended lubricant until grease exudes from the bleed hole.

DISMANTLING THE DIFFERENTIAL ASSEMBLY

Remove the axle assembly as described on page H.9.
Remove the axle shafts as described on page H.9.

Removing the Differential with Service Tools

First drain the lubricant from the gear carrier housing and then remove the gear carrier rear cover.

Flush out the unit thoroughly so that the parts can be carefully inspected.

To remove the differential, proceed as follows :—

(1) Withdraw the four bolts securing the two differential bearing caps and remove the two caps.

(2) Before attempting to remove the differential assembly, fit the stretching fixture, Tool No. SL.1. Fig. 6 (see " Special Tools " on page H.5).

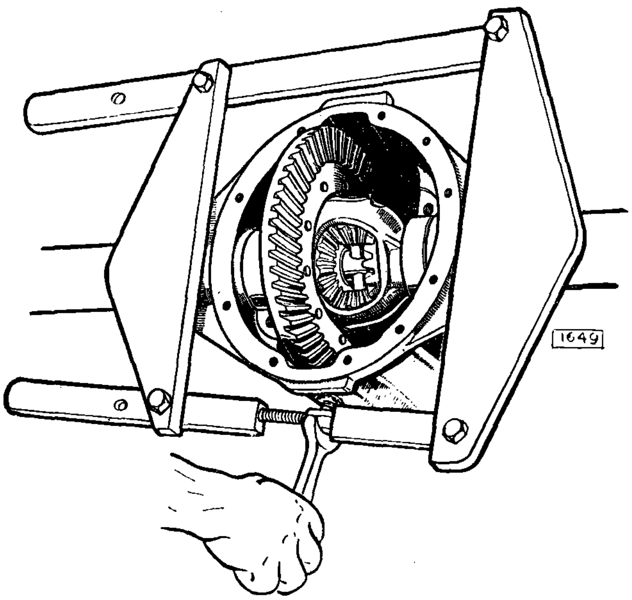


Fig. 6. Stretching the gear carrier prior to removing the differential.

The fixture should be adjusted to suit the model being serviced, a series of holes being provided in the member opposite the turn-buckle for this purpose. Open the fixture by means of the turn-buckle until it is hand tight, then spread the case by using a spanner. DO NOT OVER-SPREAD, OR THE AXLE CASING WILL BE DAMAGED BEYOND REPAIR. The correct spread does not exceed a half turn on the turn-buckle, and this figure should not be exceeded even if the differential is still stiff to remove.

(3) The differential assembly may now be prised out by means of two levers, one on each side of the differential case opening. During this operation use suitable packing between the levers and the gear carrier.

Removing the Differential—Emergency Method

First drain the lubricant from the gear carrier housing and then remove the gear carrier rear cover. Flush out the unit thoroughly so that the parts can be carefully inspected.

To remove the differential, proceed as follows :—

(1) Withdraw the four bolts securing the two differential bearing caps and remove the two caps.

(2) The differential assembly should now be prised out by means of two levers, one on each side of the differential case opening, taking care not to tilt the assembly and so wedge it more tightly than it is held by the preload. During this operation use suitable protective packing between the levers and the gear carrier.

Removing the pinion

(1) Remove the pinion nut and washer.

(2) Withdraw the universal joint companion flange with a suitable puller.

(3) PRESS the pinion out of the outer bearing. It is important that the pinion should be pressed and not driven out to prevent damage to the outer bearing. The pinion, having been pressed from its outer bearing, may now be removed from the gear carrier housing. Note : Keep all shims intact.

(4) Remove the pinion oil seal together with the oil slinger and outer bearing cone.

(5) Examine the outer bearing for wear and, if replacement is required, extract the bearing cup, using Tool No. SL.14 with SL.14-1 shown in Fig. 8.

(5a) If the correct tool is not available, and the old bearing cup is to be scrapped, it is possible to drive out the cup, the shoulder locating the bearing being recessed to facilitate the operation.

(6) Remove the pinion inner bearing cup, as shown in Fig. 8, using Tool No. SL.14 with SL.14-1 if the bearing requires replacement or adjustment of the pinion setting is to be undertaken. Take care of the shims fitted between the bearing cup and the housing abutment face.

(6a) If the inner bearing is to be replaced it may be driven out, but the correct service tool should be used when the bearing is removed in order to carry out pinion setting adjustment.

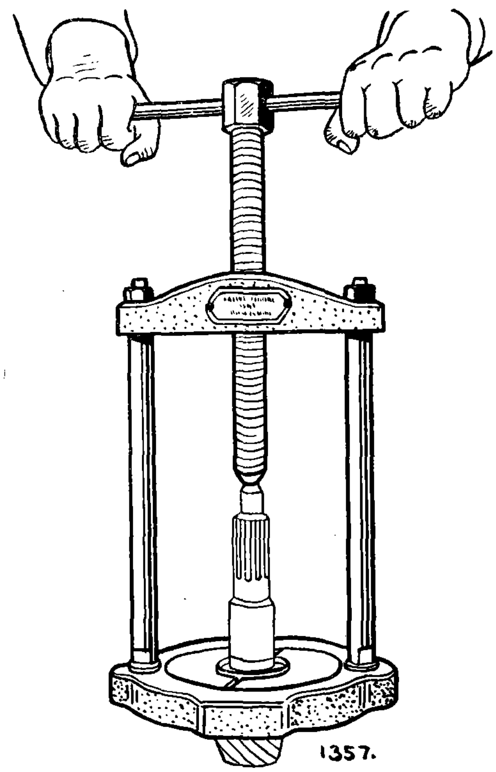


Fig. 7. *Withdrawing the pinion inner bearing.*

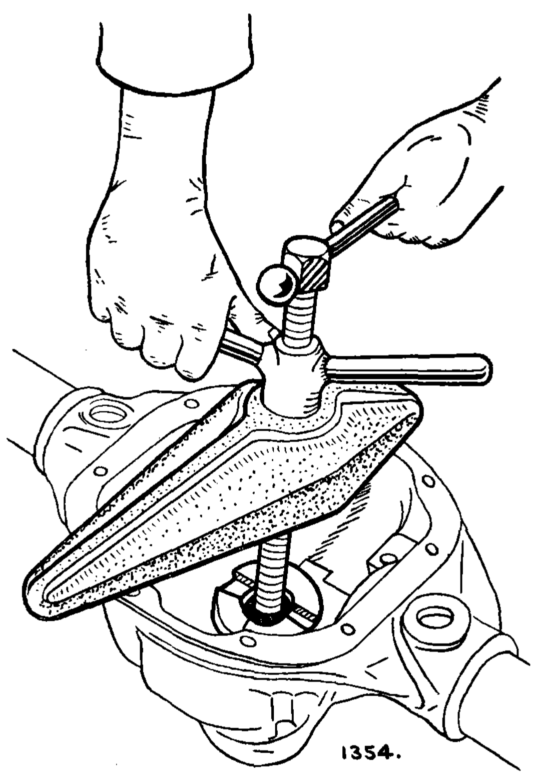


Fig. 8. *Removal of the inner bearing cup.*

Dismantling the Differential

(1) Bend down the tabs on the drive gear screws locking straps and remove the drive gear screws.

(2) Remove the drive gear from the differential case by tapping with a rawhide mallet.

(3) Using a small punch, drive out the pinion mate shaft locking pin, which is secured in place by peening the case, and remove the pinion mate shaft. Fig. 9 indicates the direction in which the

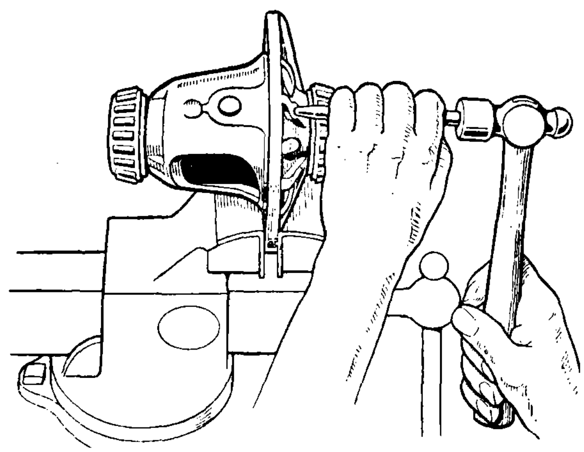


Fig. 9. *Removal of the pinion mate shaft locking pin.*

locking pin is removed ; it is not possible to drift the pin in the opposite direction.

(4) Remove the axle shaft spacer.

(5) Rotate the side gears by hand until the pinions are opposite the openings in the differential case, then remove the differential gears, care being taken not to lose the thrust washers fitted behind them.

(6) If the drive gear setting is to be altered, it will be necessary to withdraw the differential bearings, using the extractor Tool No. SL.14 with SL.14-3, to gain access to the shims located between the bearing and the abutment face on the differential case.

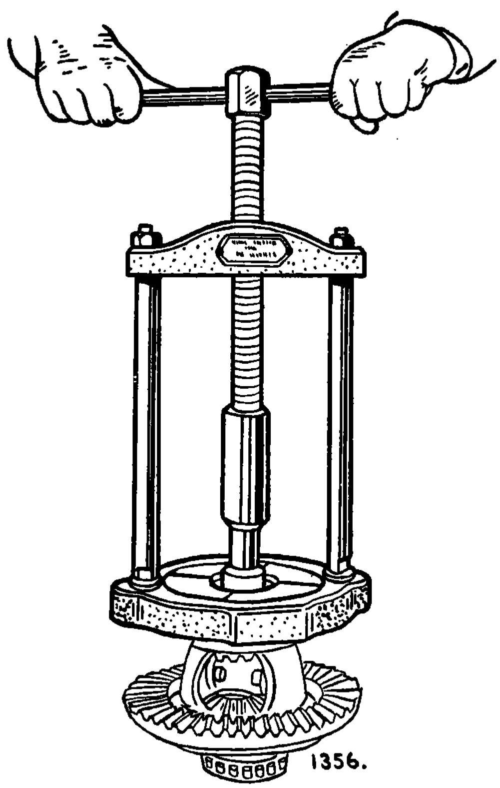


Fig. 10. *Withdrawing a differential bearing.*

ASSEMBLING THE DIFFERENTIAL

(1) Assemble the side gears with the thrust washers in position.
(2) Insert the differential pinions, through the openings in the differential case, and mesh them with the side gears. Hold the pinion thrust washers on the spherical thrust faces of the pinions whilst rotating the differential gear assembly into its operating position by hand.
(3) Line up the pinions and thrust washers, then install the pinion mate shaft with the axle shaft spacer in position.
(4) Line up the cross hole in the shaft with the hole in the differential case, then fit the pinion mate shaft lock pin.
(5) Using a punch, peen some of the metal of the differential case over the end of the lock pin to prevent its working loose and thereby causing extensive damage to the axle assembly.
(6) Clean the drive gear and differential case contacting surfaces and carefully examine same for burrs.
(7) Align the drive gear attaching bolt holes with those in the flange of the case, and gently tap the drive gear home on the case with a hide or lead hammer.
(8) Insert the drive gear bolts, with NEW locking straps and tighten them uniformly, preferably with a torque spanner to the reading given on page H.5.
Then bend the locking tabs round the bolt heads to prevent their working loose.

The procedure for fitting the differential case assembly into the gear carrier is given under the heading "Differential Bearing Adjustment".

Differential Bearing Adjustment

The thickness of shims required in the installation of the differential bearings is determined as follows :—

(1) Fit the differential bearings, without shims, on the differential case, making sure that the bearing cones and cups and the housing are perfectly clean.
(2) Place the differential assembly, with the bearing cups in their housing, within the gear carrier, the pinion not being assembled.
(3) Install the dial indicator set on the gear carrier with the button against the back face of the drive gear.
(4) Inserting two levers between the housing and the bearing cups, move the differential assembly to one side of the carrier, as shown in Fig. 11.

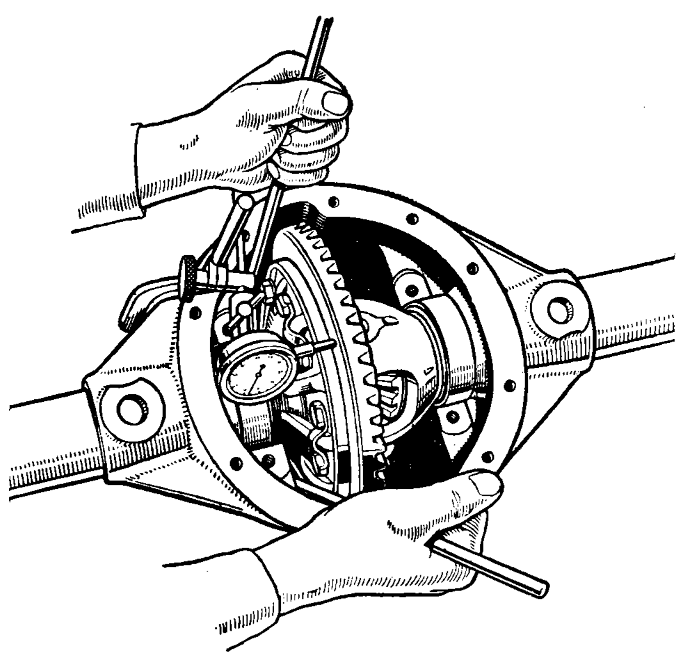


Fig. 11. *Differential bearing adjustment.*

(5) Set the indicator to zero.

(6) Move the assembly to the other side and record the indicator reading, which gives the total clearance between the bearings as now assembled and the abutment faces of the gear carrier housing.

Add .005" (.13 mm.) more to the clearance reading to give preload ; this thickness of shims to be used in the installation of the differential bearings, the shims being divided to give the gear position with correct backlash as detailed under " Drive Gear Adjustment " on page H.17.

(7) Remove the differential assembly from the gear carrier.

Pinion Adjustment

Re-install the pinion outer bearing cup with Tool No. SL.550-4 with 550 Handle. Re-install the pinion bearing inner cup with the original adjusting shims positioning same. Press the inner bearing cone on the pinion, using an arbor press and a length of tube, contacting the inner race only and not the roller retainer.

The hypoid drive pinion should be correctly adjusted before attempting further assembly, the greatest care being taken to ensure accuracy.

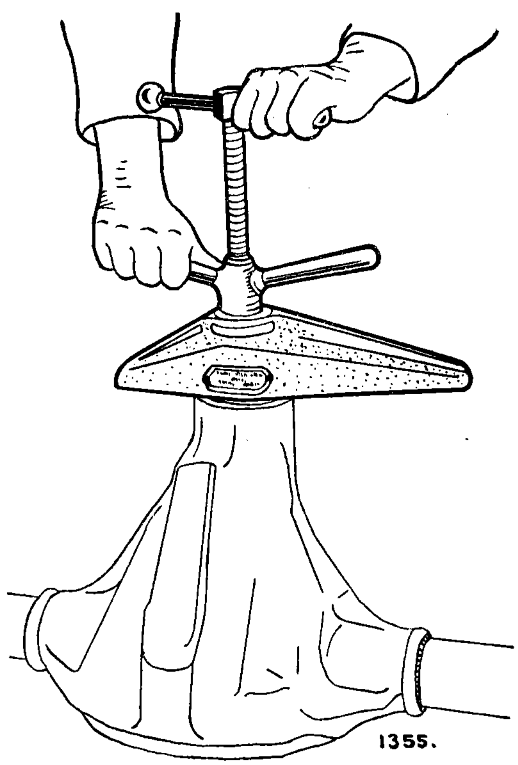


Fig. 12. Replacing the pinion bearing inner cup.

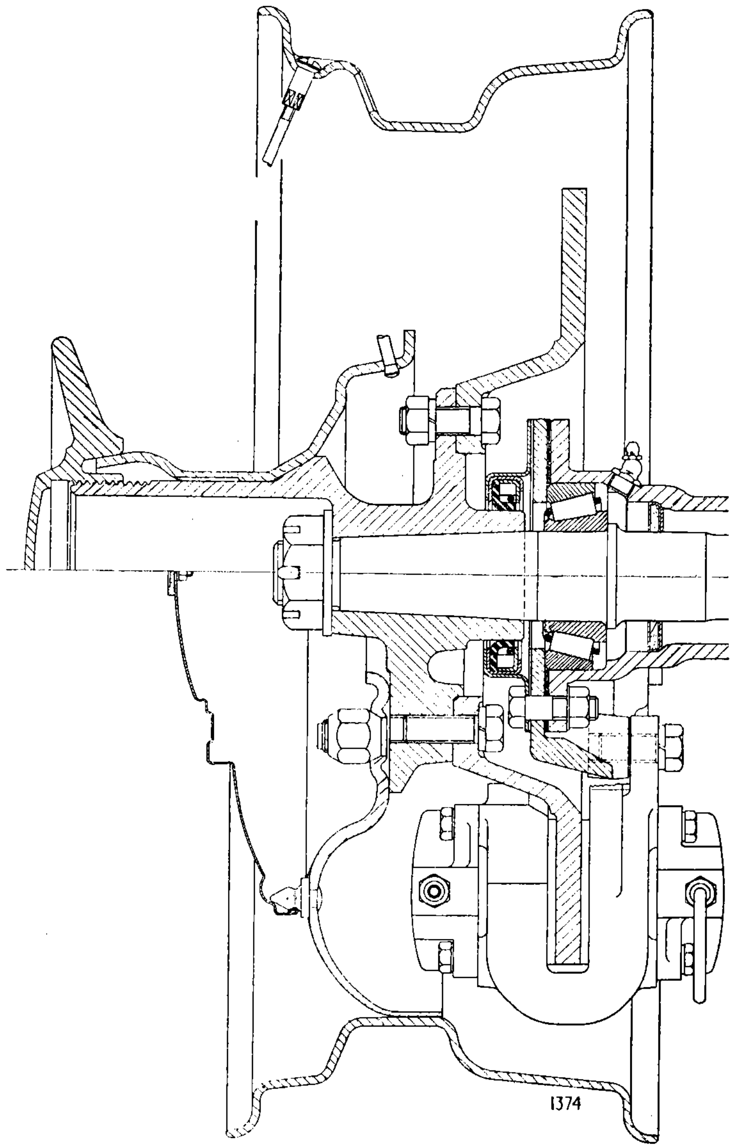


Fig. 13. Sectioned plan view of the disc brake hub arrangement. The upper half of the illustration shows a wire spoke wheel hub; the lower half shows a disc wheel hub.

The correct pinion setting is marked on the ground end of the pinion as shown in Fig. 14. The matched assembly serial number at the top is also marked on the drive gear, and care should be taken to keep similarly marked gears and pinions in their matched sets, as each pair is lapped together before despatch from the factory. The letter on the left is a production code letter and has no significance relative to assembly or servicing of any axle. The letter and figure on the right refer to the tolerance on offset or pinion drop dimension " A " in Fig. 15 which is stamped on the cover facing of the gear carrier housing.

The number at the bottom gives the cone setting distance of the pinion and may be Zero (0). Plus (+) or Minus (—). When correctly adjusted, a pinion marked Zero will be at the zero cone setting distance, dimension " B " in Fig. 15 from the centre line of the gear to the face on the small end of the pinion ; a pinion marked Plus two (+2) should be adjusted to the nominal (or Zero) cone setting plus .002", and a pinion marked Minus two (—2) to the cone setting distance minus .002".

The zero cone setting distances (" B " Fig. 15) for the various axles are given below.

Thus for a pinion marked Minus two (—2) the distance from the centre of the drive gear to the face of the pinion should be 2.623" (that is, 2.625"—.002") and for a pinion marked Plus three (+3) the cone setting distance should be 2.628".

When the pinion bearing cups have been installed in the gear carrier, with the original pinion inner bearing adjusting shims, as described in the first paragraph of this section, proceed with pinion as follows :—

(1) Place the pinion, with the inner bearing cone assembled, in the gear carrier.
(2) Turn the carrier over and support the pinion with a suitable block of wood for convenience before attempting further assembly.
(3) Install the pinion bearing spacer if fitted on the unit under repair.
(4) Install the original outer bearing shims on the pinion shank so that they seat on the spacer or a shoulder on the shank, according to the construction of the unit.

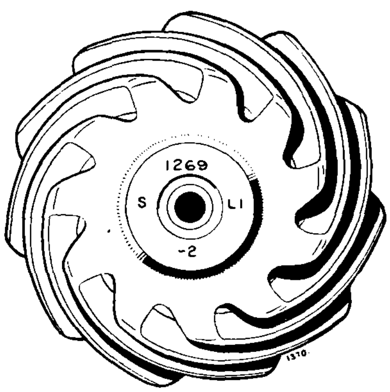


Fig. 14. Pinion setting marks.

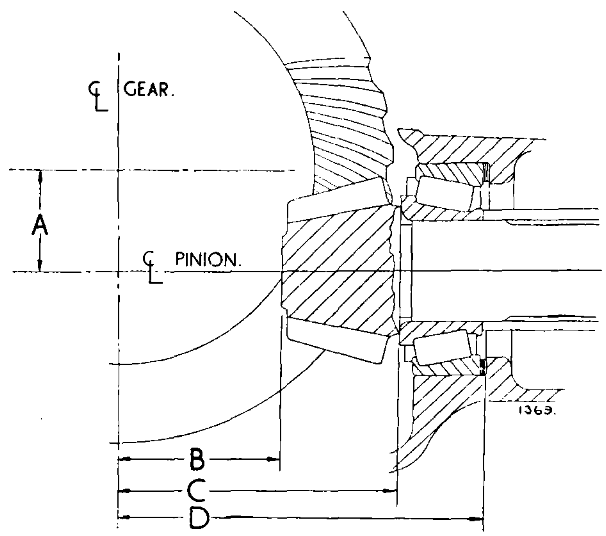


Fig. 15. Pinion setting distances.

		3 HA	4 HA
A.	Pinion Drop	1.375" (34.92 mm.)	1.5" (38.1 mm.)
B.	Zero Cone Setting	2.250" (31.75 mm.)	2.625" (66.67 mm.)
C.	Mounting Distance	3.937" (100.00 mm.)	4.312" (108.52 mm.)
D.	Centre Line to Bearing Housing	5.120" (130.05 mm.) to to 5.130" (130.30 mm.)	5.495" (139.57 mm.) to to 5.505" (139.83 mm.)

(5) Fit pinion outer bearing cone, companion flange, washer and nut only, omitting the oil slinger and oil seal assembly, and tighten the nut.

(6) Check the pinion cone setting distance by means of the gauge, Tool No. SL.3, as shown in Fig. 16. The procedure for using the gauge is :—

(a) Adjust the bracket carrying the dial indicator to suit the model being serviced, then set the dial indicator to zero with the setting block.

(b) Place the dial indicator assembly on the fixed spindle of the gauge body.

(c) Fit the fixed spindle of the gauge body into the centre in the pinion head, slide the movable spindle into position, locating in the centre in the pinion shank with the gauge body underneath the gear carrier, and lock the spindle with the screw provided.

(d) Check the pinion setting by taking a dial indicator reading on the differential bore with the bracket assembly seated on the ground face on the end of the pinion. The correct reading will be the minimum obtained ; that is when the indicator spindle is at the bottom of the bore. Slight movement of the assembly will enable the correct reading to be easily ascertained. The dial indicator shows the deviation of the pinion setting from the zero cone setting and it is important to note the direction of any such deviation as well as the magnitude.

(7) If the pinion setting is incorrect it is necessary to dismantle the pinion assembly and remove the pinion inner bearing cup. Add or remove shims as required from the pack locating the bearing cup and re-install the shim pack and the bearing cup. The adjusting shims are available in thicknesses of .003″, .005″ and .010″. Then carry out the operations (1) to (6) detailed on page H.15.

(8) When the correct pinion setting has been obtained, check the pinion bearing preload, which should afford a slight drag or resistance to turning, there being no end play of the pinion. The correct preload for the pinion bearings gives a torque figure as listed in " Data " on page H.5. Less than the correct range will result in excessive deflection of the pinion under load, whilst too much preload will lead to pitting and failure of the bearings. To rectify the preload, adjust the shim pack between the outer bearing cone and

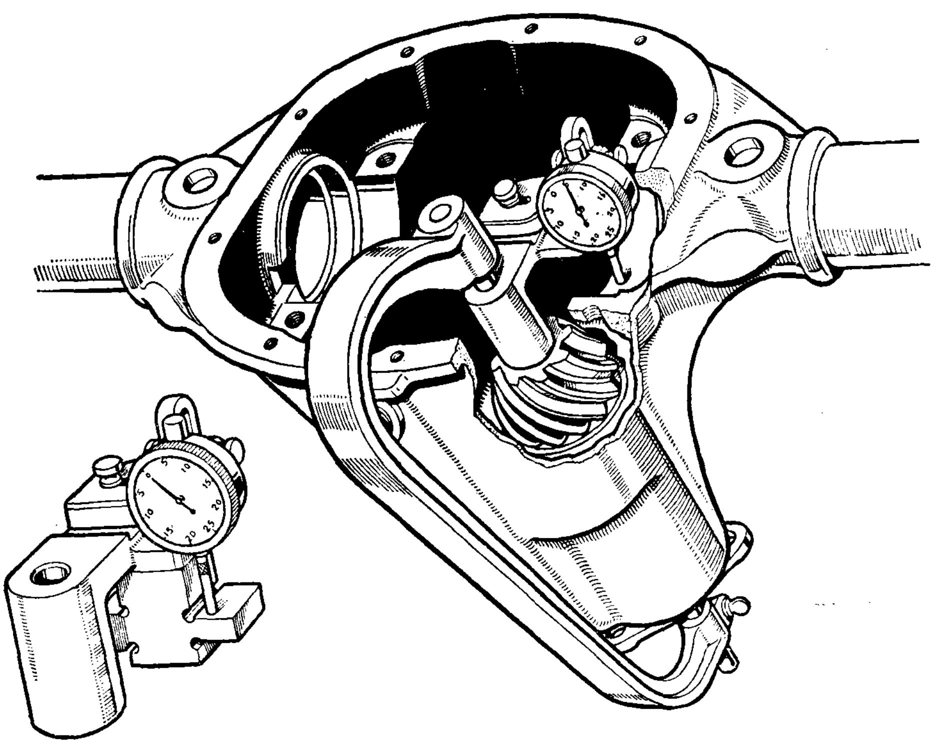


Fig. 16. Checking pinion cone setting.

the pinion shank or spacer, but do not touch the shims behind the inner bearing cup, which control the position of the pinion. Remove the shims to increase preload and add shims to decrease preload.

Installation of pinion oil seal assembly and oil slinger is usually effected after fitting differential assembly, see operations (1), (2) and (3) under " Final Assembly " on page H.18.

Drive Gear Adjustment

(1) Place the differential assembly with bearing cups, and less shims, in the housing, being sure that the bearing cones, cups and housing are perfectly clean.

(2) Install a dial indicator on the housing with the button on the back face of the drive gear as shown in Fig. 11.

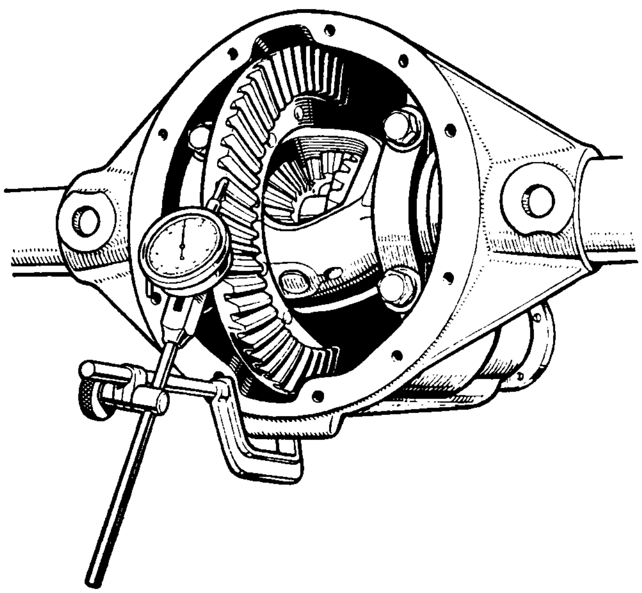


Fig. 17. Checking backlash between gears.

(3) Inserting two small levers between the housing and bearing cups, move the differential case and drive gear assembly away from the pinion until the opposite bearing cup is seated against the housing.

(4) Set the dial indicator to zero, then move the differential assembly towards the pinion until the drive gear is in metal to metal contact deeply in mesh with the pinion.

The indicator reading now obtained (clearance between drive gear and pinion) minus the backlash allowance as etched on the drive gear (e.g., B/L.007) denotes the thickness of shims to be placed between the differential case and the bearing cone on the drive gear side of the differential.

(5) Install the thickness of shims, determined in operation (4), on the drive gear side of the differential, taking the shims from the pack determined previously ; see " Differential Bearing Adjustment " on page H.13.

(6) Install the balance of the total shims required on the opposite side of the differential case.

As an example of differential and drive gear adjustment, assume that the total indicator reading obtained, as described under " Differential Bearing Adjustment ", is .080″. This figure, plus .005″ for the recommended preload, equals .085″, which denotes the total thickness of shims to be used. Also assuming the clearance between the drive gear and pinion to be .042″, determined as in operations (1) to (4) as above subtract the backlash as etched on the gear, say .007″, from the .042″ clearance. The .035″ difference denotes the thickness of shims to be placed between the differential case and bearing cone on the drive gear side of the differential. Then subtract the thickness of shims (.035″) inserted on the drive gear side of the differential case from .085″ and the .050″ difference denotes the thickness of shims to be installed on the opposite side of the case.

(7) To facilitate installation of the differential assembly, fit the stretching fixture as shown in Fig. 6. Stretch the gear carrier, being sure not to exceed the half turn specified on the turnbuckle or the axle casing will be damaged beyond repair.

(8) Lower the differential assembly into position, lightly tapping the bearings home with a hide hammer, whilst ensuring that the gear teeth are led into mesh with those of the pinion. Careless handling at this stage may result in bruising the gear teeth, and removal of the consequent damage can only be partially successful and result in inferior performance.

(7a) **Emergency Operation.** In an emergency it is possible to install the differential assembly by slightly tilting the bearing cups and tapping same lightly into position with a hide hammer. Naturally, this method increases the difficulty of avoiding damage to gear teeth, and extreme care is necessary to prevent damage to the differential bearings. This procedure is not recommended and should be strictly reserved for emergencies.

(8a) Install the differential bearing caps, taking care to ensure that the position of the numerals marked on the gear carrier housing face and the caps correspond, as indicated in Fig. 18. Finally tighten the bolts securing the bearing caps.

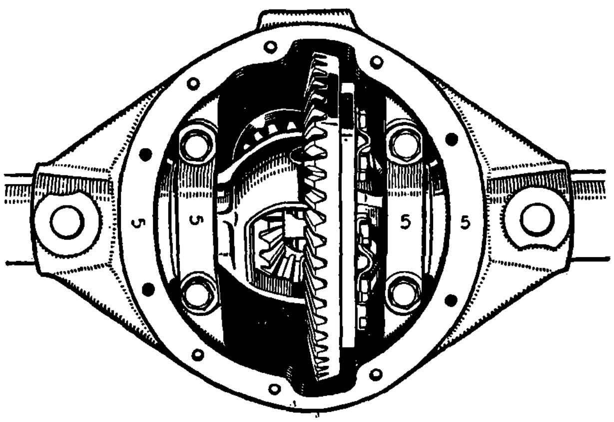


Fig. 18. Differential bearing cap markings.

(9) When refitting the bearing caps, be sure that the position of the numerals marked on the gear carrier housing face and the caps correspond as indicated in Fig. 18. Tighten the caps lightly, remove the stretching fixture, then finally tighten the bolts securing the bearing caps. Then continue with operation (10).

(10) Mount a dial indicator on the gear carrier housing with the button against the back face in a similar manner to that employed for differential bearing adjustment, as shown in Fig. 11. Turn the pinion by hand and check the run out on the back face, which should not exceed .005″ (.13 mm.). If there is excessive run out, strip the assembly and rectify by cleaning the surfaces locating the drive gear. Any burrs on these surfaces should be removed.

(11) Remount the dial indicator on the gear carrier housing with the button against one of the drive gear teeth, as nearly in line with the direction of tooth travel as possible (see Fig. 17). Move the drive gear by hand to check the backlash which should be as etched on the gear. If the backlash is not in accordance with the specification, transfer the necessary shims from one side of the differential case to the other to obtain the desired setting. To increase backlash, remove shims from the drive gear side of the differential and install on the opposite side. Backlash is decreased by transferring shims to the drive gear side from the opposite side of the differential case.

(12) After setting the backlash to the required figure, use a small brush to paint eight or ten of the drive gear teeth with a stiff mixture of marking raddle, used sparingly, or engineers blue may be used if preferred. Move the painted gear teeth in mesh with the pinion until a good impression of the tooth contact is obtained. The resulting impression should be similar to Fig. A in Fig. 20. Refer to the section on tooth contact and to Fig. 20 for instructions on correction of tooth contact if the impression obtained is not satisfactory.

Final Assembly

To complete the rebuilding of the unit :—

(1) Remove the drive pinion nut, washer and companion flange.

(2) Install the oil slinger, and then fit the pinion oil seal assembly, using Tool No. SL.4, as shown in Fig. 19. Place the oil seal with the dust excluder flange uppermost (not omitting the oil seal gasket used with the metal case type seal on later models), fit the installation collar, Tool No. SL.4, and then tighten down the pinion nut and washer to drive the assembly home. Remove the installation collar.

(3) Fit the companion flange, washer and pinion nut, tighten securely.

(4) Fit the rear cover gasket, renewing it if required, and rear cover, securing same with set bolts and lock washers, not omitting the ratio tag which is attached by one of the set bolts.

(5) Re-install the axle shafts and hub bearings, etc., as described on page H.10 under " Axle Shafts—Refitting ".

(6) Check that the drain plug is securely tightened, then fill with the appropriate quantity of one of the hypoid lubricants recommended on page H.8.

(7) Replace the filler plug and check that the cover set bolts are tight.

(8) Check for oil leaks at the cover, pinion oil seal and where the differential cap bolt holes break through.

(9) Finally grease the hub bearings.

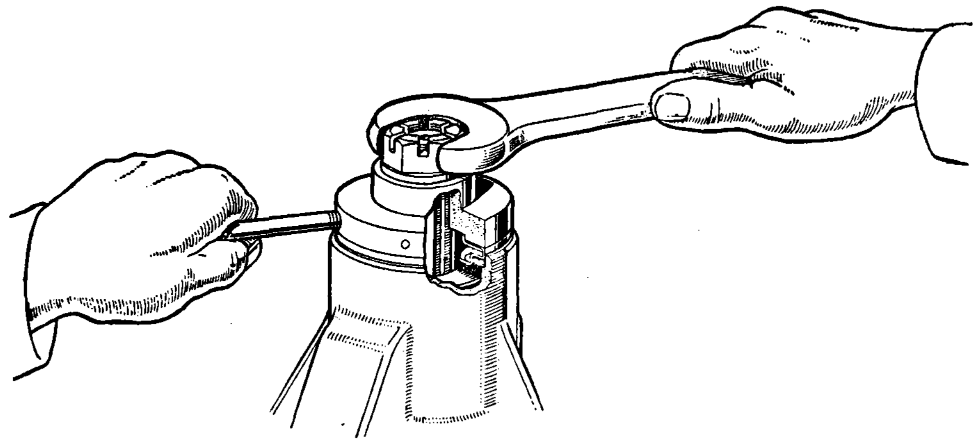


Fig. 19. Fitting the pinion oil seal.

TOOTH CONTACT

(Refer to Fig. 20)

The illustrations referred to in this section are those shown in Fig. 20 which indicates the tooth bearing impression as seen on the drive gear.

The HEEL is the large or outer end of the tooth.
The TOE is the small or inner end of the tooth.
The FACE top or addendum is the upper portion of the tooth profile.
The FLANK or dedendum is the lower portion of the tooth profile.
The DRIVE side of the drive gear tooth is CONVEX.
The COAST side of the drive gear tooth is CONCAVE.

(a) **Ideal Contact**

Fig. A. shows the ideal tooth bearing impression on the drive and coast sides of the gear teeth. The area of contact is evenly distributed over the working depth of the tooth profile and is located nearer to the toe (small end) than the heel (large end). This type of contact permits the tooth bearing to spread towards the heel under operating conditions when allowance must be made for deflection.

(b) **High Tooth Contact**

In Fig. B it will be observed that the tooth contact is heavy on the drive gear face or addendum, that is, high tooth contact. To rectify this condition, move the pinion deeper into mesh, that is, reduce the pinion cone setting distance, by adding shims between the pinion inner bearing cup and the housing and adding the same thickness of preload shims between the pinion bearing spacer, or the shoulder of the pinion shank and outer bearing cone. This correction has a tendency to move the tooth bearing towards the toe on drive and heel on coast, and it may therefore be necessary after making this change to adjust the drive gear as described in paragraphs (d) and (e).

(c) **Low Tooth Contact**

In Fig. C. it will be observed that the tooth contact is heavy on the drive gear flank or dedendum, that is, low tooth contact. This is the opposite condition from that shown in (b) and is therefore corrected by moving the pinion out of mesh, that is, increase the pinion cone setting distance by removing shims from between the pinion inner bearing cup and housing, and removing the same thickness of preload shims from between the pinion bearing spacer or the shoulder on the pinion shank and the outer bearing cone. This correction has a tendency to move the tooth bearing towards the heel on drive and toe on coast, and it may therefore be necessary after making this change to adjust the drive gear as described in (d) and (e).

(d) **Toe Contact**

Fig. D. shows an example of toe contact which occurs when the bearing is concentrated at the small end of the tooth. To rectify this condition, move the drive gear out of mesh, that is, increase backlash, by transferring shims from the drive gear side of the differential to the opposite side.

(e) **Heel Contact**

Fig. E. shows an example of heel contact which is indicated by the concentration of the bearing at the large end of the tooth. To rectify this condition move

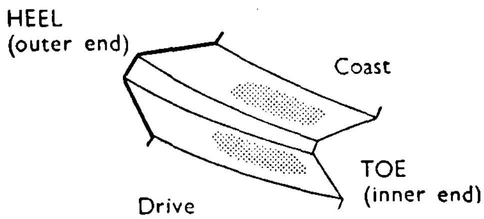
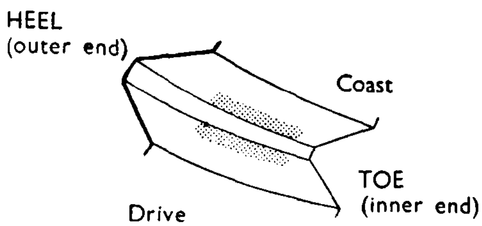
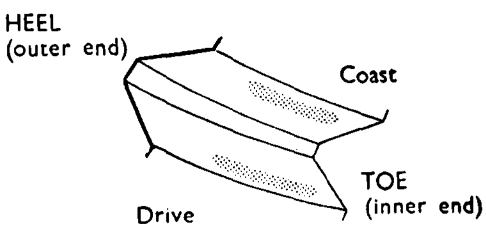
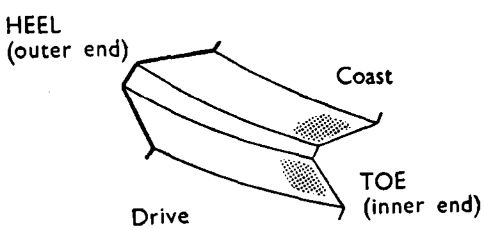
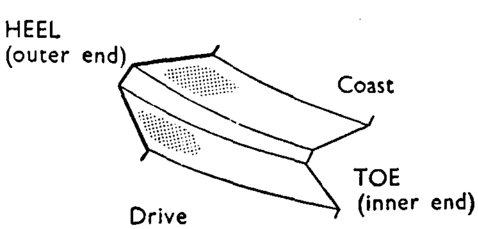
	TOOTH CONTACT (*DRIVE GEAR*)	CONDITION	REMEDY
A		IDEAL TOOTH CONTACT Evenly spread over profile, nearer toe than heel.	$\frac{o}{o}$
B		HIGH TOOTH CONTACT Heavy on the top of the drive gear tooth profile.	Move the DRIVE PINION DEEPER INTO MESH. *i.e.*, REDUCE the pinion cone setting.
C		LOW TOOTH CONTACT Heavy in the root of the drive gear tooth profile.	Move the DRIVE PINION OUT OF MESH. *i.e.*, INCREASE the pinion cone setting.
D		TOE CONTACT Hard on the small end of the drive gear tooth.	Move the DRIVE GEAR OUT OF MESH. *i.e.*, INCREASE backlash.
E		HEEL CONTACT Hard on the large end of the drive gear tooth.	Move the DRIVE GEAR INTO MESH. *i.e.*, DECREASE backlash *but* maintain minimum backlash as given in "Data"

Fig. 20. Tooth contact indication (contact markings on drive gear).

the drive gear closer into mesh, that is, reduce backlash, by adding shims to the drive gear side of the differential and removing an equal thickness of shims from the opposite side.

Note : It is most important to remember when making this adjustment to correct a heel bearing that sufficient backlash for satisfactory operation must be maintained. If there is insufficient backlash the gears will at least be noisy and have a greatly reduced life, whilst scoring of the tooth profile and breakage may result. Therefore, always maintain a minimum backlash requirement of .004" (.10 mm.).

Backlash

When adjusting backlash always move the drive gear as adjustment of this member has more direct influence on backlash, it being necessary to move the pinion considerably to alter the backlash a small amount—.005" (.13 mm.) movement on pinion will generally alter backlash .001" (.025 mm.).

Gear and Pinion Movement

Moving the gear out of mesh moves the tooth contact towards the heel and raises it slightly towards the top of the tooth.

Moving the pinion out of mesh raises the tooth contact on the face of the tooth and slightly towards the heel on drive, and towards the toe on coast.

THORNTON "POWR-LOK" DIFFERENTIAL

GENERAL

The Thornton " Powr-Lok " limited slip differential is fitted as standard to the 3.8 litre model except on cars for the U.S.A., Canada and Mexican markets when it is specified as an optional extra.

Identification

New cars fitted with a Thornton differential have a metal tag stamped P/L attached to one of the rear axle cover bolts. If a tag is not fitted, remove the filler plug when if the differential case can be seen in close proximity to the filler hole it can be assumed that a Thornton differential is fitted.

Warning

When a car is equipped with a Thornton " Powr-Lok " differential the engine must NOT be run with the car in gear and one wheel off the ground otherwise, owing to the action of the differential, the car may drive itself off the jack or stand.

If it is desired to turn the transmission by running the engine with the car in gear **both** wheels must be jacked up clear of the ground.

DESCRIPTION

The limited slip differential has two pinion shafts with two mates to each shaft. The pinion shafts are mounted at right angles to each other but do not make contact at their intersection. Double ramps with flat surfaces at each end of the pinion shafts, mate with similar ramps in the differential case. Clearance in the differential case permits slight peripheral movement at the ends of the pinion shafts.

When a driving force is applied to the differential case, the pinion shafts, pinion mates and differential side gears splined to the axle shafts, rotate as a unit. Resistance to turning at the wheels forces the pinion shafts to slide up the differential case ramps, pushing the pinion shafts apart. As the pinion shafts move apart they apply load to the clutch plates thus restricting turning between the axle shafts and the differential case. Both axle shafts have now become clutched to the differential case to a varying degree dependent upon the amount of torque transmitted. This in effect locks the axle shafts to the differential case, in the normal straight ahead driving position, which prevents spinning of either rear wheel should it leave the road or encounter poor traction such as ice, snow, sand, loose gravel or oil patches.

Due to the lateral movement of the pinion shafts in the differential case, a little more backlash may be apparent in a limited slip rear axle. Slight chatter may also occur when one wheel is on a slippery surface, this is due to surge torque.

PRINCIPLE OF OPERATION

The conventional differential divides the load equally between both driving wheels. In this connection, it should be remembered that the conventional differential will always drive the wheel which is easiest to turn. This is a definite disadvantage under adverse conditions of driving where the traction of one wheel is limited.

The main purpose of the limited slip differential is to overcome this limitation. Many times the torque of the slipping wheel is provided to the driving wheel, thus permitting improved operation under all conditions of driving. The torque is transmitted from the differential case to the cross pins and differential pinions to the side gears in the same manner as torque is applied in the conventional differential.

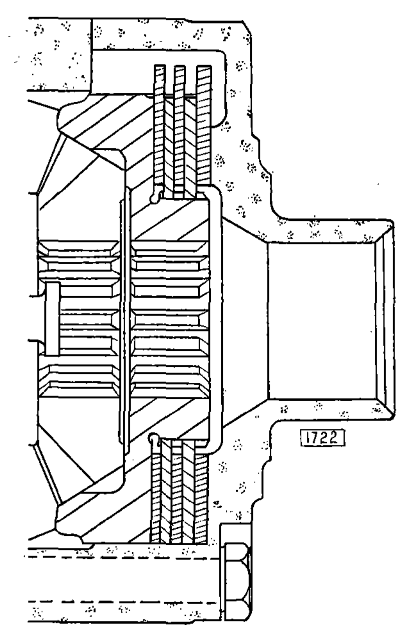


Fig. 21. Sectioned view showing friction discs and plates.

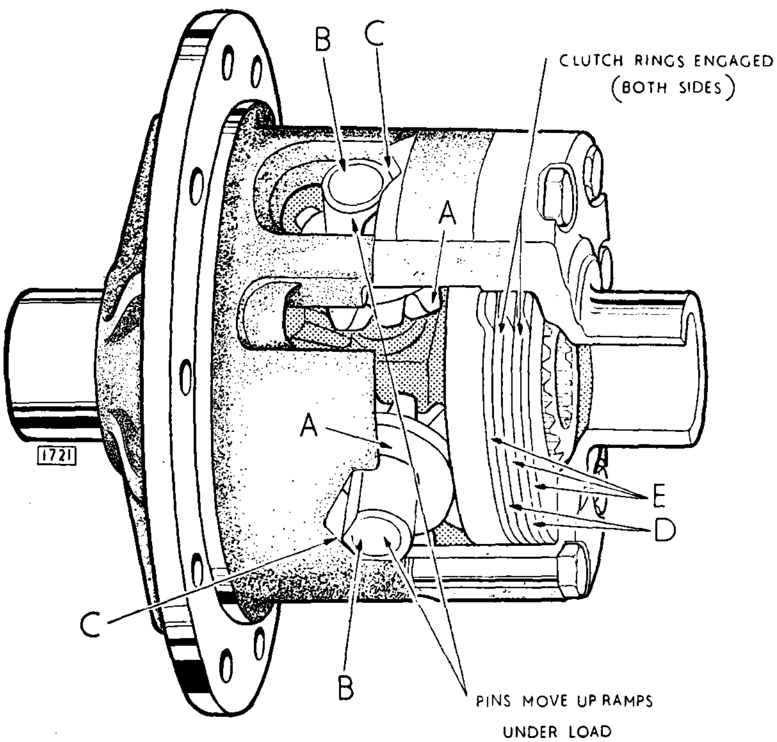


Fig. 22.

The driving forces moves the cross pins B, Fig. 22, up the ramp of the cam surfaces C, applying a load to the clutch rings D and restricts turning of the differential through the friction clutches E. This provides a torque ratio between the axle shafts which is based on the amount of friction in the differential and the amount of load that is being applied to the differential.

When turning a corner, this process is in effect partially reversed. The differential gears become a planetary set, with the gear on the inside of the curve becoming the fixed gear of the planetary. The outer gear of the planetary over-runs as the outside wheel on the curve has a further distance to travel. With the outer gear over-running and the inner gear fixed, the pinion mates A (see Fig. 24) are caused to rotate, but inasmuch as they are restricted by the fixed gear, they first must move pinion mate shafts B back down the cam surface C relieving the thrust loads on the plate clutches E. Thus when turning the corner, the differential, for all practical purposes, is similar to a conventional differential and the wheels are free to rotate at different speeds.

On straight driving, the clutches are engaged and thus prevent momentary spinning of the wheels when leaving the road or when encountering poor traction. In turning a corner, the load is relieved from the clutch surfaces so that wear is reduced to a minimum.

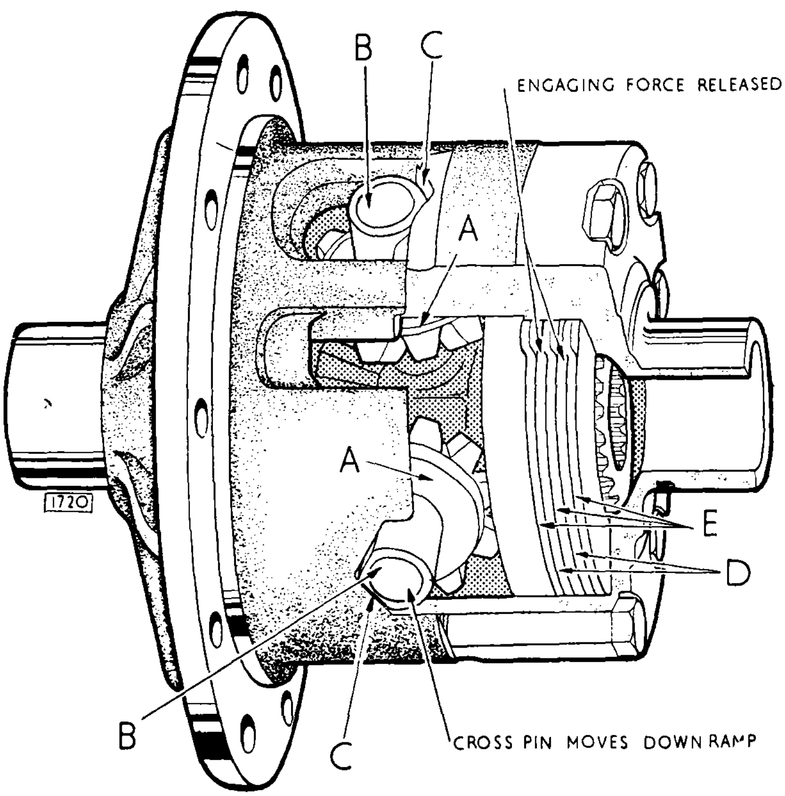
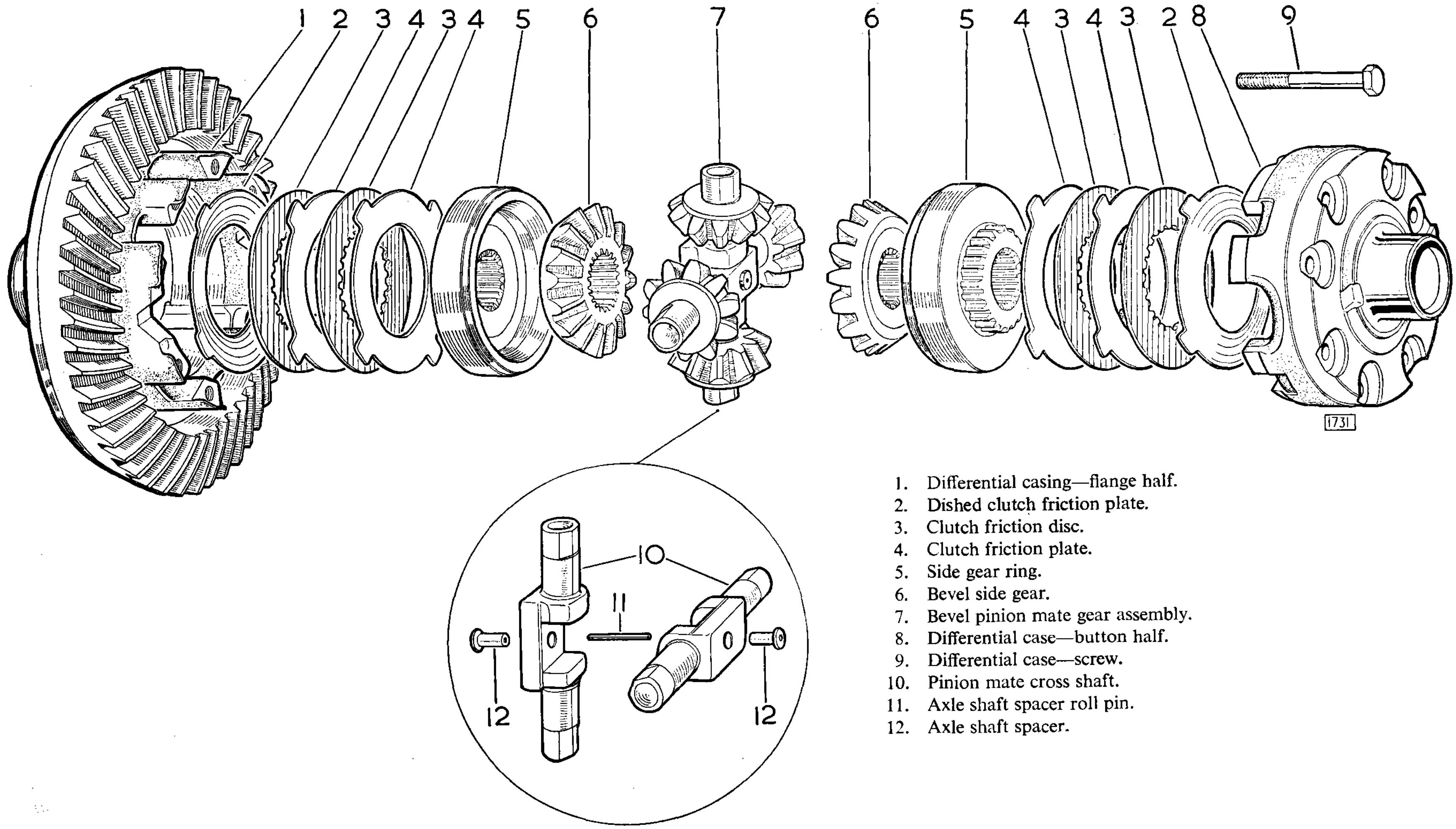


Fig. 23.



1. Differential casing—flange half.
2. Dished clutch friction plate.
3. Clutch friction disc.
4. Clutch friction plate.
5. Side gear ring.
6. Bevel side gear.
7. Bevel pinion mate gear assembly.
8. Differential case—button half.
9. Differential case—screw.
10. Pinion mate cross shaft.
11. Axle shaft spacer roll pin.
12. Axle shaft spacer.

Fig. 24. Exploded view of the Thornton " Powr-Lok " differential.

POWER FLOW IN FORWARD DRIVING

Under normal starting and operating conditions the torque or power flow in both the limited slip and conventional type differential is transmitted equally to each axle shaft and wheel. However, when sudden patches of ice, loose gravel or oil are encountered, the limited slip differential will not permit the wheel with the lesser traction to spin, gain momentum and swerve the car when a dry surface is regained.

POWER FLOW IN TURNS

In turning, the limited slip differential gives normal differential action and permits the outer wheel to turn faster than the inner wheel. At the same time the differential applies the major driving force to the inside rear wheel, improving stability and cornering.

POWER FLOW WITH POOR TRACTION

When traction conditions under the rear wheels are dissimilar, the driving force with an ordinary differential is limited by the wheel with the poorer traction. Typically, in this situation, the wheel with the poorer traction spins and the vehicle remains immobile. The limited slip differential enables the wheel with the better traction to apply the major driving force to the road.

ACTION ON ROUGH ROADS

Bumps do not adversely affect wheel action when wheels are controlled by the limited slip differential. The free wheel does not spin and gain momentum. There is no sudden wheel stoppage to cause car swerve or tyre scuffing and wheel hop is reduced.

REMOVAL FROM AXLE ASSEMBLY

The removal of the Thornton "Powr-Lok" differential from the rear axle is exactly the same as detailed in this section for the conventional type of differential.

DISMANTLING

In the absence of any mating or alignment marks as shown in Fig. 25, scribe a line across the two half casings to facilitate assembly.

Remove the eight bolts (9 Fig. 24) securing the two halves of the differential casing.

Split the casing and remove the clutch discs (3) and plates (2) from one side.

Remove the differential side gear ring (5).

Remove the pinion side gear (6) and the pinion mate cross shafts (7) complete with the pinion mate gears.

To separate the cross shafts (10) extract the shaft spacers (12) from the spacer roll pin (11).

Remove the remaining side gear and the side gear ring.

Extract the remaining clutch discs and plates.

REASSEMBLING

Refit the clutch plates and discs alternately into the flange half of the casing.

Fit the side gear ring so that the serrations on the gear mesh with the serrations in the two clutch discs.

Place one of the side gears into the recess of the side gear ring so the splines in both align.

Fit the cross shafts together.

Enter one axle shaft spacer with a new spacer roll pin attached through the hole in the cross shafts and press the other spacer on to the roll pin.

Refit the pinion mate cross shafts complete with pinion mate gears ensuring that the ramps on the shafts coincide with the mating ramps in the differential case.

Assemble the remaining side gear and side gear ring, so the splines in both align.

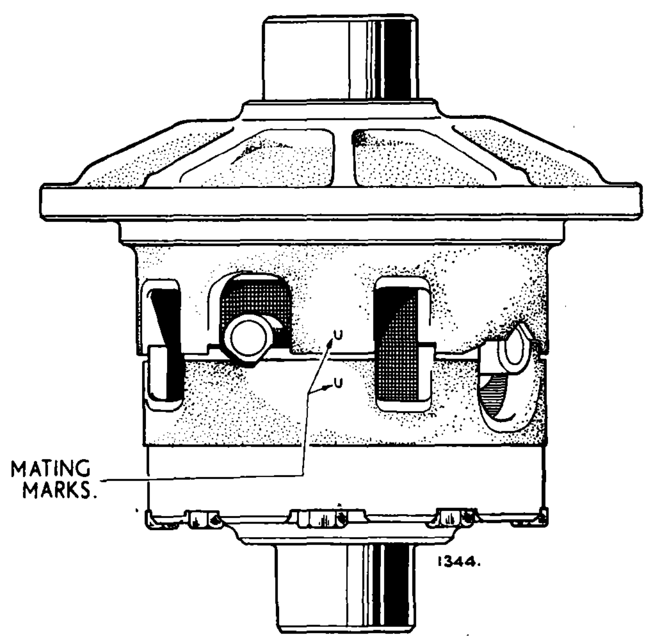


Fig. 25. Alignment marks on the differential case.

Refit the remaining clutch plates and discs to the side gear ring.

Offer up the button half of the differential case to the flange half in accordance with the identification marks and position the tongues of the clutch friction plates so they align with the grooves in the differential case. Assemble the button half to the flange half of the differential case with eight bolts but do not tighten at this juncture.

Check the alignment of the splines in the side gear rings and side gears by inserting the axle shafts, then tighten the eight bolts to a torque of 35—45 lbs./ft. (4.8 to 6.2 kg/m.) while the axle shafts are in position. Failure to observe this instruction, particularly with the differential unit having the dished clutch friction plates, will render it difficult or impossible to enter the axle shafts after the eight bolts have been tightened.

CHECKING FOR WEAR

With one axle shaft and the drive pinion locked, the other axle shaft must not turn radially more than $\frac{3}{4}''$ (19 mm.) measured on a 6″ (152 mm.) radius.

ADJUSTMENTS

The bearing preload and drive gear and pinion adjustments for an axle fitted with a Thornton " Powr-Lok " differential are exactly the same as detailed in this section for the conventional type of differential.

SECTION I

STEERING

(Including Power-assisted Steering)

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

STANDARD STEERING

INDEX *(continued)*

POWER-ASSISTED STEERING

INDEX *(continued)*

STEERING

A Burman F.3 steering unit is fitted as standard equipment on the Mark 2 models. Burman power-assisted steering is specified as an optional extra for the 3.4 and 3.8 litre models and is dealt with at the end of this section.

STANDARD STEERING

DESCRIPTION

The Burman F.3 steering unit is of the high efficiency recirculating ball type in wh ch motion is transmitted from the inner column worm to the rocker shaft by means of a nut running on a continuous train of steel balls.

The worm is supported at each end by a loose ball race. Adjustment of the ball races is by means of shims under the end plates at the top and bottom of the steering box.

The rocker shaft is supported in a single bush pressed into the steering box. End float of the rocker shaft is controlled by an adjusting screw and locknut fitted to the top cover plate.

The one piece drop arm is taper splined to the rocker shaft and secured by a large spring washer and nut.

The drop arm and idle lever are connected by an adjustable track rod with a rubber/steel bonded bush at each end. Extensions of the track rod ends are attached to the inner ball joints of the two steering tie rods. The outer ball joints of the tie rods are connected to steering arms which are bolted to the stub axle carriers.

DATA

Type	Recirculating ball
Steering gear ratio at centre of travel	20.3 : 1
Number of turns—lock to lock	$4\frac{1}{4}$
Turning circle	33′ 6″ (10.21 m.)
Diameter of steering wheel	17″ (43 cm.)
Front wheel alignment	Parallel to $\frac{1}{16}$″ (1.59 mm.) toe-in

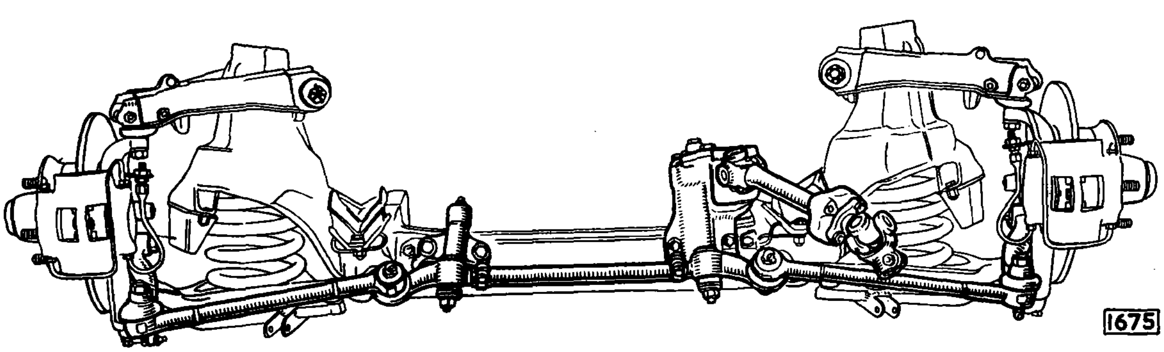


Fig. 1. Steering layout.

ROUTINE MAINTENANCE

EVERY 2,500 MILES (4,000 KM.)

Steering Unit

The steering unit is attached to the front suspension cross member ; the filler plug is situated in the top cover and is accessible from the engine compartment on the driver's side of the car. The filler plug has a plain head and should not be confused with the rocker shaft adjustment screw which is threaded externally. Top up the steering box with the recommended grade of lubricant until no more oil will enter.

Steering Idler Housing

The steering idler housing is attached to the front suspension cross member ; a nipple is provided in the top of the housing and is accessible from underneath the car. (Early cars only).

Steering Tie Rods

Lubricate the ball joints at the ends of the two steering tie rods with the recommended lubricant. The tie rods are situated at the rear of the front suspension cross member. When carrying out this operation examine the rubber seals at the ends of the ball housings to see if they have become displaced or split. In this event they should be repositioned or replaced, as any dirt or water that enters the ball joint will cause premature wear.

Do not over-lubricate the ball joints to the extent where grease escapes from the rubber seals.

Recommended Lubricants

	Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent Caltex Texaco
Steering box	Mobilube C. 140	Castrol D	Spirex 140 E.P.	Esso Gear Oil GP 90/140	Gear Oil S.A.E. 140 E.P.	Nol E.P.140	Multigear Lubricant E.P.140
Steering idler housing (Early cars only) Steering tie-rods	Mobilgrease HP	Castrolease LM	Retinax A	Esso Multi-purpose Grease H	Energrease L.2	L.B. 10	Marfak All-Purpose
Power assisted steering	Mobilfluid 200	Castrol T.Q.	Shell Donax T.6	Esso Automatic Transmission Fluid	Automatic Transmission Fluid Type A	Nolmatic	Texamatic Fluid

1. Steering box
2. Trunnion bush
3. Inner column worm
4. Main nut
5. Roller
6. Steel balls
7. Ball race
8. Distance piece
9. End plate (bottom)
10. Gasket
11. End plate (top)
12. Oil seal retainer plate
13. Oil seal
14. Gaskets
15. Shims
16. Setscrew
17. Spring washer
18. Rocker shaft
19. 'O' ring
20. Washer
21. Drop arm
22. Nut
23. Spring washer
24. Cover plate
25. Gasket
26. Setscrews
27. Spring washer
28. Rocker shaft adjustment screw
29. Locking nut
30. Spring
31. Spring tension bolt
32. Oil filler plug
33. Washer
34. Bolt (long)
35. Bolt (short)
36. Tab washer

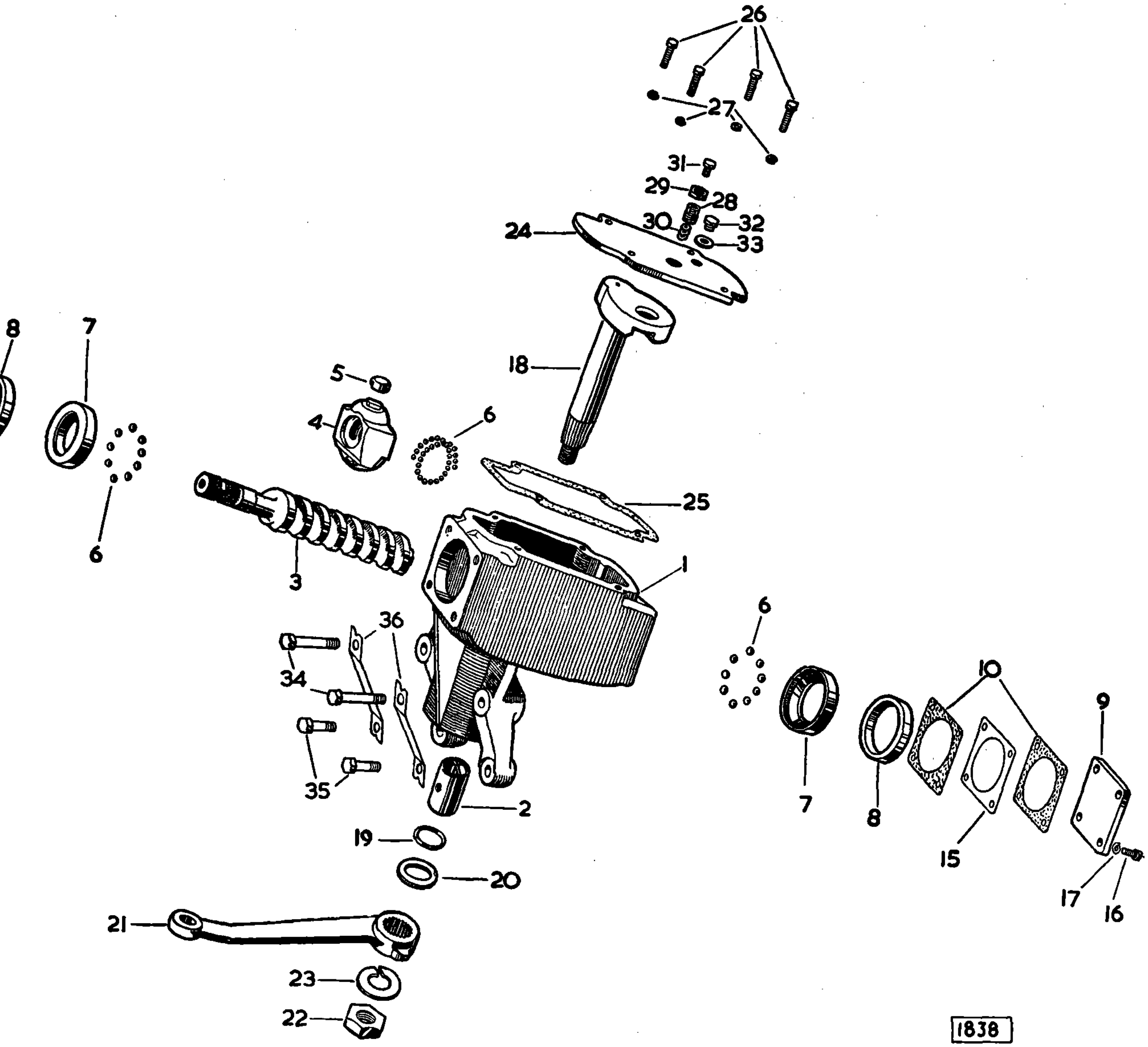


Fig. 2. Exploded view of the steering unit.

STEERING UNIT

Removal

Remove the pinch bolt retaining the upper steering column to the socket on the lower steering column. Using the steering wheel, pull back the column a sufficient amount for the splines to clear the universal joint. Detach the universal joint from the steering box.

Remove the self-locking nut and washer which secures the track rod end to the drop arm. Drift out the track rod end from the drop arm in which it is a taper fit.

Tap back the tab washers and remove the four bolts attaching the steering unit to the front suspension cross member when the unit can be removed.

Dismantling

Remove the four set bolts and spring washers securing the rocker shaft cover plate (24, Fig. 2), to the steering box. Remove the cover plate and gasket taking care not to dislodge the spring (30) from the rocker shaft adjustment screw (28). Drain the oil into a suitable receptacle. Remove the roller (5) from the top of the main nut.

Remove the nut (22) securing the drop arm (21) to the rocker shaft (18). Observe the line scribed on the drop arm and rocker shaft to ensure correct assembly. Using a suitable extractor, draw the drop arm off the spline on the rocker shaft. (Under no circumstances must the drop arm be hammered off otherwise indentation will be caused to the ball tracks). Withdraw the rocker shaft. Remove the 'O' ring (19) from the bottom of the box.

Remove the four set bolts and spring washers securing the upper end plate to the steering box. Remove the retainer plate (12), end plate (11), gasket (14), shims (15), the other gasket and the distance piece (8).

Push the worm shaft upwards and withdraw the outer race of the upper bearing. Collect the ten balls. Unscrew the worm through the worm nut and withdraw from box.

Remove the four set bolts and washers attaching the end plate to the bottom of the steering box. Remove the gaskets, shims and distance piece. Withdraw the outer race of the lower bearing and collect the ten balls.

Remove the two setscrews and tab washers retaining the transfer tube to the main nut and remove the clip, tube and thirty-one balls.

Assembling

Note: When assembling the steering unit carry out adjustment of the worm shaft and rocker shaft end float as described in this section.

Fit the transfer tube and clip to the worm nut and secure with the two setscrews.

Fit the thirty-one recirculating balls into the unit ; use grease to retain the balls in position. Fit the ten ball bearings to the bottom race with grease and assemble to the bottom of the steering box together with the distance piece. Fit the gaskets, shims, distance piece and end plate to the bottom of the steering box and secure with four set bolts. Screw the worm shaft into the worm nut until the nut is half way along the worm. Feed the worm shaft carefully into the steering box through the top cover aperture, making sure that the balls in the bottom ball race are all securely in position when the wormshaft makes contact with them.

Fit the ten balls to the top race with grease and assemble to the top of the steering box together with the distance piece.

Fit the shims with a gasket at each side to the top of the steering box. Cover the serrations at the top of the wormshaft with a piece of brown paper or adhesive tape to protect the oil seal when sliding the end plate over the worm shaft.

Carefully slide the upper end plate over the worm shaft and remove all traces of brown paper or adhesive tape. Secure the end plate with the four set bolts.

Enter the rocker shaft into its bore in the steering box and engage the slotted extension with the top portion of the main nut. Fit the roller to the top of the main nut. Fit the cover plate gasket and secure the cover plate with the four set bolts.

Fit the drop arm to the rocker shaft ensuring that the scribed line on the rocker shaft matches the appropriate line on the drop arm, according to whether the steering unit is for right-hand or left-hand drive (Fig. 3).

Refitting

Refit the steering unit to the front suspension cross member. Turn the road wheels to the straight ahead position and attach the track rod to the drop arm. Fit the lower column to the steering unit with the slot in the top socket in the same position as noted on removal. Set the steering wheel so that the spokes are horizontal and the motif is upright.

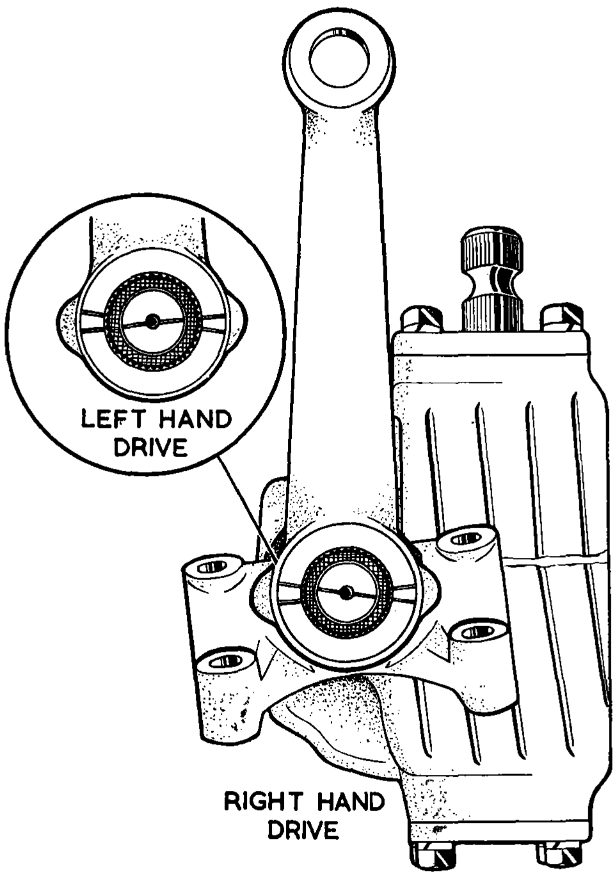


Fig. 3. Showing the alignment of the drop arm/rocker shaft marks for both right-hand and left-hand steering.

Before tightening the top socket pinch bolt depress the upper half of the joint fully and raise it $\frac{1}{4}''$ (6 mm.).

WORMSHAFT END FLOAT

The wormshaft bearings should be adjusted to a pre-load of .002" to .003" (.05 to .08 mm.) by means of the shims and gaskets at each end of the steering box. The shims are .005" (.13 mm.) thick ; the gaskets are .003" (.08 mm.) thick.

Remove the bolt (31, Fig. 2) and spring and unscrew the rocker shaft adjustment screw (28) so that no load exists on the shaft. Eliminate, or reduce to a minimum, the end float of the worm shaft by removing shims as necessary. Check that the worm shaft turns freely by rotating the shaft with the lower steering column.

Remove a shim and/or gasket to obtain the required pre-load. Always maintain a minimum of two gaskets at each end of the steering box, one at each side of the shim pack.

ROCKER SHAFT END FLOAT

To adjust the end float of the rocker shaft the shaft must be at the centre of its travel. If the steering unit is in position on the car, this is when the wheels are in the straight ahead position ; if the steering unit is off the car it will be necessary to halve the number of turns the worm shaft makes from " lock to lock " to obtain the centre position.

Unscrew the bolt (31, Fig. 2) and extract the spring (30). Slacken the locknut (29) securing the adjuster screw (28) in the cover plate. Screw down the adjuster screw by hand until it contacts the rocker shaft, so that all end float is eliminated.

Hold the adjuster screw firmly and tighten the locknut. Test the freedom of the movement of the worm shaft; if tightness exists in the centre of its travel it will be necessary to re-adjust the rocker shaft end float.

Refit the spring and retaining bolt.

STEERING WHEEL

Removal

Unscrew the four setscrews securing the horn ring cover to the steering wheel and remove the horn ring assembly. Undo the locknut (31, Fig. 4) and the nut (29) securing the steering wheel to the inner column. Withdraw the steering wheel and collect the two halves of the split cone (27).

Refitting

Hold the split cones in place in the grooves of the inner column shaft, making sure that the narrowest part of the cone is towards the top of the column. With the other hand slide the steering wheel on to the column shaft splines so that the two spokes are horizontal when the road wheels are pointing straight ahead. Push the steering wheel fully home on to the split cone. Fit the plain washer, the securing nut and the locknut. Refit the horn ring and cover.

STEERING COLUMN

Removal

Note: On early cars the flashing indicator switch is fitted on the right-hand side of the steering column. The removal and dismantling procedure is basically the same as described below for later cars with flashing indicator switch fitted on the left-hand side.

Disconnect the battery.

Unscrew the bezels securing the remote control

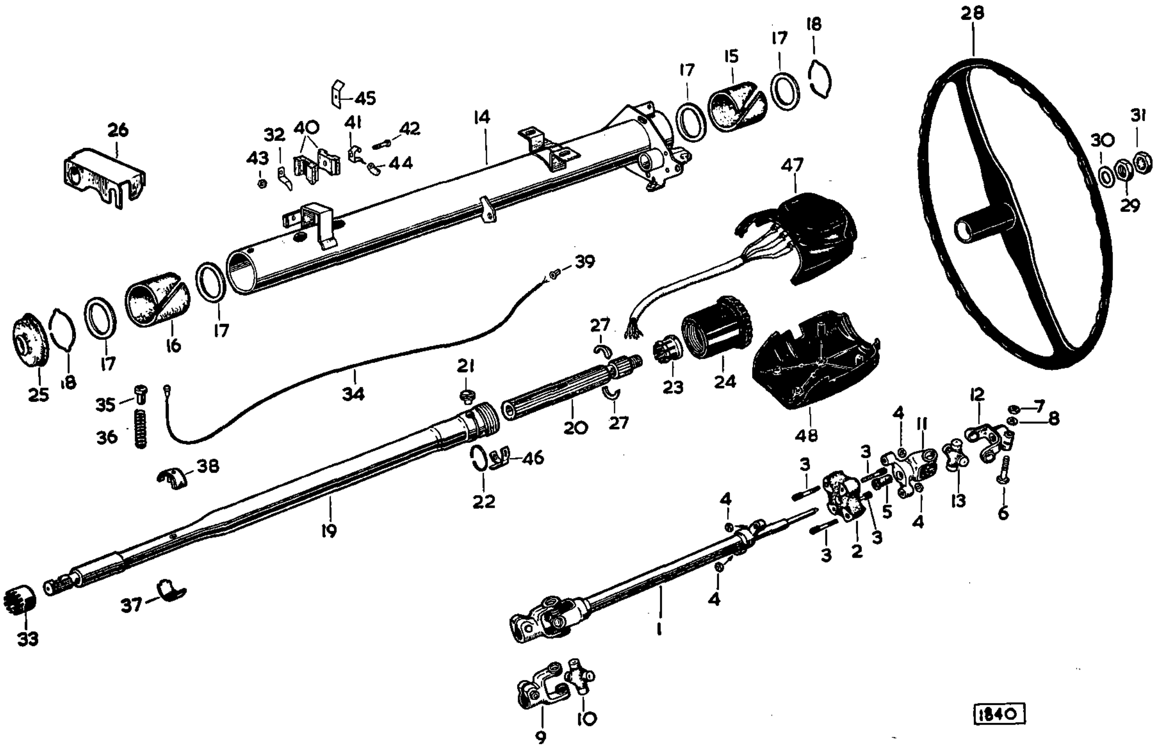


Fig. 4. Exploded view of the steering column assembly (Early cars)

1. Lower column sub-assembly.
2. Rubber coupling
3. Bolt
4. Locking nut
5. Rubber bush
6. Bolt
7. Nut
8. Spring washer
9. Universal joint end yoke
10. Universal joint journal assembly
11. Flange yoke
12. Universal joint end yoke
13. Universal joint journal assembly
14. Outer tube
15. Felt bearing
16. Felt bearing
17. Retaining washer
18. Spring clip
19. Inner column
20. Shaft
21. Stop button
22. Spring clip
23. Split collet
24. Lock nut
25. Rubber seal
26. Stone guard
27. Split cone
28. Steering wheel
29. Nut
30. Washer
31. Locking nut
32. Earth contact
33. Slip ring
34. Cable
35. Contact
36. Spring
37. Bottom half of rubber rotor
38. Top half of rubber rotor
39. Eyelet
40. Contact holder
41. Contact
42. Bolt
43. Nut
44. Rubber sleeve
45. Fibre insulating strip
46. Striker peg
47. Upper switch cover
48. Lower switch cover

cables for the speedometer trip and time clock to the dash casing.

Remove the four drive screws and washers securing the dash casing.

Remove the two nuts and washers securing the steering column tie bar to the side facia panel.

Disconnect the wires from the flashing indicator/headlamp flashing switch at the snap connectors.

If an overdrive is fitted disconnect the wires from the overdrive switch at the snap connectors.

Remove the two screws and washers securing the top half of the nacelle (47, Fig. 4) to the bottom half.

Lift off the top half of the nacelle and withdraw the three illumination bulbs from the back.

If the car is fitted with automatic transmission and is right-hand drive, unscrew the ratchet adjustment on the adjustment rod and lift out the ball joint on the crank lever.

Unscrew the jubilee clip securing the bottom of the steering column to the mounting bracket.

Remove the pinch bolt (6) securing the inner column to the top universal joint on the lower steering column.

Remove the two nuts and washers securing the upper steering column to the body.

Withdraw the steering column and collect the rubber cup (25) from the bottom end of the column.

On left-hand drive cars fitted with automatic transmission it is necessary to remove the four bolts securing the upper steering column bottom retaining bracket to the body. The control rod which operates the bowden cable passes through the bracket and should be removed with the steering column.

Dismantling

Remove the four screws and spring washers securing the horn ring assembly to the steering wheel.

Unscrew the locknut, (31, Fig. 4), nut (29) and plain washer (30) securing the steering wheel (28) to the shaft (20) inside the inner column (19).

Withdraw the steering wheel and collect the split cone (27).

Unscrew the steering wheel locking nut (24) and remove.

Remove the two screws and plain washers securing the top half of the nacelle (47) to the bottom half.

Remove the three screws and plain washers securing the bottom half of the nacelle (48) to the upper steering column.

Withdraw the inner column (19).

Remove the two screws, serrated and plain washers securing the flashing indicators striker ring (46) in position.

Remove the circlip from the end of the horn wire contact nipple and remove the washer, spring and rubber.

Remove the split collet (23)

Unscrew the centre button (21) retaining the inner column (20) in position.

Withdraw the inner end shaft (20)

Prise up slightly the horn pick up ring (33) serrations.

Slide off the horn pick up ring and remove the bottom half of the rubber rotor (37).

Carefully withdraw the horn wire (34) at the same time as the removal of the top half of the rubber rotor (38).

Remove the two screws and serrated washers securing the flashing indicator switch to the outer column.

If the car is fitted with automatic transmission unclip the circlip and slide it and the washer along the automatic transmission upper control rod.

If the car is fitted with an overdrive remove the two nuts, bolts and serrated washers securing the overdrive switch to the outer column.

Slacken the nut securing the upper control rod to the lower control rod.

Remove the two bolts, nuts, washers and spacers securing the quadrant selector to the outer column bracket.

Remove the bolt, plain and serrated washers securing the quadrant selector pointer to the outer column bracket.

Pinch together one of the ends of the starter/reverse inhibitor switch control rod and withdraw the washer and control rod.

Withdraw the upper and lower automatic transmission control rods from their respective bushes.

On left-hand drive cars it will be necessary to slide the lower cranked control rod off the outer column with the column support bracket after slackening the jubilee clip and then withdraw the lower control rod from the support bracket.

Remove the bolt securing the starter/reverse inhibitor switch.

Remove the nut and bolt securing the earth contact (32).

Remove the nut (43) and bolt (42) securing the two rubber contact holders (40), fibre insulating strip (45) and contact (41).

Remove the spring clips (18) and washers (17) securing the felt bearings (15 and 16) in the top and bottom of the outer steering column (14).

Re-assembling

Replace the two washers (17) and spring clip (18) securing the upper felt bearing (15) in the outer steering column (14).

Repeat the procedure when refitting the lower felt bearing.

Replace the two rubber contact holders (40) in the bracket at the lower end of the outer column.

The large contact (41) which touches the horn pick up ring should face towards the top of the outer column.

Pass the bolt (42) through the contact (41), fibre insulating strip (45) and secure with the nut (43).

Replace the earth contact (32) and secure it to the outer column with a nut and bolt.

If the car is fitted with automatic transmission slide the lower control rod through the lower bush.

On left-hand drive cars thread the lower control rod through the hole in the steering column bottom support bracket.

Refit the support bracket and jubilee clip and pass the lower control rod through the supporting bush on the side of the outer column.

Refit the selector quadrant and secure it to the outer column bracket by two nuts, bolts, spacers and washers. The spacers are to fit between the selector quadrant and the bracket.

Pass the upper control rod through the top bush on the outer column.

Slide the plain washer and circlip over the upper control rod.

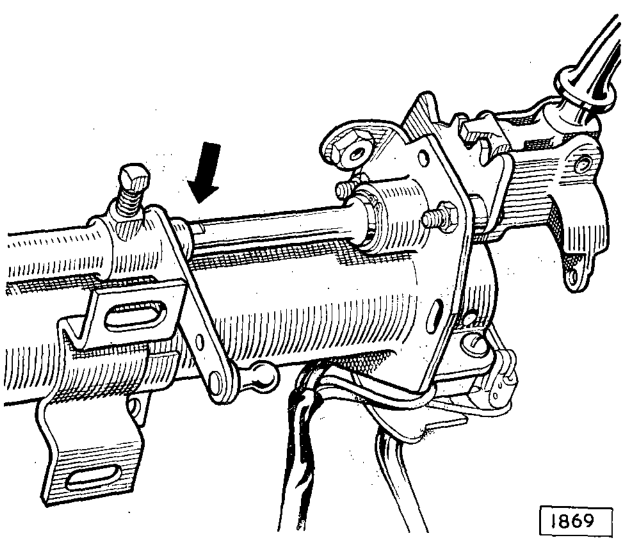


Fig. 5. Aligning the flat on the end of the upper control rod with the securing screw in the lower control rod.

Align the flat on the end of the upper control rod with the hole for the securing screw in the end of the lower control rod.

Join the upper and lower control rods together, fit the plain washer and secure the upper control rod with the circlip.

Ensure that the upper and lower control rods are aligned and secure with the bolt.

Refit the quadrant selector pointer to the bracket on the outer column and secure finger tight with a nut, bolt and serrated washer.

Refit the reverse/starter inhibitor switch to the bracket on the outer column and secure finger tight with a bolt and serrated washer

Fit the rubber grommet to the crank lever on the lower control rod. Pass the starter/reverse inhibitor switch control through the grommet in the crank, fit the washer and open the ends of the control rod.

Refit the two screws and serrated washers securing the flashing indicator switch to the outer column.

If the car is fitted with an overdrive secure the overdrive switch to the outer column bracket with two bolts, nuts and serrated washers.

The top half of the rubber rotor (38) fitted to the inner column has the horn wire passing through it.

Thread the horn wire (39) through the inner column (19) and fit the top half of the rubber rotor (38) with the groove towards the bottom of the column.

Fit the bottom half of the rubber rotor (37) and slide the horn pick up ring (33) over both halves of the rotor with the serrations in the pick up ring towards the bottom of the column.

Gently knock the serrations into the groove in the rubber rotors until the horn pick up ring is secure.

Slide the inner shaft (20) over the horn wire into the inner column (19) so that the slot in the shaft serrations aligns with the centre button hole in the inner column.

Screw the centre button (21) into position until the inner shaft binds on the button.

Slacken off the button until the inner shaft moves freely.

The striker ring (46) should be fitted with the striker peg towards the bottom of the column and the opposite side to the inner shaft retaining button.

Turn the inner column until the striker retaining bolts are in the vertical position.

Set the striker peg so that it is just below the horizontal axis position.

Refit the two screws, serrated and plain washers securing the flashing indicator striker ring in position.

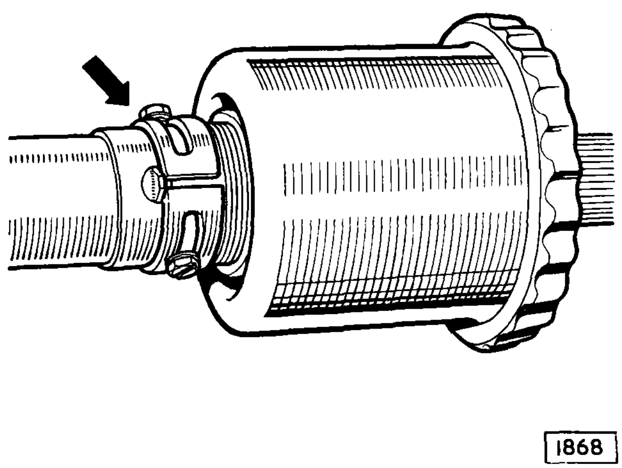


Fig. 6. Centralising the flashing indicator striker peg.

Slide the split collet (23) on to the inner shaft (20) with the serrations towards the bottom of the column.

Slide the inner column (19) into the outer column (14). Care should be taken to avoid damaging the earth contact (32) on the outer column.

Place the bottom half of the nacelle (48) on to the outer column (14) and secure with three screws and washers.

Refit the top half of the nacelle (47) and secure with two screws and washers.

If the car is fitted with automatic transmission move the hand control to the 'D' position in the selector quadrant and move the pointer along the elongated slot in the outer column bracket until the pointer coincides with the 'D' on the nacelle.

Tighten the pointer securing the nut and bolt.

Slide the rubber grommet, with the flange towards the top of the column, over the horn wire also the spring with the larger coils first and the washer. These are retained on the horn wire by a circlip which fits on the nipple.

Refitting

Ensure that the front road wheels are in the straight ahead position.

Offer up the steering column to the mounting points.

Fit the rubber cup (25, Fig. 4) over the bottom end of the upper steering column.

Ensure that the striker ring (46) on the inner column (19) is between the two cancelling arms on the flashing indicator switch.

Engage the splines of the upper steering column with the splines on the lower steering column universal joint.

On left-hand drive cars fitted with automatic transmission secure the bottom support bracket on the column to the body with four bolts.

Refit the two nuts and washers securing the upper steering column top mounting bracket to the body.

Refit the pinch bolt (6) securing the inner column to the top universal joint on the lower steering column.

Tighten the jubilee clip securing the upper steering column to the lower mounting bracket.

On right-hand drive automatic transmission cars, refit the ratchet adjustment on to the ball joint on the crank lever.

To ensure correct operation of the reverse light and starter cut-out inhibitor switch it is important that the following instructions be adhered to :

On all automatic transmission cars slacken the starter/reverse light inhibitor switch securing bolt. Move the gear selector lever until the gear indicator is in the " D " drive position. Move the starter/reverse light inhibitor switch until the hole in the lever is in line with the hole in the switch base plate. Place a piece of wire through the two holes and tighten the nut securing the switch to the upper steering column (see Fig. 7). Remove the wire.

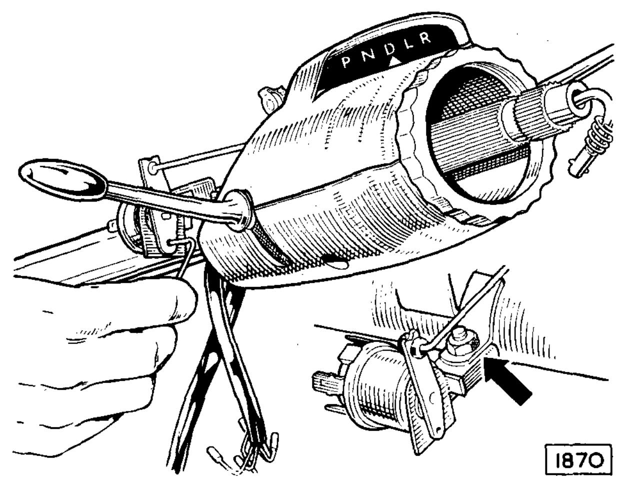


Fig. 7. Setting the starter/reverse inhibitor switch.

Fit the three illumination bulbs at the back of the nacelle.

Fit the top half of the nacelle and secure to the bottom half with two screws and washers.

If an overdrive switch is fitted connect the wires from the overdrive switch to the snap connectors.

Refit the wires from the flashing indicator/headlamp flashing switch to the snap connector.

Replace the steering column tie bar on the side facia panel and secure with two nuts and washers.

Refit the dash casing and secure with four screws.

Secure the speedometer trip and time clock remote control cables to the dash casing with the chrome bezels.

Screw the steering wheel locking nut (24) into position on the inner column (20).

Place the split cone (27) into the groove on the inner shaft (20) with the tapered end towards the top of the shaft.

Fit the steering wheel (28) on to the inner shaft with the two holes on the steering wheel centre boss towards the top.

Refit the plain washer (30), nut (29) and locknut (31).

Secure the horn ring to the steering wheel centre boss with three screws and spring washers.

Ensure that the horn wire nipple makes good contact with the horn ring pick up.

Clip the horn ring contact cover into position on the horn ring.

LOWER STEERING COLUMN

Removal

Remove the upper steering column as described in the foregoing paragraphs.

Remove the pinch bolt retaining the universal joint to the steering box shaft when the lower column can be removed.

Detaching the Rubber Coupling

Remove the four lock nuts (4, Fig. 4) and unscrew the four Allen headed screws (3) attaching the jaw (11) and the lower column (1) to the rubber coupling (2).

Refitting

Refitting is the reverse of the removal procedure.

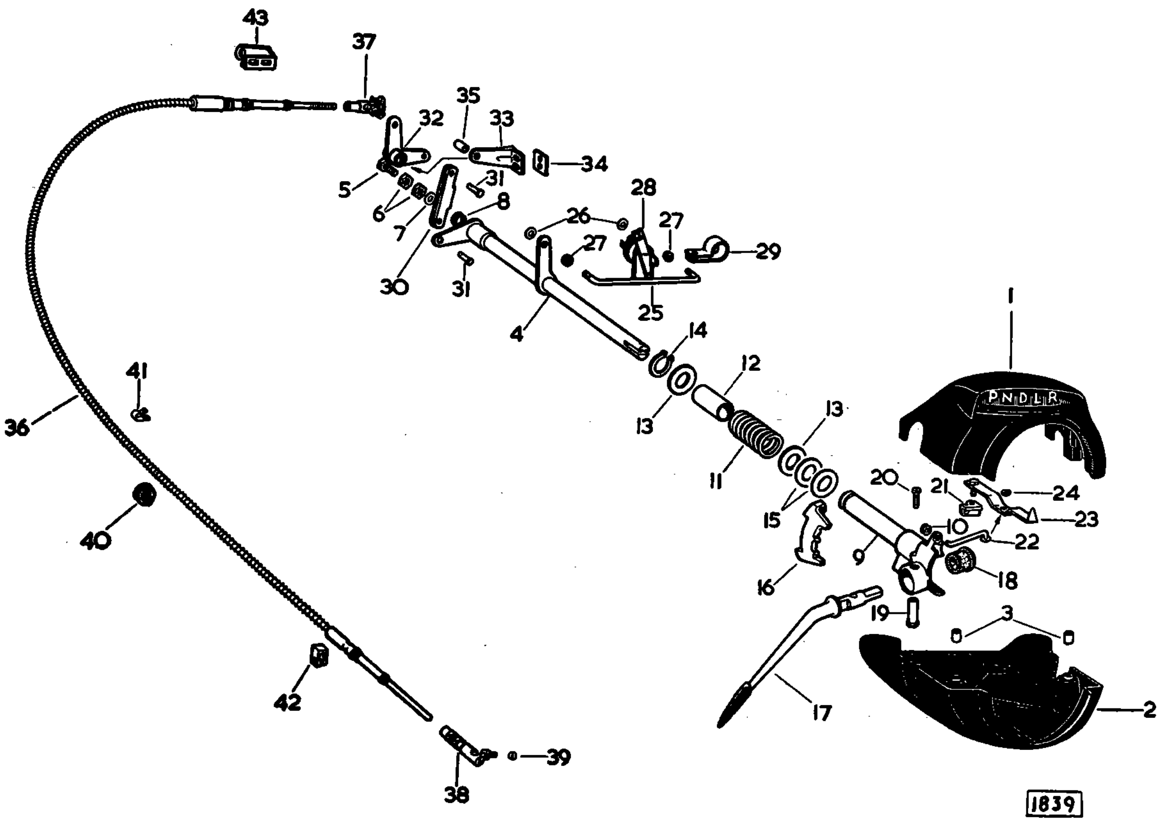


Fig. 8. Exploded view of the automatic transmission selector lever.

1. Upper switch cover
2. Lower switch cover
3. Ring dowel
4. Operating shaft assembly
5. Setscrew
6. Nut
7. Plain washer
8. Felt washer
9. Housing
10. Grommet
11. Return spring
12. Distance tube
13. Washer
14. Circlip
15. Shim
16. Selector lever gate
17. Lever assembly
18. Rubber bush
19. Fulcrum pin
20. Screw
21. Indicator arm bracket
22. Connecting link
23. Gear indicator arm
24. Grommet
25. Connecting link for starter/reverse light inhibitor switch
26. Plain washer
27. Grommet
28. Starter/reverse light inhibitor switch
29. Clip
30. Bell crank connecting link
31. Clevis pin
32. Bell crank control cable lever
33. Support bracket for bell crank lever
34. Securing plate
35. Distance tube
36. Gear selector cable
37. Ball joint
38. Ball joint
39. Steel bush
40. Rubber grommet
41. Clip
42. Abutment clamp
43. Dash panel abutment bracket

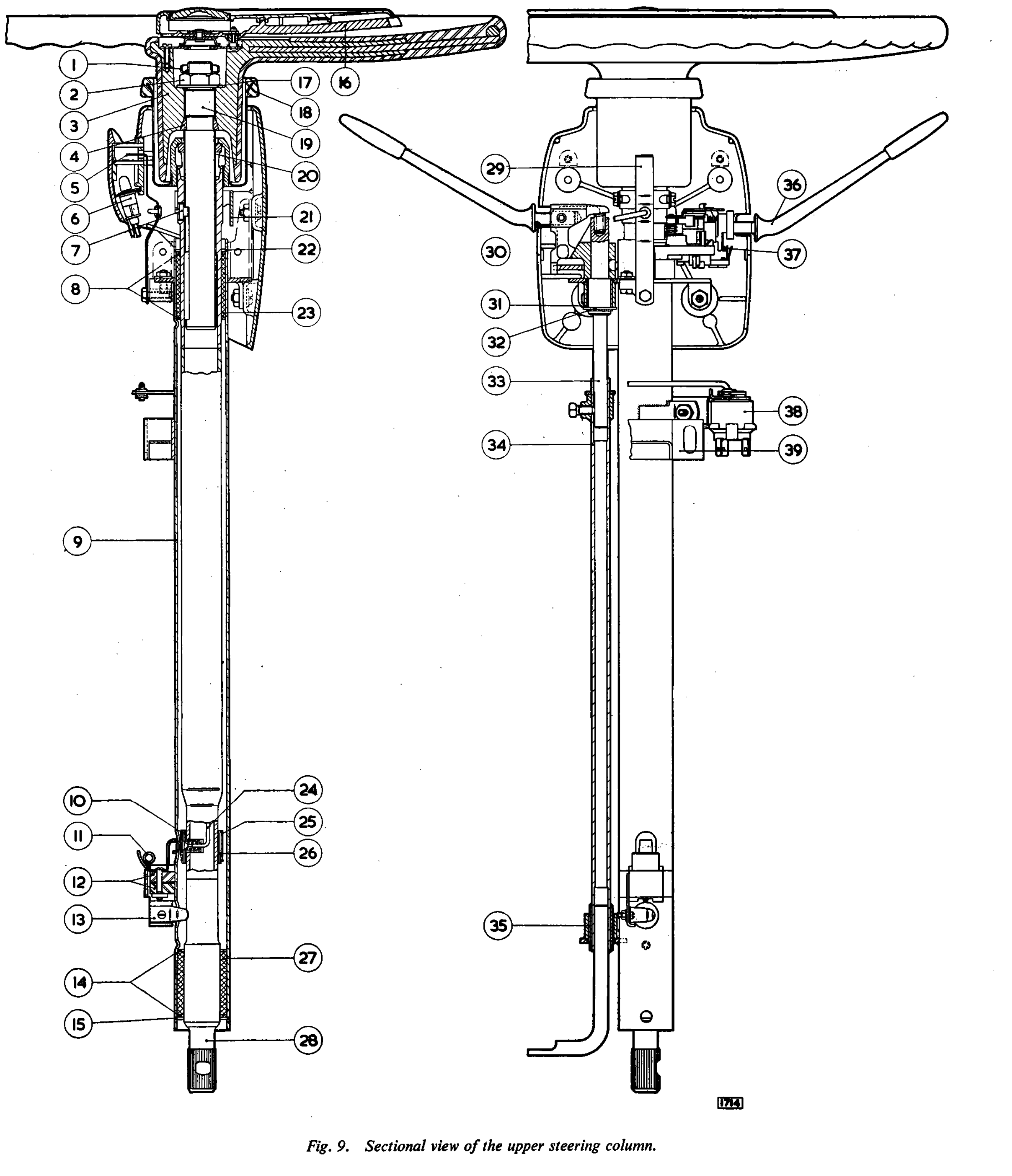


Fig. 9. Sectional view of the upper steering column.

1. Tabwasher
2. Nut
3. Steering wheel
4. Split cone
5. Indicator
6. Bulb socket
7. Stop button
8. Retaining washer
9. Outer tube
10. Rotor (bottom half)
11. Contact
12. Contact holder
13. Earth contact
14. Retaining washer
15. Spring clip
16. Horn push
17. Washer (plain)
18. Locknut
19. Shaft
20. Split collet
21. Striker
22. Spring clip
23. Felt bearing
24. Cable
25. Horn slip ring
26. Rotor (top half)
27. Felt bearing
28. Inner column
29. Indicator
30. Selector operating lever
31. Bearing bush
32. Circlip
33. Selector
34. Control lever
35. Bearing bush
36. Headlamp flashing and flashing indicator operating lever
37. Headlamp flasher contacts
38. Reverse and starter inhibitor switch
39. Mounting bracket

STEERING IDLER ASSEMBLY

Removal

Remove the self-locking nut and washer securing the track rod end to the idler lever. Drift out the track rod end from the idler lever in which it is a taper fit.

Remove the four bolts and spring washers attaching the steering idler bracket to the front suspension cross member, when the steering idler assembly can be detached.

Steering Idler Assembly	*Commencing Chassis No.* R.H. Drive	L.H. Drive
2.4 Litre Mark 2	117585	127544
3.4 Litre Mark 2	166588	179841
3.8 Litre Mark 2	232641	223644

On cars with the above chassis numbers and onward, standard steering models are fitted with a steering idler assembly having tapered roller bearings. This assembly is similar to that fitted to power assisted steering cars but is not the same unit.

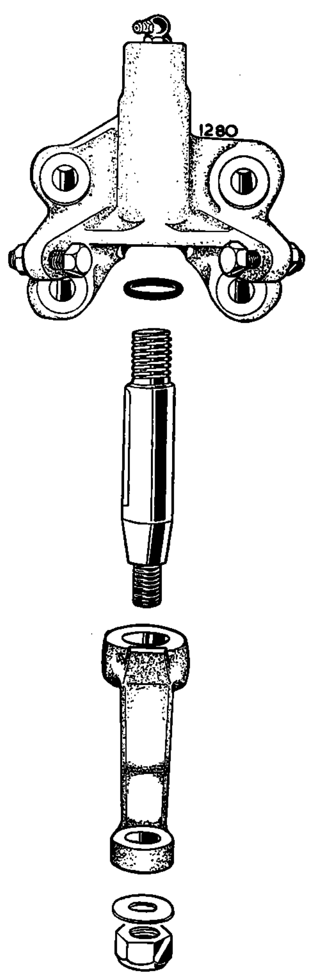


Fig. 10. Exploded view of the steering idler assembly. (early cars)

The new unit may be fitted in place of the previous type with the plain bush when replacement becomes necessary.

Dismantling

Remove the self-locking nut and washer attaching the idler lever to the fulcrum pin. With a suitable extractor withdraw the idler lever from the fulcrum pin on which it is a taper fit.

Unscrew the fulcrum pin from the bracket housing.

Remove the ' O ' ring from the bottom of the fulcrum pin bracket housing.

Assembling

Fit a new ' O ' ring to the groove at the bottom of the bracket.

Screw the fulcrum pin fully into the bracket housing until the top of the taper is $\frac{3}{16}''$ (4.5 mm.) from the bottom face of the idler housing as illustrated in Fig. 11.

Tap the idler lever on to the taper of the fulcrum pin. Fit the washer and self-locking nut and tighten securely, ensuring that the fulcrum pin does not turn during the process.

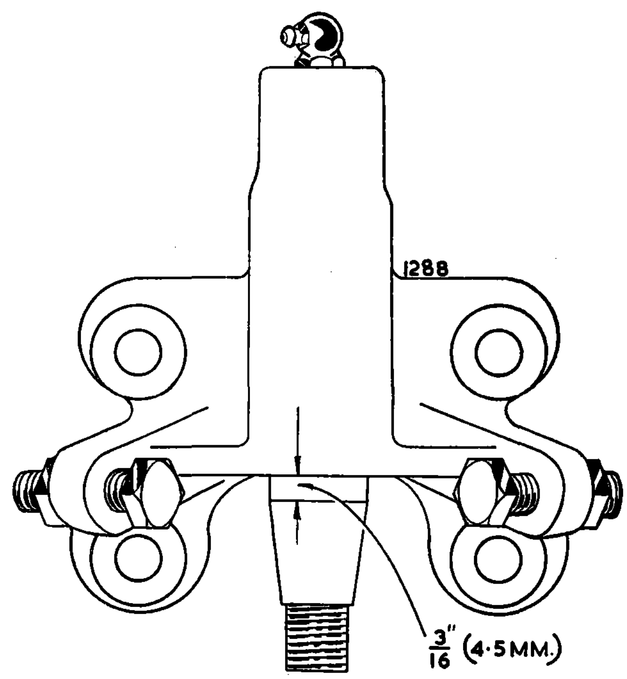


Fig. 11. Setting dimension for the steering idler fulcrum pin.

Refitting

Refitting is the reverse of the removal procedure, but it is important to ensure that the idler lever is in the straight ahead position, as illustrated in Fig. 12, before fitting the track rod end to the lever.

STEERING ARM

Removal

Raise the car by placing a jack under the front suspension cross member and remove the road wheel.

Remove the self-locking nut and plain washer securing the tie rod to the steering arm. Drift out the tie rod ball pin from the steering arm in which it is a taper fit.

Unscrew the centre self-locking nut securing the stub axle shafts and steering arm to the carrier and remove the wired bolt attaching the end of the steering arm to the carrier. The steering arm can now be removed.

Refitting

Refitting is the reverse of the removal procedure. Use new locking wire to secure the steering arm attachment bolt.

TIE ROD

The tie rod ball joints cannot be dismantled and if worn a complete tie rod assembly must be fitted.

Removal

Remove the self-locking nuts and plain washers securing the tie rod to the steering arm and track rod end.

Tap the tie rod ball pins out of the steering arm and track rod end in which they are a taper fit.

Refitting

Refitting is the reverse of the removal procedure.

TRACK ROD

The track rod ends incorporate rubber/steel bonded bushes. On early cars these are not replaceable, and if the bushes show signs of deterioration it will be necessary to change the complete track rod end.

Removal

Remove the self-locking nuts and washers from the inner ball joint of each tie rod. Tap the ball pin out of each track rod end in which they are a taper fit.

Remove the self-locking nuts and washers securing the track rod ends to the drop arm and idler lever.

Tap the track rod ends out of the drop arm and idler lever in which they are a taper fit.

Dismantling

To remove the track rod ends, slacken the clamp at each end of the centre tube ; unscrew each end from

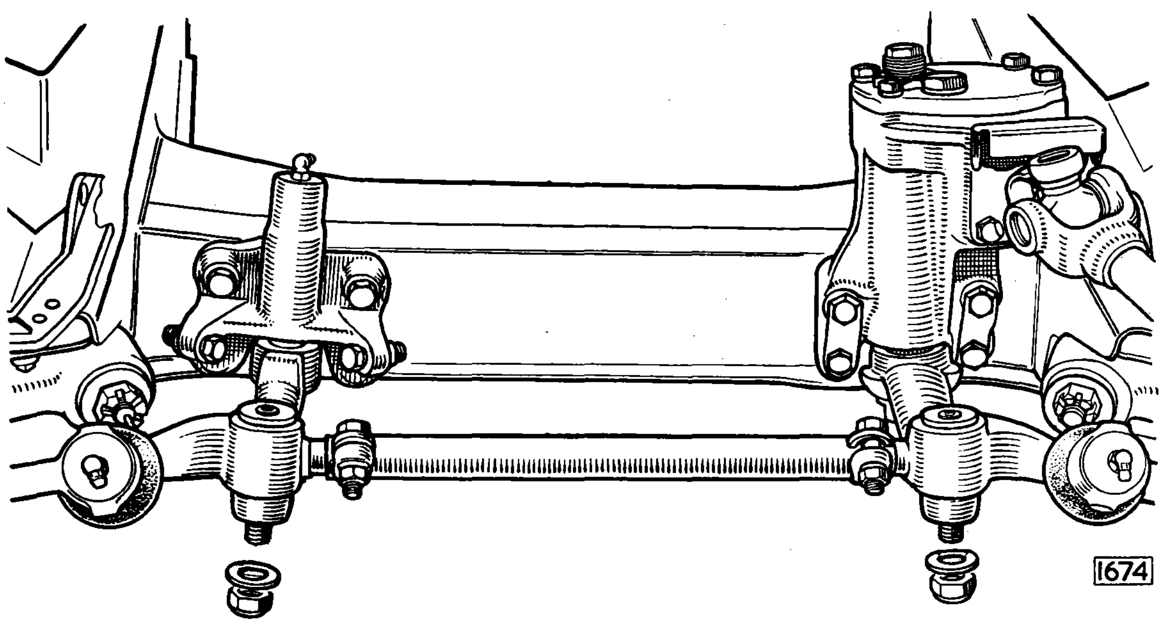


Fig. 12. When refitting the track rod the drop arm and idler lever must be in the " straight ahead " position.

the tube noting that one end has a left-hand thread and the other a right-hand thread.

Assembling

When refitting the track rod ends to the centre tube, screw in each end **an equal number of turns.** The final setting of the track rod length must be carried out after the track rod has been refitted, as described under the heading " Front Wheel Alignment ".

Refitting

As the track rod ends incorporate rubber bushes it is essential that the steering drop arm and idler lever are turned to the " straight ahead " position, as shown in Fig. 12, before refitting the track rod. It is also important that the pins are tapped into the tapers in the drop arm and idler lever to prevent the pins from turning when tightening the securing nuts.

Failure to observe this procedure will cause undue torsional loading of the rubber bushes resulting in a possible tendency for steering wander and premature failure.

FRONT WHEEL ALIGNMENT

Check that the car is full of petrol, oil and water. If not, additional weight must be added to compensate for, say, a low level of petrol (the weight of 10 gallons of petrol is approximately 80 lbs.—36.0 kg.).

Ensure that the tyre pressures are correct and that the car is standing on a level surface.

With the wheels in the straight ahead position check the alignment of the front wheels with an approved track setting gauge.

The front alignment should be :—

Parallel to $\frac{1}{16}''$ (1.59 mm.) " toe-in " (measured at the wheel rim).

Re-check the alignment after pushing the car forward until the wheels have turned half a revolution (180°).

If adjustment is required, slacken the clamp bolt at each end of the track rod and rotate the tube in the required direction until the alignment of the front wheels is correct. Tighten the clamp bolts and re-check the alignment.

LOCK STOP ADJUSTMENT

The lock stop bolts are screwed into the idler bracket and are retained in position by locknuts. The stops are set at the factory to allow 38° travel of the drop arm and idler lever each side of the central (straight ahead) position.

Normally, the lock stop bolts should not require adjustment but if attention is found to be necessary the adjustment should be carried out in the following manner.

Slacken the locknuts and screw in the lock stop bolts as far as possible. Turn the steering until the steering unit is at the end of its travel on that lock. Screw out the lock stop bolt until the head contacts the abutment on the idler lever. Screw out the stop bolt a further two turns and tighten the locknut. Repeat for the other lock.

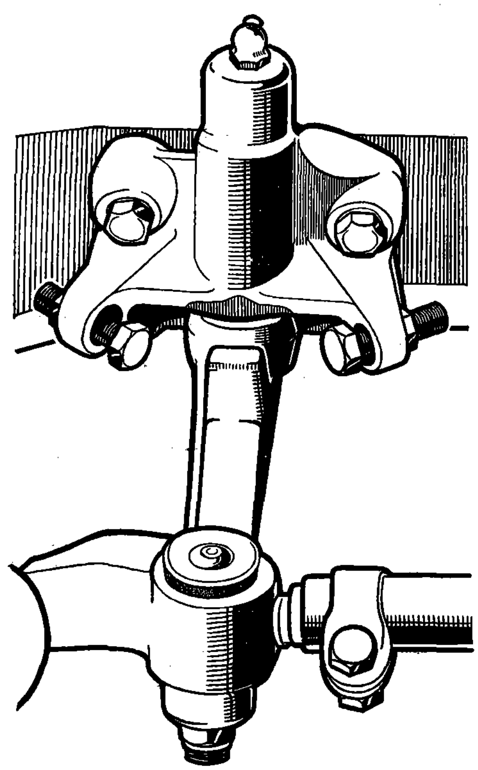


Fig 13. Showing the steering lock stop bolts.

ACCIDENTAL DAMAGE

The following dimensional drawings are provided to assist in assessing accidental damage. A component suspected of being damaged should be removed from the car, cleaned off, and the dimensions checked and compared with those given in the appropriate illustration.

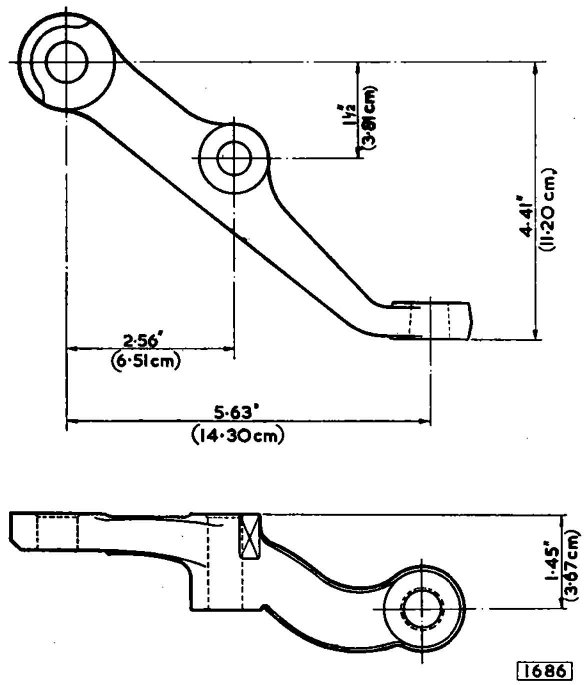


Fig. 14. Steering arm.

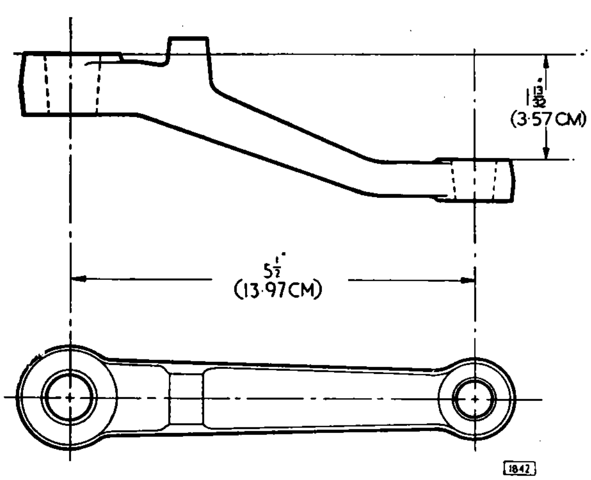


Fig. 15. Steering idler lever

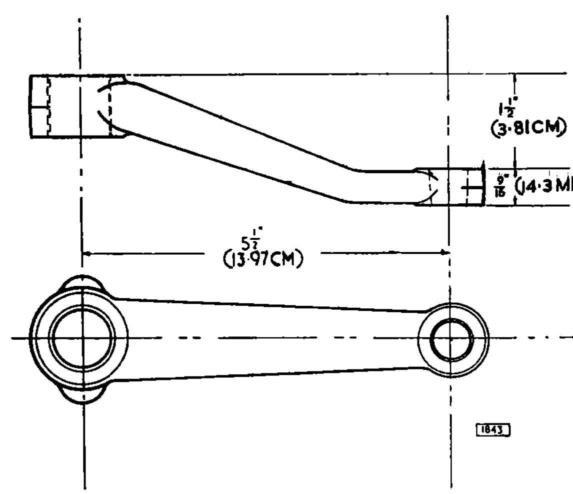


Fig. 16. Steering drop arm.

POWER-ASSISTED STEERING

(Fitted as an optional extra)

The following information deals with the power-assisted steering system specified as an optional extra for the 3.4 and 3.8 litre models only. The details cover the differences in equipment that exist between the power-assisted and standard steering systems.

DESCRIPTION

The power-assisted steering system consists of an oil reservoir, eccentric rotor type pump driven off the rear of the dynamo shaft, and an hydraulically assisted worm and re-circulating ball type steering box. These parts are connected by flexible hoses as follows :—

Reservoir to inlet side of pump.

Outlet side of pump to inlet pipe connection attached to the steering box.

Outlet at top of steering box to reservoir.

The pump supplies a continuous flow of oil through the system while the engine is running and the steering is in the straight ahead position. Pressure is only created in the system when the steering column is rotated and is proportional to the effort applied to the steering wheel.

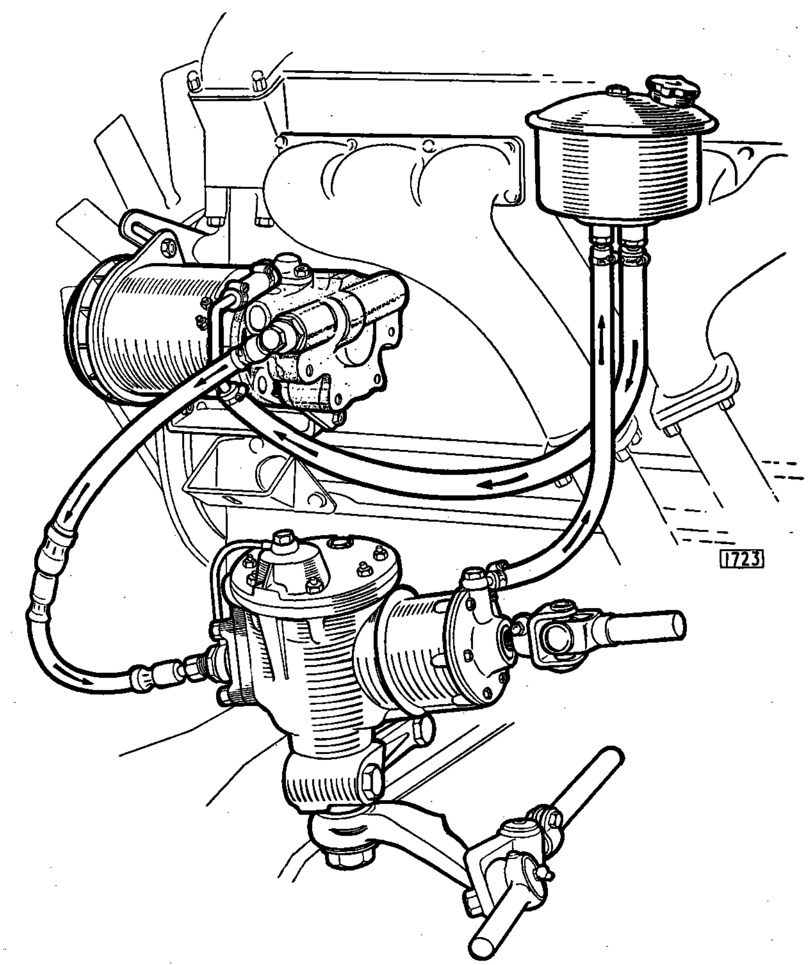


Fig. 17. Layout of the power assisted steering system.

The Steering Unit

The steering box is of the re-circulating ball worm and nut type in which hydraulic assistance is applied to a piston forming part of the nut (G, Fig. 18). The piston works within a cast iron cylinder pressed into the aluminium steering box casing, hydraulic pressure being admitted to one side or other of the piston, depending on which steering lock is applied.

Admission of oil to the appropriate pressure chamber is controlled by a selector valve (M) co-axially mounted within the hollow rear end of the wormshaft (P). The valve extends rearwards through the steering box top cover, and forms the input shaft to which the lower end of the steering column is directly connected.

Rotary movement of the valve relative to the wormshaft opens and closes ports in the wormshaft and thus directs oil to the side of the piston in operation for the steering lock required.

When steering wheel effort is at a minimum, centralisation of the valve within the wormshaft is effected by the action of an interlock ball (K) which is loaded by a coil spring (Q) located at the bottom of the valve. The interlock ball operates in specially shaped mating holes in the valve and wormshaft.

To obtain a high mechanical efficiency the internal sealing in the box is obtained by the use of sealing sleeves instead of rubber ' O ' rings.

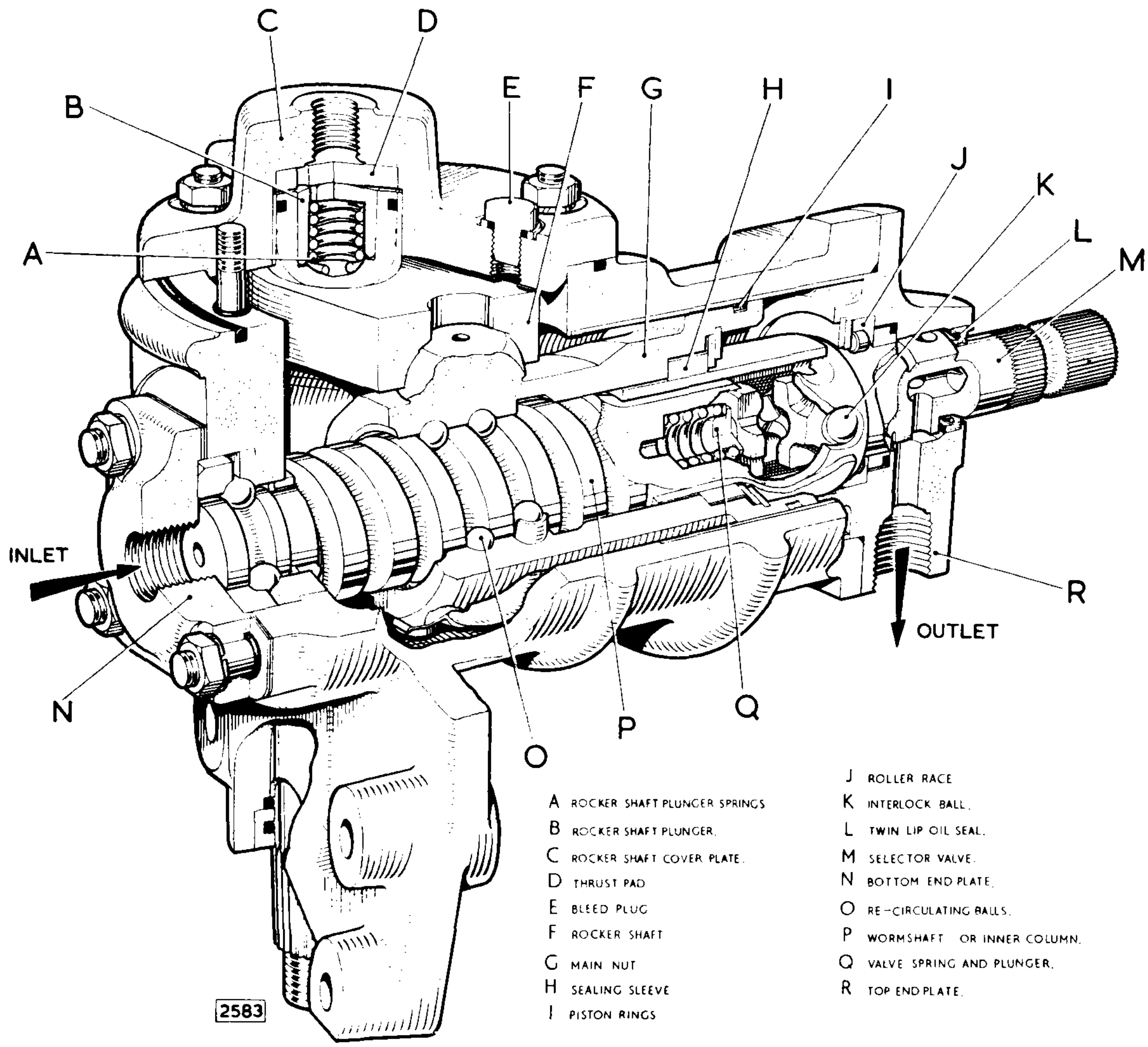


Fig. 18. Sectional view of the power-assisted steering unit.

DATA

Steering Unit	
Make	Burman
Type	Hydraulically assisted worm and re-circulating ball
Steering gear ratio at centre of travel	21.4 : 1
Number of turns—lock to lock	4.9
Turning circle	33′ 6″ (10.21 m.)
Oil Pump	
Make	Hobourn-Eaton
Type	Eccentric rotor
Location	Rear of generator
Operating pressure	800—850 lb. per sq. in. (56.24—59.76 kg./cm².)

The Valve

The valve is of cylindrical form and has a central longitudinal passage which is closed at each end. An interrupted flange, formed on the outside of valve the working between stops on the wormshaft, limits the rotary movement of the valve within the wormshaft. This prevents overloading of the valve and permits normal steering in the event of the hydraulic assistance not being available. At each side of the valve symmetrical oil feed grooves and ports are machined, the port drillings communicating with the central passage (see Fig. 19).

Note: A limited amount of axial movement of the valve (input shaft) may be noticed when turning the steering but this movement is quite normal.

The Rocker Shaft

The rocker shaft (F, Fig. 18) is of the normal spring-loaded type but when the steering is on lock the spring loading is augmented by the hydraulic pressure existing in the system.

Note: It may be noticed when turning the road wheels on lock that there is a certain amount of end movement of the rocker shaft. This is quite normal and is inherent in the design of the steering unit.

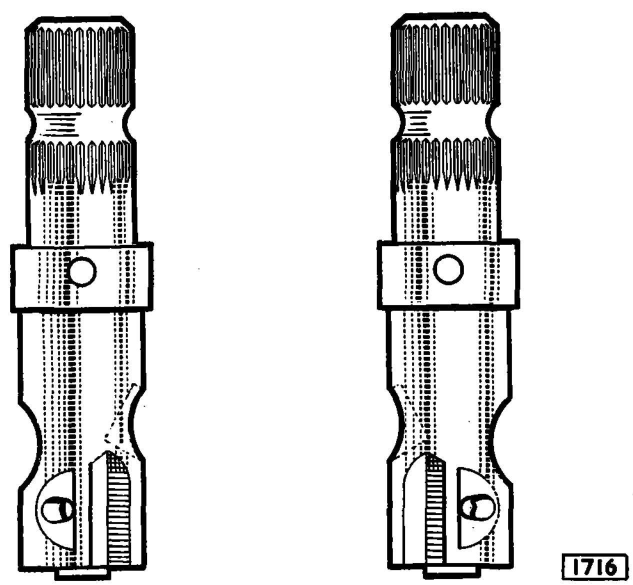


Fig. 19. Showing the oil feed groove and port at each side of the valve.

ROUTINE MAINTENANCE

EVERY 1,250 MILES (2,000 KM.)

Checking the Reservoir Oil Level

The oil reservoir is attached to the left-hand wing valance. It is important that absolute cleanliness is observed when replenishing with oil as any foreign matter that enters may affect the hydraulic system. Clean the area around the filler cap and then remove the cap by turning anti-clockwise.

Check the level of oil and top up if necessary with the recommended grade. The level of oil must be just above the filler element located in the reservoir.

Important: If the oil level is allowed to fall appreciably, the power assistance to the steering will be affected.

EVERY 2,500 MILES (4,000 KM.)

Steering Tie Rods

Lubricate the ball joints at the ends of the two steering tie rods with the recommended lubricant. The tie rods are situated at the rear of the front suspension cross member. When carrying out this operation examine the rubber seals at the ends of the ball housings to see if they have become displaced or split. In this event they should be repositioned or replaced, as any dirt or water that enters the ball joint will cause premature wear.

Do not over-lubricate the ball joints to the extent where grease escapes from the rubber seals.

EVERY 20,000 MILES (32,000 KM.)

Oil Reservoir Filter

At the recommended intervals, renew the paper filter element in the oil reservoir.

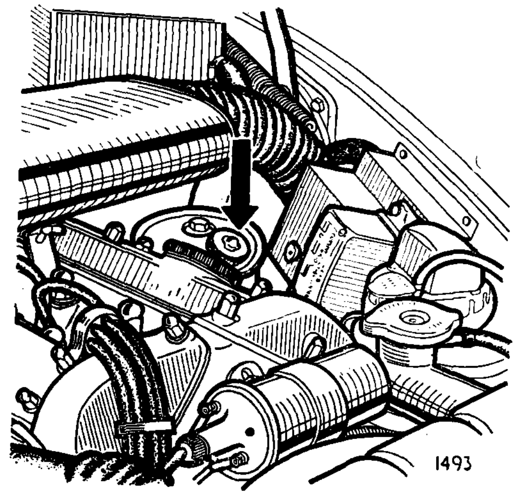


Fig. 20. Checking the reservoir oil level.

Unscrew the bolt securing the oil reservoir top cover. Lift off the top cover and collect the spring and retainer plate. The filter element can now be lifted out from the reservoir.

When fitting the new element ensure that it is located in the support plate at the bottom of the reservoir. Refit the retainer plate, spring and top cover. Tighten the central bolt.

Steering Idler Housing

On cars with power-assisted steering the idler housing is pre-packed with grease which only requires replenishing if the idler assembly is dismantled for overhaul.

Recommended Lubricants

	Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent Caltex/ Texaco
Steering reservoir	Mobil Fluid 200	Castrol T.Q.	Shell Donax T6	Esso Automatic Transmission Fluid	Energol Automatic Transmission Fluid Type A	Nolmatic	Texamatic Fluid
Steering idler housing Steering tie rods	Mobilgrease MP	Castrolease or LM	Retinax A	Esso Multi-purpose Grease H	Energrease L.2	LB 10	Marfak All-Purpose

OPERATION

(a) **Steering in straight ahead position**

Oil direct from the pump enters the steering box via the bottom end cover (N, Fig. 18) and passes up through a longitudinal hole in the wormshaft ; the valve being in its central position permits free flow of oil through the steering box to the outlet in the top cover (R). In this condition the oil is at low pressure and no thrust is applied to the piston.

(b) **Steering on lock**

Rotation of the steering wheel causes the valve to move relative to the wormshaft by an amount proportional to the effort applied to the steering wheel ; the amount is determined by the resistance of the road wheels to turning. On either side of the worm a milled slot communicates with the oil feed grooves in the valves ; the larger milled slot controls the flow to the chamber above the piston, and the smaller slot, together with a longitudinal groove controls the flow to the chamber below the piston. A sleeve pressed on to the outside of the worm and valve assembly effects a seal between the upper and lower chambers and also acts as a retainer for the interlock ball.

The relative movement of the valve to wormshaft restricts or completely closes the return port in the valve, which causes pressure to build up in the chamber on the side of the piston on which it is required to exert hydraulic pressure. Immediately steering wheel movement ceases and the car is held on a constant lock, the valve tends to centralise in the wormshaft by the combined action of the valve spring and interlock ball and the reduction in resistance to turning of the wormshaft due to the hydraulic assistance being applied to the main nut piston. A state of balance then exists between the effort at the steering wheel and the normal self-centring action of the front road wheels. On returning to the straight ahead position the hydraulic condition described in paragraph (a) is restored.

THE STEERING UNIT

REMOVAL

Remove the bolt securing the reservoir return hose banjo to the top end cover of the steering unit and drain the oil into a clean container. Undo the union securing the hose from the pump to the feed pipe adaptor on the lower end of the steering box.

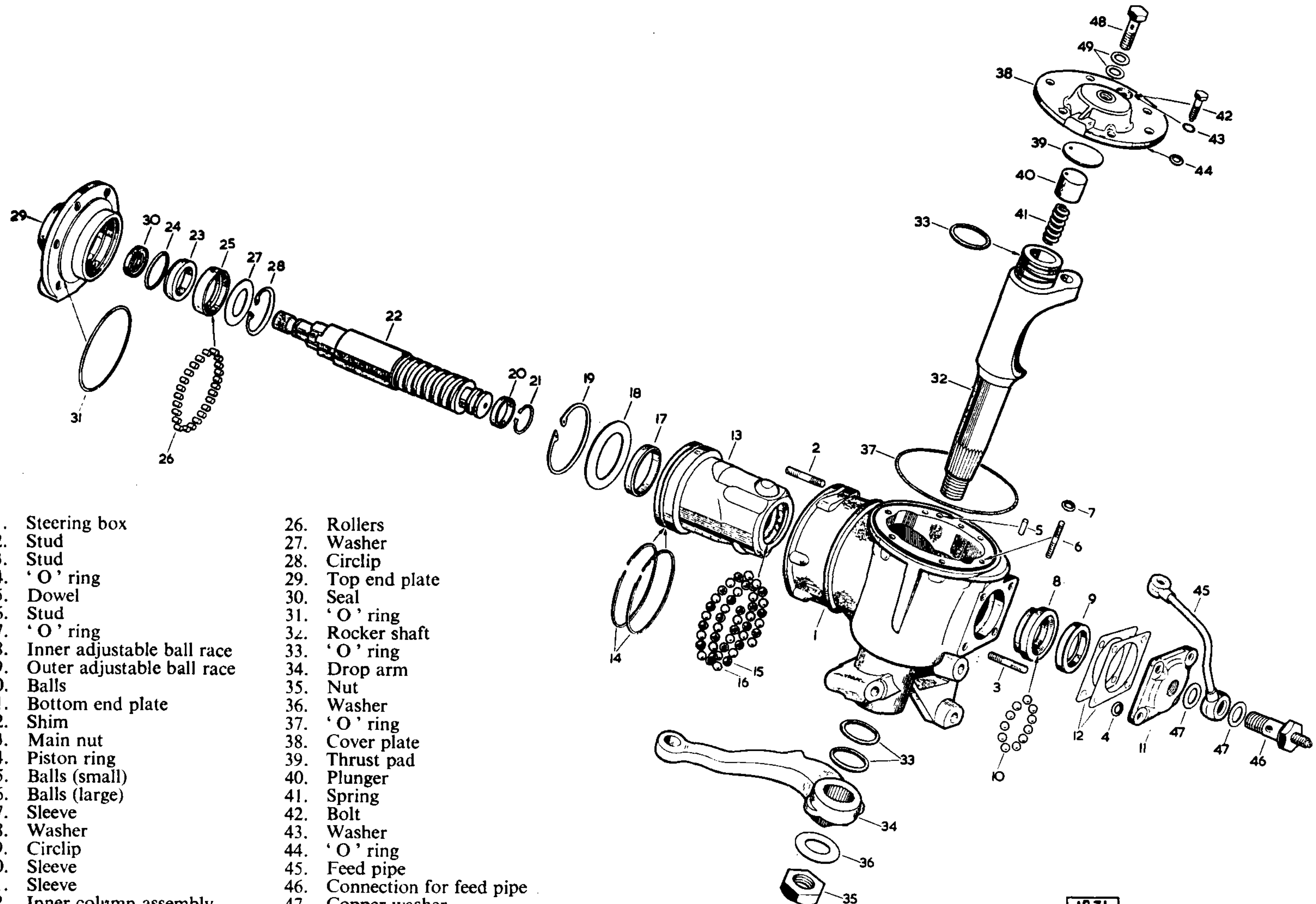
Remove the pinch bolt retaining the upper steering column to the socket on the lower column and pull back the steering wheel until the splines clear the retaining jaw. Detach the universal joint from the steering box and remove the lower column.

Refitting will be simplified if, before removal of the lower column, the road wheels and steering wheels are set in the straight ahead position. If these are then left undisturbed during the dismantling operations refitting can be carried out without any further adjustment of steering wheel or indicator cancelling device.

Remove the self-locking nut securing the track rod end to the drop arm. Drift out the track rod end from the drop arm in which it is a taper fit. Remove the three set screws and one long bolt securing the steering unit to the front suspension cross member when the unit can be removed.

DISMANTLING (Fig. 21)

Tap back the tab washer and unscrew the nut (35) and with a suitable extractor withdraw the drop arm (34) from the rocker shaft. With the steering box held in a vice by the mounting boss and a suitable tray placed underneath it to catch the oil, remove the feed pipe assembly from the lower end cover and rocker shaft cover. Remove the six nuts and the setscrew securing the rocker shaft cover to the steering box (the setscrew will be held in position on the cover by an 'O' ring). By pushing up on the rocker shaft the cover may now be removed. Extract the plunger (40) and the coil spring. Collect the thrust pad (39) from the counter bore in the cover. Empty out the oil from the box into the tray.



1. Steering box
2. Stud
3. Stud
4. ' O ' ring
5. Dowel
6. Stud
7. ' O ' ring
8. Inner adjustable ball race
9. Outer adjustable ball race
10. Balls
11. Bottom end plate
12. Shim
13. Main nut
14. Piston ring
15. Balls (small)
16. Balls (large)
17. Sleeve
18. Washer
19. Circlip
20. Sleeve
21. Sleeve
22. Inner column assembly
23. Packing piece
24. ' O ' ring
25. Roller race
26. Rollers
27. Washer
28. Circlip
29. Top end plate
30. Seal
31. ' O ' ring
32. Rocker shaft
33. ' O ' ring
34. Drop arm
35. Nut
36. Washer
37. ' O ' ring
38. Cover plate
39. Thrust pad
40. Plunger
41. Spring
42. Bolt
43. Washer
44. ' O ' ring
45. Feed pipe
46. Connection for feed pipe
47. Copper washer
48. Banjo bolt
49. Copper washer

Fig. 21. Exploded view of the power-assisted steering unit.

Remove the four nuts securing the bottom cover (11) and withdraw the cover and outer ball race. The eleven loose balls may be released by pushing on the inner column.

Remove the six nuts securing the top cover and withdraw the end cover complete with the worm and nut assembly. (The rocker shaft will have to be lifted to disengage the ball on the nut assembly from the socket in the rocker arm before withdrawing the worm and nut assembly). The rocker shaft may now be withdrawn.

Remove the end cover and roller race assembly and collect the twenty-four loose rollers. Unwind the main nut from the wormshaft and collect the forty-four re-circulating balls.

Note: **Twenty-two of these balls are exactly $\frac{7}{32}''$ (5.55 mm.) diameter whilst the other twenty-two are undersize by 0.0007″ (.017 mm.). The smaller balls are black in colour and it is MOST IMPORTANT that they should be re-assembled alternately with the larger balls.**

Remove the spring circlip and sealing sleeve from the lower end of the worm.

From the upper end cover and roller race assembly, remove the circlip and washer. The roller race can then be tapped out of position against a piece of wood. If this does not dislodge the roller race, immerse the end cover in boiling water and repeat the treatment. The sealing sleeve and ' O ' ring will come out with the roller race and the oil seal may now be pushed out.

From the main nut assembly remove the piston rings; do not stretch too far or breakage will occur. Remove the internal circlip, washer and sealing sleeve.

ASSEMBLING

When assembling the steering unit it is advisable, owing to the high pressure (800-850 p.s.i.) existing in the system to renew all the rubber ' O ' ring seals and the lip seal.

Press the lower inner ball race into the bottom end of the box.

Fit lower sealing sleeve inside the inner ball race and check for freedom of rotation.

Assemble the lower sealing sleeve and spring circlip on to the lower end of valve assembly.

Over the tube pressed on to the worm and assembly, fit the sealing sleeve and check for freedom of rotation.

Fit the sealing sleeve in top end cover on to worm and check for freedom of rotation.

Assemble the sealing sleeve, retaining washer and circlip into the main nut.

Assemble the piston rings into groove on main nut.

Assemble the forty-four balls into the main nut making sure that they are placed alternatively, large and small, around the grooves. (See note under " Dismantling").

Screw the worm and valve assembly into the nut, taking care not to dislodge any balls from the nut.

The End Cover

Press oil seal into recess in end cover with the spring showing towards the inside of the box.

Fit the ' O ' ring and sealing sleeve to top end cover and push in the roller race. Insert the twenty-four rollers and pack with petroleum jelly.

Fit the washer and circlip.

Position the piston rings in the groove on the main nut so that the slots are opposed at 180°. By means of a special ring clamp, (a steering box liner is ideal) which will fit into the recess in the end of the box, insert the rocker shaft and worm nut assembly into the box. It will be necessary to turn the rocker shaft on to the far lock and lift the rocker arm so that the ball on the nut assembly will fit into the socket in the rocker arm. Fit the eleven steel balls into the lower ball-race (with petroleum jelly). Fit the end plate, outer ball race and shim so that the worm assembly rotates freely without end float. Then remove .0025″ (.063 mm.) thick shim to obtain the correct axial pre-load. Always tighten down the end cover evenly.

Wrap tape around serrations on the valve. Fit ' O ' ring to spigot on upper end cover and fit end cover over the studs with the oil outlet facing upwards (for L.H.D. cars) or downwards (for R.H.D. cars).

Remove tape when cover is right home and tighten down evenly.

Rocker Shaft Adjustment

The rocker shaft itself rises and falls slightly in travelling to either lock and it is necessary that the adjustment for the end float should be carried out at the highest point of the rocker arm travel.

Assemble the original thrust washer and plunger (omitting the spring) into the top cover and fit the top cover but leave off the ' O ' rings at this stage. Bolt down the top cover evenly. Rotate the input shaft by hand to check the assembly for tightness as the rocker passes over the highest point on each lock. If no tightness is felt, remove the top cover and replace the thrust washer by one 0.005″ thicker. Carry on in this manner until tightness is felt, then remove the washer and fit one 0.005″ thinner.

Rocker Shaft Assembly

(a) Remove top cover complete with distance washer.
(b) Remove and dismantle plunger.
(c) Fit ' O ' ring to top cover studs.
(d) Fit ' O ' rings to top cover face.
(e) Assemble ' O ' ring to top of rocker shaft and check fit within top cover bush.
(f) Insert spring and plunger in rocker shaft.
(g) Refit top cover complete with distance washer.

Note: Care must be taken to tighten top cover evenly or the top bush may be damaged.

To Complete Assembly

(a) Fit drop arm, ensuring line on rocker shaft and drop arm are in alignment.
(b) Fit nut and secure with new lock washer.
(c) Fit the pipe between the bottom cover and the rocker shaft cover with a new copper washer on each side of the banjo connections.

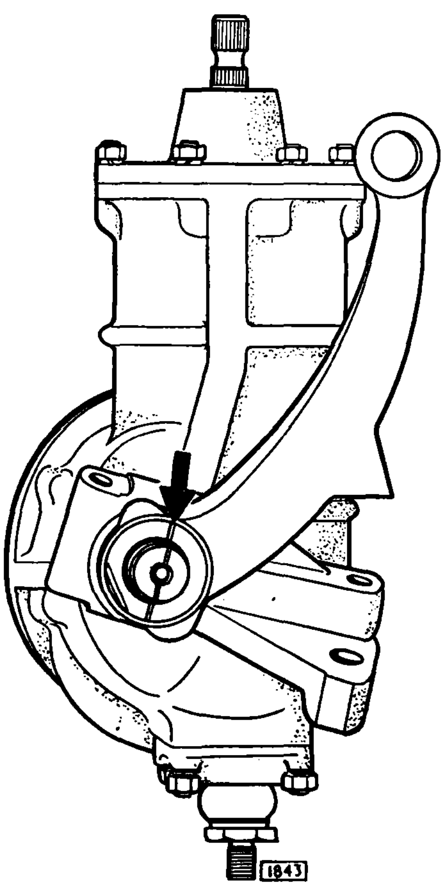


Fig. 22. Showing the alignment of the drop arm/rocker shaft marks on the steering unit.

Refitting

Refitting is the reverse of the removal procedure but special attention must be given to the following points.

Whilst reconnecting the upper steering column to the universal joint on the lower column care must be taken to ensure that the horn contact (41) does not catch the horn slip ring (33) on the inner column. The contact may be prised up with a screwdriver whilst the column is brought into position.

Should the road wheels or steering wheel have become disturbed during the removal operation, then these must be set in the straight ahead position before connecting the lower column jaw to the input shaft. Check that the indicators cancel evenly on each side of the straight ahead position. An adjustment can be made by removing the switch cover, turning the steering wheel until the adjustment screws on the trigger are visible, slackening the screws and moving the trigger in the required direction. Should the adjustment screws be already hard up against the ends of the slots then the adjustment must be made by re-positioning the lower column jaw in relation to the input shaft of the steering box. Adjust the top socket on the lower column as described on page I.9.

Bleed the system as described on page I.30.

Adjust the lock stops as described on page I.33.

REPLACEMENT OF TOP END PLATE OIL SEAL

Remove the steering box as described on page I.26.

Remove the six nuts securing the upper end cover and carefully withdraw the end cover and roller race assembly. Remove the circlip and washer and collect the twenty-four loose rollers. The roller race can then be tapped out of position against a piece of wood. If this does not dislodge the roller race immerse the end cover in boiling water and repeat the treatment. The sealing sleeve and ' O ' ring will now come out with the roller race and the oil seal may be pushed out.

Press a new oil seal into the recess in the end cover with the spring showing towards the inside of the box.

Fit the new ' O ' ring and sealing sleeve to the top end cover and push in the roller race (if necessary, immerse in boiling water).

Fit the twenty-four loose rollers with petroleum jelly. Fit the washer and circlip.

Wrap tape around the serrations of the valve. Fit the new ' O ' ring to the spigot on the upper end cover and fit the end cover over the studs with the oil outlet facing upwards (for L.H. drive cars) or downwards (for R.H. drive cars).

Remove the tape when the cover is right home and tighten down evenly.

Bleed the system as described on page I.30.

THE RESERVOIR

Dismantling, Inspection and Re-assembling

Remove the pump inlet hose from beneath the reservoir and allow the oil to drain into a clean container.

Thoroughly clean the exterior of the reservoir assembly.

Remove the screw, cover, spring and spring seat. Then remove the filter element.

(Loosen the screw and remove the reservoir cover and filter.)

Examine the filter and renew if damaged.

Place the filter on the reservoir stud.

Install the reservoir cover and a new gasket and secure it with the screw.

Caution: Check to ensure that the cover is installed flush with the reservoir body.

BLEEDING THE SYSTEM

The system requires bleeding only when any part of the steering system has been disconnected. The procedure is as follows :—

(1) Fill the reservoir to the top of the filter element with the recommended grade of oil.

(2) Start the engine and allow to idle. Whilst the engine is idling pour more oil into the reservoir until the level reaches to the top of the filter element. Check the hose connection for leaks.

(3) Increase the engine speed to 1,000 r.p.m. and turn the wheels in each direction five or six times.

(4) Re-check for leaks and oil level in reservoir after road test.

On later cars, a bleed screw is fitted in the top cover of the power steering box. If stiffness is felt on either lock, it will be necessary to slacken the bleed screw half a turn or more to release air from the unit while the engine is running. Always tighten securely after bleeding.

STEERING IDLER ASSEMBLY

Removal

Remove the self-locking nut and washer securing the track rod end to the idler lever. Drift out the track rod end from the idler lever in which it is a taper fit.

Remove the two bolts and steering lock stop bolt attaching the steering idler bracket to the front suspension cross member when the steering idler assembly can be detached.

Dismantling

Prise out the dust cap from the top of the idler bracket.

Tap back the tab washer and unscrew the nut at the top of the idler shaft.

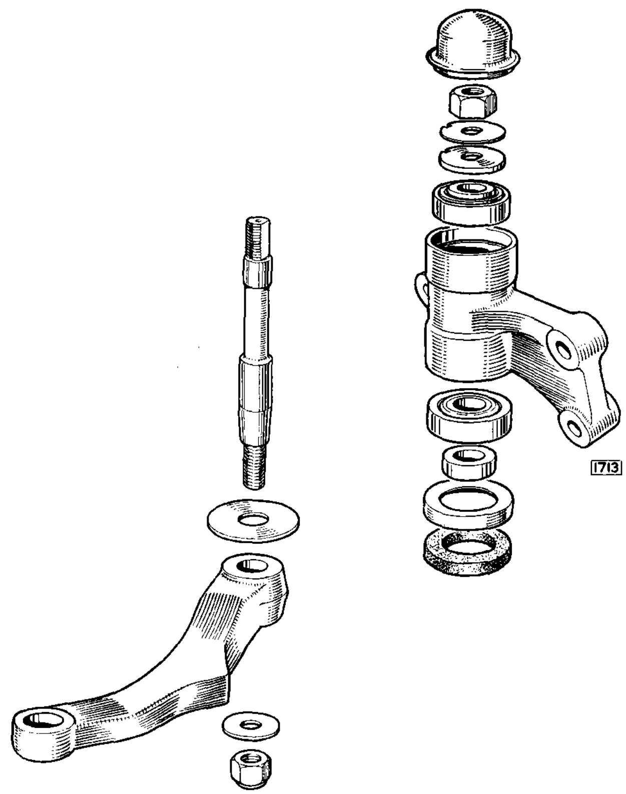


Fig. 23. Exploded view of the power-assisted steering idler lever assembly.

The idler arm and shaft can now be withdrawn and the washers, felt seal, etc., removed. Remove the inner races of the taper roller bearings.

Assembling

Thoroughly clean out the inner races of the taper roller races and the idler housing. Repack the housing and bearings with one of the recommended greases.

Fit the lower bearing, distance piece, seal retainer and a new felt seal.

Place the large washer over the idler shaft and pass the shaft upwards into the housing.

Fit the upper bearing, " D " washer, tab washer and nut. Tighten the nut to a torque of 5 lb/ft. If a torque wrench is not available tighten the nut until rotation of the idler shaft by the idler arm feels restricted and then slacken back the nut one flat ; lock the nut by means of the tab washer and refit the dust cap.

Refitting

Refitting is the reverse of the removal procedure but it is important to ensure that the idler lever is in the straight ahead position as illustrated in Fig. 26 before fitting the track rod end to the lever.

Reset the lock stop as described on page I.33.

THE OIL PUMP

The oil pump (see Fig. 24) which provides the hydraulic pressure in the system is of the eccentric rotor type and incorporates a combined flow and relief valve (see Fig. 25). The pump is attached to the rear of the dynamo and is driven from the dynamo shaft by means of a rubber coupling.

REMOVAL

Disconnect hoses at unions on pump assembly and place ends in raised position to prevent drainage of oil. Alternatively, allow oil to drain into clean container.

Remove nuts and lock washers that secure pump to dynamo and remove pump. If flexible coupling comes away with pump, withdraw from slot in pump shaft.

DISMANTLING, INSPECTION AND ASSEMBLY

Note: Thoroughly clean exterior of pump using care so that dirt does not enter the intake or outlet holes.

Hold pump in vice using soft jaws.

Remove two setscrews holding intake adaptor (4). Remove sealing ring (3).

Remove the five screws holding cover (13) to body (1), and separate pump body from pump cover.

Remove sealing rings (6 and 7) from grooves in body housing. Remove thrust button (12) from bearing hole in cover.

Withdraw drive shaft and rotor assembly. Do not reverse inner rotor in outer rotor.

Remove snap ring from drive shaft.

Drive bearing oil seal (19) from body with a punch if worn or damaged.

Remove valve cap adaptor (17) and seal (16) from pump cover. Remove flow control valve spring (15) and flow control valve (20).

Using pin nose pliers remove circlip (23) from flow control valve. Remove relief valve (22) and relief valve spring (21).

Caution: Place parts where they will not be damaged.

Wash all parts in a suitable solvent and dry with lint free cloth.

Check cover and body wear caused by rotors. Replace either part if scored or worn.

Grease lip of new seal and assemble seal with lip towards rotor. An arbor press is generally employed with $1\frac{7}{32}''$ (30.95 mm.) diameter piece of steel bar used as a piloting tool. Press seal in to fullest extent but do not squash.

Install shaft by inserting through oil seal end. Gently rotate shaft while inserting to lessen risk of damage to seal.

Inspect the drive and driven rotors. If noticeably worn or scored replace both parts. (Serviced in matched sets). If parts appear satisfactory place over shaft in pump body, and check the clearance between the rotors at all points with feeler gauges. Replace rotors if clearance exceeds .006″ (.15 mm.).

Using a straight edge and feeler gauges, check end clearance of the rotors in pump body. If end clearance exceeds .0025″ (.06 mm.) replace pump body.

Check clearance between driven rotor and bushing in pump body. Replace body if clearance exceeds .008″ (.20 mm.).

Replace drive pin in slot of shaft and drive rotor. Replace snap ring.

Carefully inspect the relief valve and ensure that the valve is not sticking. All burrs should be removed with fine oil stone. Replace valve spring in flow control valve.

Install relief valve in flow control valve.

Secure relief valve spring and relief valve in flow control valve with circlip.

Install flow control valve and spring in pump cover.

Install valve cap adaptor and seal. Screw in securely.

Renew ' O ' ring seals. Place pump body and cover together and secure with five screws ; tighten evenly.

Caution: Check shaft rotation for freedom after tightening screws. There must be no binding.

Install new ring seal in groove on inlet face, replace intake adaptor and secure with screws.

REFITTING

To install, place flexible coupling (24) assembly in slot on dynamo shaft. Align slot in pump shaft (9) with driving tongue on flexible coupling and push pump home on to mounting studs. Secure with nuts and lockwashers. Connect pressure and intake hose fitting to pump.

Bleed the system as described on page I.30.

FAULT FINDING

(1) **High Steering Effort**

(a) Insert pressure gauge in discharge line as close to pump as possible. Pressure should be 800—850 lb. per sq. in. (56.24—59.76 kg/cm.^{2}) with engine at 1,000 r.p.m. and wheels against stops. If the pump is not delivering oil under pressure, it may be due to one of the following causes :—

(i) Low oil level. Add oil as necessary.

(ii) Drive belt slippage. Adjust and tighten. Not excessively.

(iii) Stuck valves, dirt wedges in valves. Remove valves from pump and check for free operation.

(iv) Valving surfaces scored by abrasive matter. Replace all scored or worn parts. Clearance of relief valve should not exceed .0015" (.038 mm.).
Clearance of flow control valve to bore should not exceed .0015" (.038 mm.).

(v) Worn pumping elements.
 (a) End clearance should not exceed .0025" (.063 mm.).

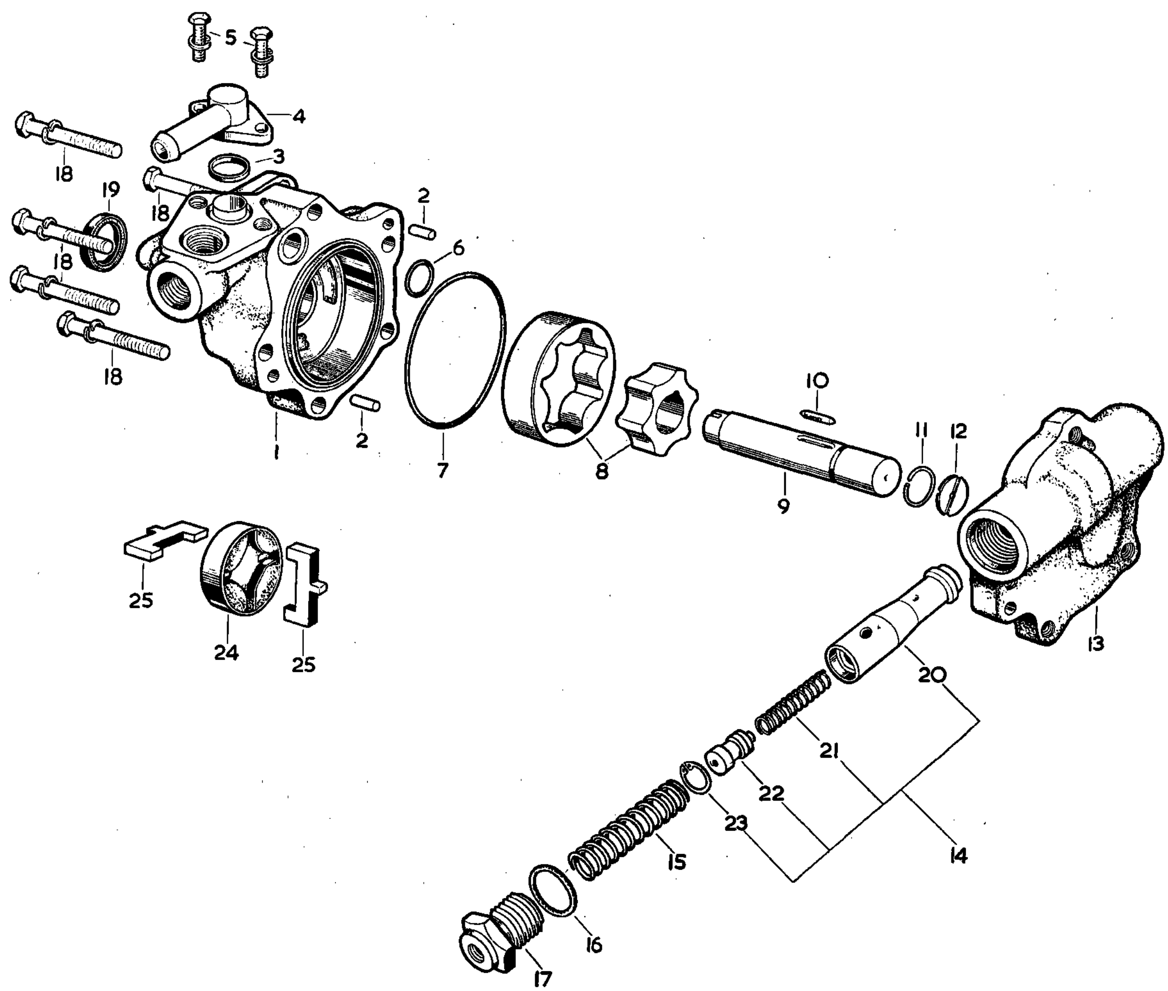


Fig. 24. Exploded view of the oil pump.

1. Oil pump body assembly
2. Dowel
3. Sealing ring
4. Inlet pipe adaptor
5. Screw and lockwasher
6. Small 'O' ring
7. Large 'O' ring
8. Rotor assembly
9. Shaft
10. Drive pin
11. Circlip
12. Thrust button
13. Cover Assembly
14. Flow control valve assembly
15. Return spring
16. 'O' ring
17. Adaptor
18. Bolt and lock washer
19. Oil seal
20. Flow control valve
21. Spring
22. Relief valve
23. Circlip
24. Coupling assembly
25. Driving dog

(b) Tooth clearance should not exceed .006" (.015 mm.).

(2) **Noise (The installation is noisy at engine idling speed).**

(a) Check for hoses rubbing against the chassis or body metal ; isolate hoses.

(b) This may be caused by entrapped air in the system.

(i) Check reservoir to pump inlet connections for leaks.

(ii) Bleed the system.

(iii) Refill reservoir to correct level.

(c) Air leak past oil seal.

(i) Inspect oil seal ; lips may have been damaged due to faulty installation ; replace oil seal.

(d) Flow control valve stuck closed, excessive internal pressure build up causing noise.

(i) Free up valve. If necessary use crocus cloth to remove burrs in bore and on valve.

(e) Some noise may be expected when wheels are against stops. This is caused by the relief valve. It is undesirable to hold wheels in this position.

(f) When the oil level is low on a cold morning start, some noise may be caused by funneling of the oil, allowing air to enter the system. This will stop when the oil heats.

(3) **Oil Leaks**

(a) Shaft seal leakage. Replace oil seal.

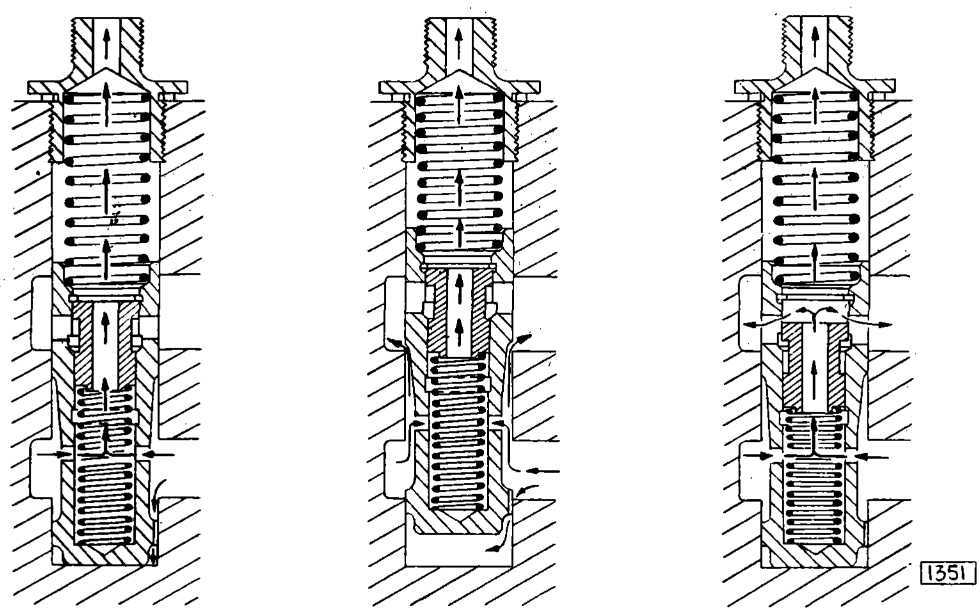
(b) Reservoir gasket. If leakage is indicated by excessive oil around reservoir, replace gasket.

(c) Oil flowing out of air vent may indicate a clogged filter. Replace the element.

LOCK STOP ADJUSTMENT

The lock stop bolts are screwed into the front suspension cross member and are retained in position by locknuts. The stops are set at the factory to allow 38° travel of the drop arm and idler lever each side of the central (straight ahead position).

Normally, the lock stop bolts should not require adjustment but if attention is found to be necessary



(By permission of The Motor Trader)

Flow through metering holes with flow valve not in operation.

Flow through metering holes with flow valve in operation.

Flow through metering holes with flow valve not in operation. Relief valve open.

Fig. 25. Diagram showing the operation of the combined flow and relief valve.

the adjustment should be carried out in the following manner.

Slacken the locknuts and screw in the lock stop bolts as far as possible. Turn the steering until the steering unit is at the end of its travel on that lock. Screw out the lock stop bolt until the head contacts the abutment on the idler lever or drop arm. Screw out the stop bolt a further four turns and tighten the locknut. Repeat for the other lock.

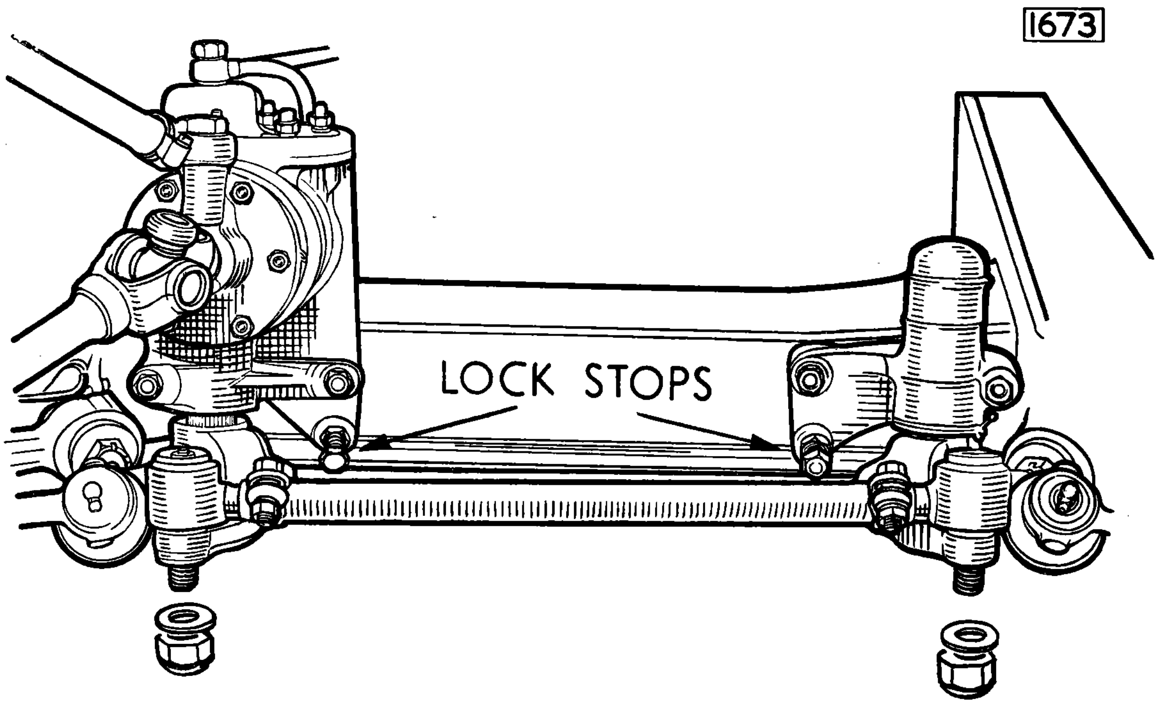


Fig. 26. Positions of the lock stops as fitted to power-assisted steering units.

ACCIDENTAL DAMAGE

The following dimensional drawings are provided to assist in assessing accidental damage. A component suspected of being damaged should be removed from the car, cleaned off, and the dimensions checked and compared with those given in the appropriate illustration.

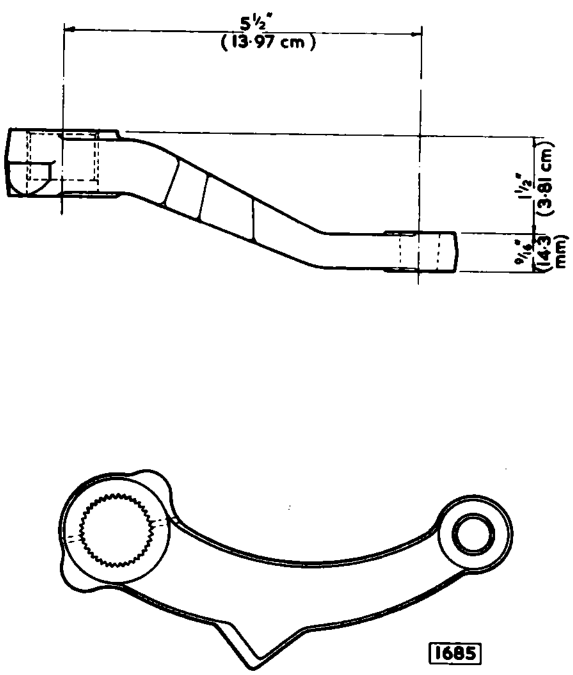


Fig. 27. Power-assisted steering drop arm.

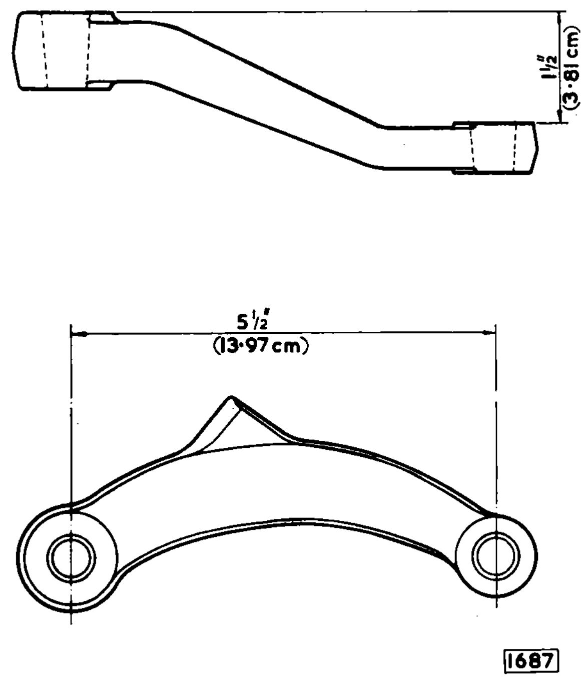


Fig. 28. Power-assisted steering idler lever.

THE POWER STEERING PUMP

(Roller Type)

The later type oil pump which provides hydraulic pressure in the system is a Hobourn-Eaton unit of the roller type and incorporates a combined flow and relief valve (Fig. 29). The pump is attached to the rear of the dynamo and is driven from the dynamo shaft by means of a rubber coupling. Commencing Engine Nos. KG.7700 (3.4 litre), LB.2634 (3.8 litre).

OPERATION

Pressure from the pump is caused by six rollers in slots in a circular carrier, keyed to the pump drive shaft. These rollers circulate inside an eccentrically mounted cam ring. Owing to the eccentricity, the gap between each pair of rollers widens and narrows during the cycle, drawing oil from the inlet side of the pump and forcing it to the flow control valve.

When the pump comes into operation, and oil flow commences, a drop in pressure caused by the primary orifice (A, Dia. 1, Fig. 29) occurs. Oil at this lower pressure passes through the secondary orifice (B) and enters the chamber containing spring (D) (Condition in Diagram 1). This pressure difference increases with the oil flow causing the control valve to move against the spring (D) and when a pre-determined flow has been reached, the valve uncovers the by-pass hole (C) leading to the intake side of the system.

Any further increase in flow causes the by-pass hole to be uncovered further and thus a constant flow is maintained (Condition in Diagram 2).

Should the line pressure become excessive, the ball (F) in the valve moves against the spring (G) and oil flow from the chamber containing spring (D) by-passes through the annular holes (E) (Condition in Diagram 3).

When this occurs, a further pressure drop caused by the secondary orifice (B) causes the valve to move up to its normal by-pass position irrespective of the oil flow conditions. As soon as the line pressure drops the ball valve closes and the pressure difference is restored bringing the constant oil flow back to normal.

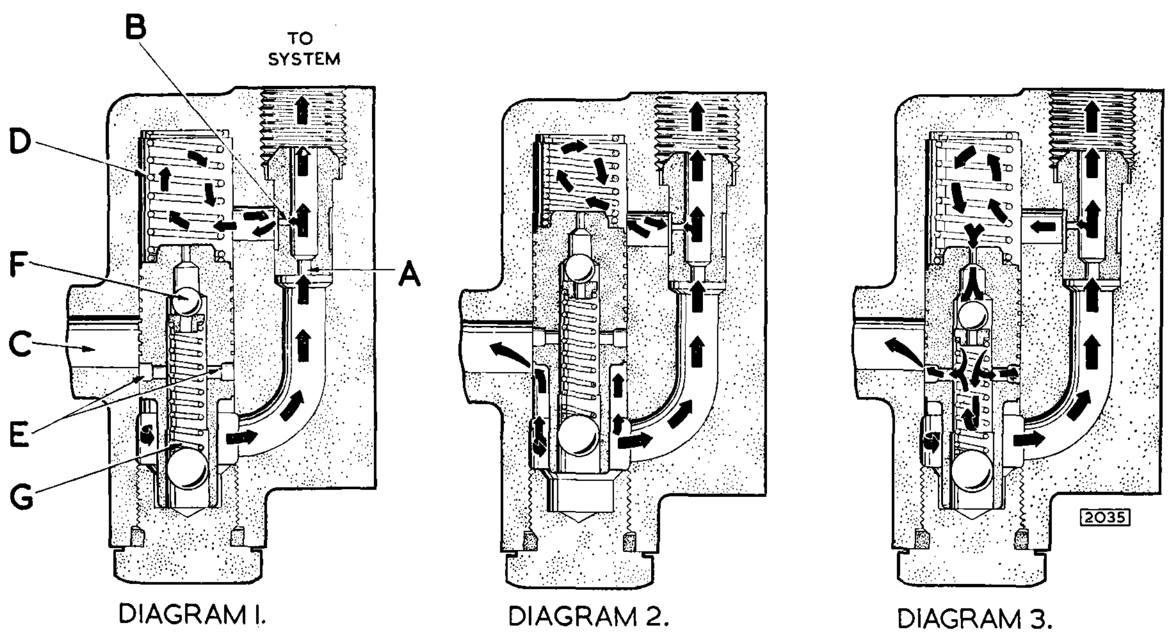


Fig. 29. Operation of the combined flow and relief valve.

REMOVAL

Disconnect the hoses at the pump unions and place the hose ends in a raised position to prevent oil drainage. Alternatively, allow the oil to drain into a clean container.

Remove the nuts and lock washers securing the pump to the dynamo and remove the pump. If the flexible coupling comes away with the pump, withdraw the coupling from the slot in the pump shaft.

DISMANTLING, INSPECTION AND ASSEMBLY

Note : Thoroughly clean the exterior of the pump ensuring that dirt does not enter the inlet and outlet holes.

Hold the pump in a vice, using soft jaws.

Remove the adaptor screw (25, Fig. 30), fibre washer (24), adaptor (23) and gasket (22).

Remove the six screws securing the cover (19) to the pump body (4).

Remove the pump from the vice, remove the cover from the pump body vertically to prevent the loss of parts.

Remove the sealing rings (9 and 12) from the grooves in the pump body. Remove the thrust washer (18) from the bearing hole in the cover.

Remove the snap ring (16) from the drive shaft (15) and withdraw the six rollers (14) and roller carrier (13).

Remove the drive pin (15a) and withdraw the drive shaft from the pump body.

Remove the cam (11) from the cam locking peg (10).

Drift the oil seal (2) from the body if worn or damaged ensuring that the drive shaft bushing is not damaged.

Remove the valve cap (8), valve seal (7) and flow control valve (6) and flow control spring (5).

Caution : Place the parts where they will not be damaged.

Wash all parts in a suitable solvent and dry with a lint free cloth or compressed air.

Check the pump body and cover for wear and replace either part if the faces or bushes are scored or worn.

Grease the lip of a new oil seal and assemble the seal with the lip towards the roller assembly. An arbor press is generally employed with a $1\frac{7}{32}''$ (30.95 mm.) diameter piece of steel bar used as a piloting tool. Press the seal in until it is fully home but ensure that the seal is not squashed.

Refit the cam locking peg. Inspect the cam for wear and replace if worn or damaged. Refit the cam with the slot over the locking peg. Ensure that the cam is seated correctly.

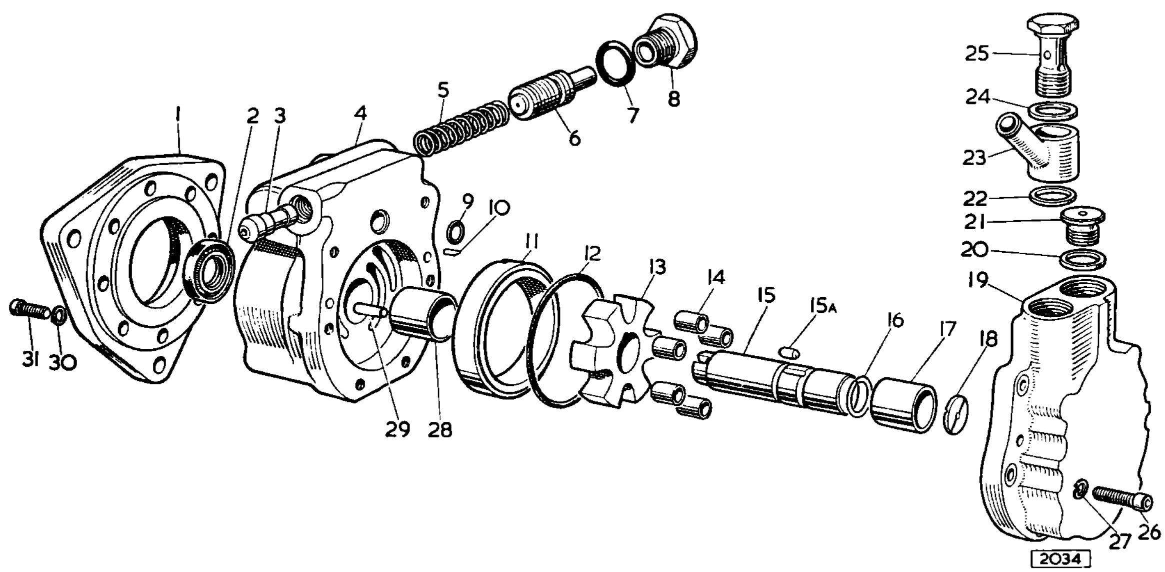


Fig. 30. Exploded view of the steering pump.

1. End plate
2. Oil seal
3. Orifice tube
4. Pump body
5. Flow control spring
6. Flow control valve
7. Valve seal
8. Valve cap
9. Sealing ring
10. Cam locking peg
11. Cam
12. Sealing ring
13. Roller carrier
14. Rollers
15. Drive shaft
15a. Drive pin
16. Snap ring
17. Drive shaft bush
18. Thrust washer
19. Pump cover
20. Plug seal
21. Plug
22. Gasket
23. Adaptor
24. Fibre washer
25. Adaptor screw
26. Cover screw
27. Spring washer
28. Drive shaft bush
29. Dowel pin (2 off)
30. Spring washer
31. End plate screw

Insert the drive shaft from the seal side of the body, ensuring that there are no sharp edges on the shaft to damage the oil seal lip.

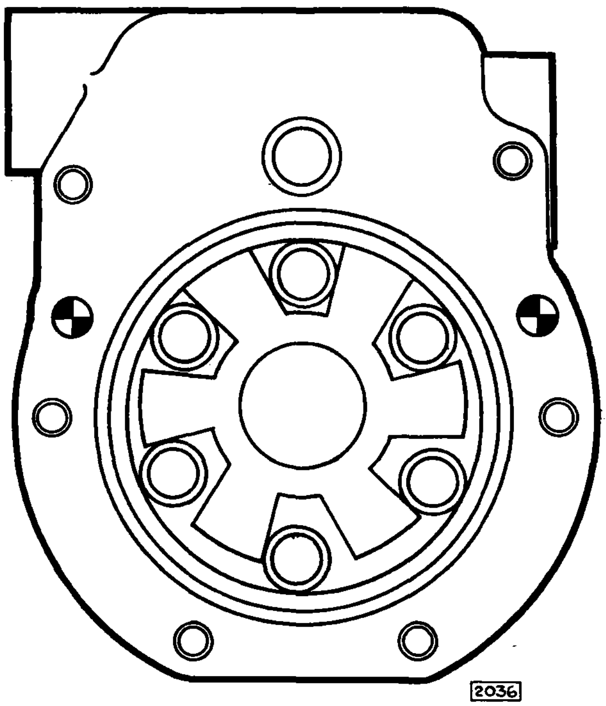


Fig. 31. The roller carrier and rollers in position.

Refit the drive pin to the shaft and having inspected the roller carrier, fit it into position as shown in Fig. 31. Ensure that the correct face of the carrier slots are driving the rollers. Refit the snap ring.

Inspect the rollers, paying particular attention to the finish on the ends. Replace if scored, damaged or out of round, refit the rollers.

Check the end float of the carrier and rollers in the pump body using feeler gauges and a straight edge across the cam surface. If the end float exceeds .002" (.051 mm.) the rollers and carrier should be replaced.

Refit the flow control spring in the valve bore. The spring should be replaced if the tension is not between 8—9 lb. (3.63—4.08 kg.) at 0.82" (20.8 mm.).

Refit the valve in the pump body with the exposed ball bearing end entering last. Ensure that the valve is not sticking. Refit the cap sealing ring and tighten the cap to 30—35 lb.ft. (4.15—4.84 kg.m.).

Fit new sealing rings to the pump body joint face. Fit the thrust washer to the cover and refit the pump cover to the body, secure with the six cover screws and tighten evenly to a torque of 18 lbs.ft. (2.49 kg./m.).

Important : Check the drive shaft rotation for freedom after tightening the cover screws. There must be no binding.

Fit a new rubber gasket at the adaptor on the cover. Refit the adaptor, adaptor bolt and fibre washer. The plug in the top of the cover housing is used only for sealing purposes and if removed, care should be taken to ensure that an airtight seal is obtained when the plug is replaced.

REFITTING

To install, place the flexible coupling assembly in the slot on the dynamo shaft. Align the slot in the pump driving shaft with the driving tongue on the flexible coupling and push the pump home on to the mounting studs. Secure with nuts and spring washers. Connect the pressure and intake hoses to the pump.

Bleed the system as described on page I.30 .

AMENDMENTS
TO
SECTION I - STEERING

STEERING COLUMN–DISMANTLING

Ref: Page I.11

Later cars have a plastic bearing fitted to the top and bottom of the outer tube. To withdraw the inner column, it is first necessary to remove the spring clip and retaining ring at the bottom of the outer tube; depress the retaining lug to withdraw the bearing. Depress the retaining lug to withdraw the upper plastic bearing.

STEERING COLUMN–RE-ASSEMBLING

Ref: Page I.12.

On later cars, when re-assembling the flashing indicator to the steering column, pass the two fixing screws through the switch clamp; attach the spring washer and locknut to the bottom screw and the distance piece and washer to the top screw. Feed the two screws through the column bracket and secure the indicator switch. Tighten the top screw fully.

Attach a spring balance to the steering wheel; tighten the bottom screw until the steering wheel can just be turned with a pull of 5 ozs. (141.7 grammes) registered on the balance. Turn the locknut towards the switch carrier bracket and lock the screw. Two thicknesses of distance piece are available to compensate for any variation in the bore of the outer tube.

Grade A	0.188 in. (4.7mm.)
Grade B	0.166 in. (4.2mm.)

SUPPLEMENTARY INFORMATION
TO
SECTION I - STEERING

ADWEST POWER ASSISTED STEERING

Commencing Chassis Number	Model
171583	3.4 Litre Mk. 2 R.H. Drive
1J 80050	340 L.H. Drive
235312	3.8 Litre Mk.2 R.H. Drive (Not introduced on L.H. Drive 3.8 cars)

Description

The power assisted steering consists of two separate components: the steering box and the pump. The two are interconnected by flexible hoses; oil flowing from the output side of the pump to the steering box (high pressure hose) and returning to the reservoir via a small oil cooler attached to the engine sump (low pressure hose).

A continuous flow of oil is pumped through the system whilst the engine is running but pressure builds up only when the steering wheel is turned.

DATA

Steering Gear

Make . . . . Adwest Engineering Co. Ltd.
Type . . . . Marles Varamatic-Hour glass and roller with hydraulic servo cylinder.
Steering gear ratio on centre 21.6:1
Steering gear ratio on full lock 13:1
Number of turns–lock to lock . . . . $2\frac{3}{4}$
Turning circle . . . . 33 ft. 6 in. (10.21m.)

OPERATION

STEERING GEAR

The steering gear operates on an "hour glass" cam and roller principle with an hydraulic control valve embodied in the input shaft of the cam. The hydraulic assistance is supplied by a servo piston operating in a cylinder which is integral with the steering box casting. A rack projects from this piston and the rack teeth mesh with a sector of a spur gear which is machined on a projection from the sector shaft.

The "hour glass" cam is a hardened steel component and its track (or thread) is machined with a varying helix angle so that the pitch is non-constant. A roller carried in the sector shaft meshes with this track and the assembly is responsible for providing the variable ratio. The ratio is highest (that is, lowest geared) "on centre". At this point, the ratio is 21.6:1 and it reduces rapidly towards either lock where its value becomes 13:1. This drop in ratio occurs almost entirely within half a turn from the straight ahead position with the same sensitivity for all speeds.

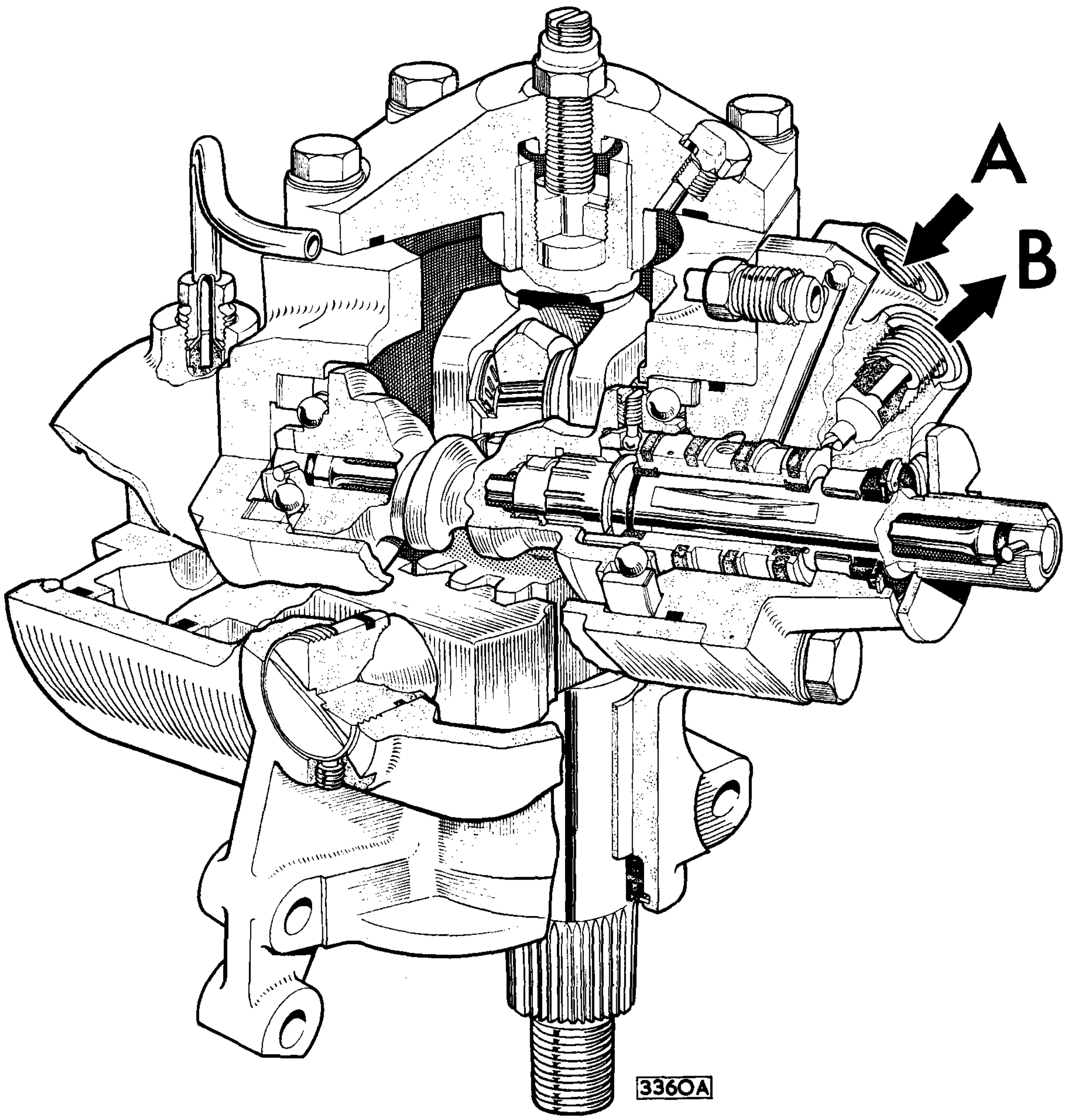


Fig. No. 32 Cut-away section of the steering box. "A" High pressure connection. "B" Low pressure connection.

THE VALVE

This is a rotary type control valve which is made up of two parts. The valve rotor, which is also the input shaft to the steering gear, has six grooves machined in it. These grooves lie between six grooves in the valve sleeve when no load is applied to the steering wheel, the rotor being centered in the sleeve by the torsion bar.

When the steering wheel is turned, effort is transmitted to the rotor which, in turn, transmits the effort to the hour glass cam by means of the torsion bar. The torsion bar is slender and the manual effort causes it to twist thus allowing the rotor to rotate within the sleeve. The relative movement of the grooves in the rotor to the grooves in the sleeve causes a hydraulic pressure build-up on one side or other of the servo piston thus assisting in turning the steering.

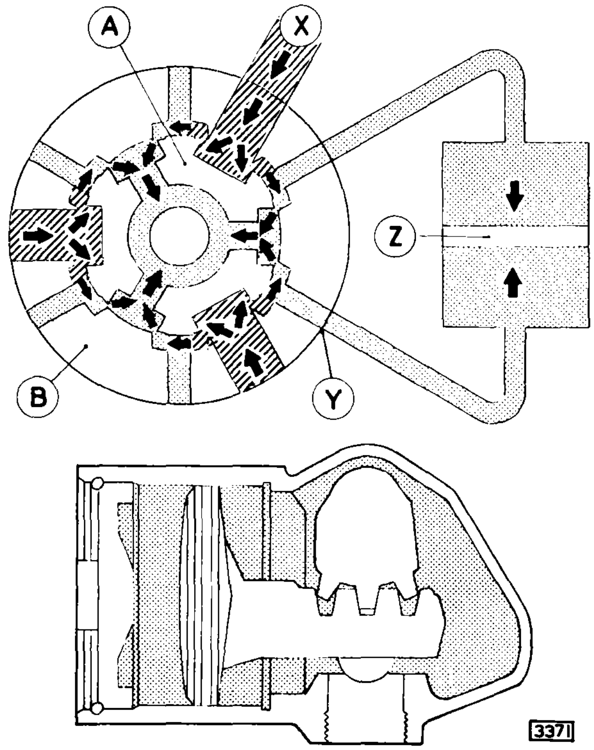


Fig. No. 33 Operating diagram of the rotor valve (straight ahead) A Rotor B Sleeve X Pump pressure Y Reservoir pressure Z Equilibrium.

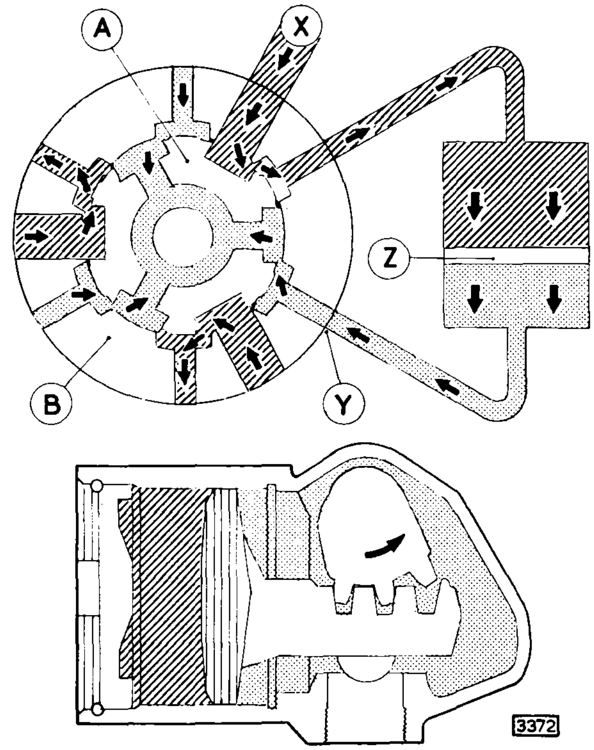


Fig. No. 34 Operating diagram of the rotor valve (steering turned) A Rotor B Sleeve X Pump pressure Y Reservoir pressure Z Pressure displacement.

THE PRESSURE PUMP

The pressure pump, which supplies hydraulic pressure in the system, is the Hobourn Eaton unit described in the Mk.2 Service Manual, Page I.36.

ROUTINE MAINTENANCE

EVERY 3,000 MILES (5,000 KM.)

Checking the Reservoir Oil Level

The only regular maintenance required for the power assisted steering system is that of checking the oil level in the reservoir.

The oil reservoir is mounted on the left hand wing valance. It is important that absolute cleanliness is observed when replenishing with oil as any foreign matter that enters may affect the hydraulic system.

Clean the area around the filler cap and remove the cap by turning anti-clockwise. Check the level and top-up, if necessary, to the FULL mark on the dipstick with the recommended grade of oil. The level must be up to the FULL mark when the oil is warm.

EVERY 6,000 MILES (10,000 KM.)

Steering Tie-rods

Lubricate the ball joints at the ends of the two steering tie-rods with the recommended lubricant.

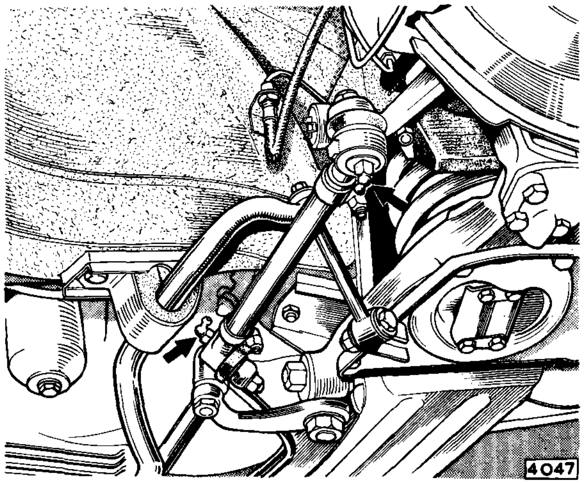


Fig. No. 35 Steering tie-rod grease nipples.

Wheel Swivels

Lubricate the nipples (4 per car) fitted to the top and bottom of the wheel swivels.

Front Wheel Alignment

Check the front wheel alignment as detailed on Page I.s.14.

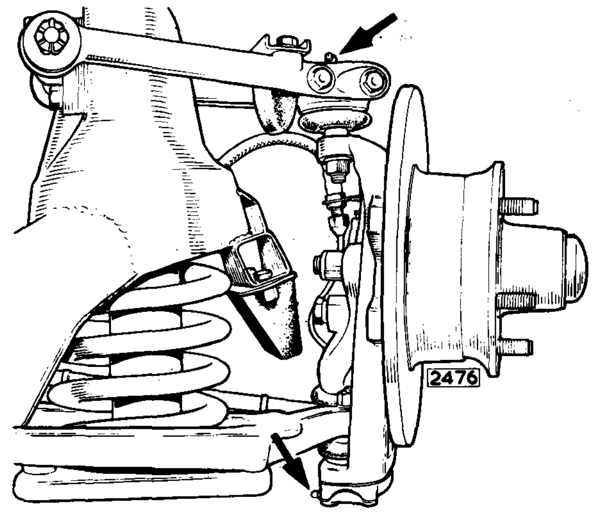


Fig. No. 36 Wheel swivel grease nipples.

ADJUSTMENTS OF STEERING GEAR IN CAR

Centralisation

This adjustment is carried out only when setting the front wheel alignment or checking the sector shaft backlash.

Because of the varying ratio curve, **it is most important**, that the steering gear is centralised when the toe-in is being set. Adjust the position of the steering wheel so that the slot in the centralising plate on the input shaft aligns with the hole in the steering box. Set the steering to the straight ahead position. Check by inserting a ¼in. (6.4mm.) rod (Fig. 37).

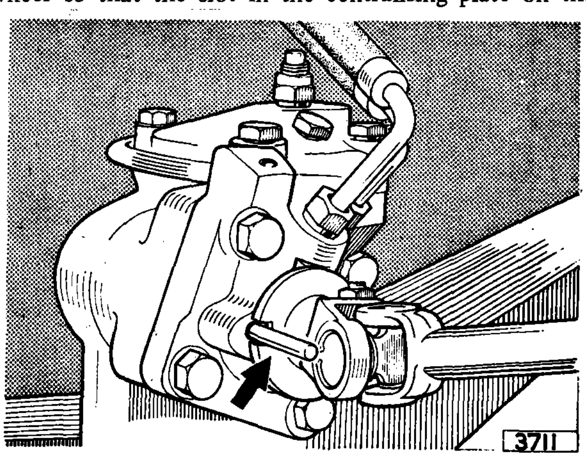


Fig. No. 37 Centralising the steering.

Sector Shaft Adjustment

If lost motion is present in the steering box, it is most likly to be wear between the hour glass cam and roller. It is unlikely that this wear will occur except after very high mileage has been covered.

To check, centralise the steering; disconnect the centre tie-rod from the drop arm. Rock the drop arm by hand to both sides of the centre line to feel for excessive backlash. If necessary, release the locknut at the top of the steering box; screw in the adjuster screw until only slight backlash can be felt. Secure the locknut; refit the centre tie-rod (see note on Page I.s.14) and road test the car.

Note: **It is important** that the steering is centralised when checking for sector shaft backlash.

If this adjustment fails to remove the lost motion from the steering gear, the remedy will have to be affected with the gear removed from the car. However, before removal, it is possible to determine cause of the trouble by carrying out the following tests.

With the engine switched off, oscillate the steering wheel and feel the input shaft for end-float that is, it should not move in and out of the housing.

If end-float exists, the steering will not only exhibit lost motion but also rattle over rough roads.

If the steering pulls right or left, carry out the following test before proceeding further.

Check tyre pressures and change tyres from one side to the other. If the pull changes direction, the fault lies with one or both the tyres. If the pull remains, proceed further.

Check the steering linkage for wear and carry out front wheel alignment check.

If no improvement is apparent, the fault must lie with the "trimming" of the valve in the steering unit.

To check, install a 2,000 lb./sq. in. pressure gauge into the pressure line. Set the steering in the straight ahead position; start the engine and allow to idle.

Turn the steering first to the left and then to the right. Watch the pressure gauge during this operation and check that the pressure recorded are equal. If the pressure rise is not balanced, the steering unit must be removed from the car and the worm and valve assembly renewed.

CHECKING THE HYDRAULIC SYSTEM

A number of faults in the steering system can be traced to inefficiencies in the hydraulic circuit—see page I.s.15 for "Fault Finding Chart". The following checks can be carried out without removing any components from the car.

Before starting any of this work the fluid must be checked for correct level and lack of froth.

Pump Blow-off Pressure

Fit a pressure gauge into the pressure line; start the engine; run at idle speed and turn the steering wheel to full lock and continue to increase the effort until the pressure ceases to increase. The peak pressure should lie between 950 and 1,000 lb./sq. in. (67-70 kg./sq. cm.) and it should not increase with increased engine r.p.m. If however, the pressure is below 950-1,000 lb./sq. in. at idle but rises to the correct figure with increased engine speed, then the trouble is caused either by a faulty control valve in the pump or by excessive internal leakage in the steering gear.

Fit a pressure gauge into the pressure line with an ON-OFF tap in series between the gauge and the steering unit. Start the engine; open the tap and turn the steering to full lock. Check the pressure reading. This should be

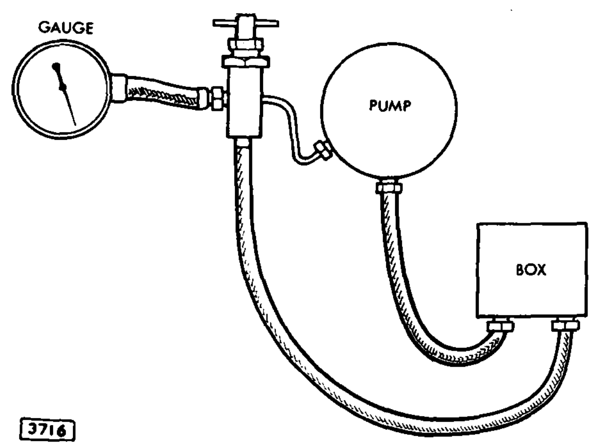


Fig. No. 38 Checking the hydraulic system.

1,000 lb./sq. in. (70 kg./sq. cm.). If the pressure does not rise to this figure, **close the tap for a maximum of 5 seconds** and note the gauge reading. This should be 1,000 lb./sq. in. (70 kg./sq. cm.) blow-off pressure.

If this reading is obtained, the leaks are confined to the steering unit which should be removed and overhauled.

THE STEERING BOX

Removal

The steering box can only be removed with the car standing on a ramp or over a pit.

Disconnect the high and low pressure unions from the box and catch the escaping oil in a container. Blank off the pipe and box unions to prevent ingress of dirt.

Disconnect the centre track-rod and the outer tie-rod from the drop arm.

Disconnect the centre track-rod from the idler lever and withdraw. Remove the anti-roll bar.

Remove the lower steering column; withdraw three bolts securing the steering unit to the centre cross-beam. Withdraw from beneath the car.

1. Steering box.
2. Screw.
3. Valve and worm.
4. Ball bearing.
5. Ball bearing.
6. Shims.
7. Valve housing.
8. Bolt.
9. Bolt.
10. Washer.
11. Centralising washer.
12. Shims.
13. Feed pipe assembly.
14. Piston and rack.
15. Teflon sealing rings.
16. Teflon sealing rings.
17. Cylinder cover.
18. Seal.
19. Clip.
20. Plug.
21. Seal.
22. Screw.
23. Thrust pad.
24. Section shaft.

24. Section shaft and worm follower.
25. Top cover.
26. Bleed screw.
27. Washer.
28. Screw and lock washer.
29. Seal.
30. Washer.
31. Seal.
32. Circlip.
33. Drop arm.
34. Nut.
35. Tab washer.

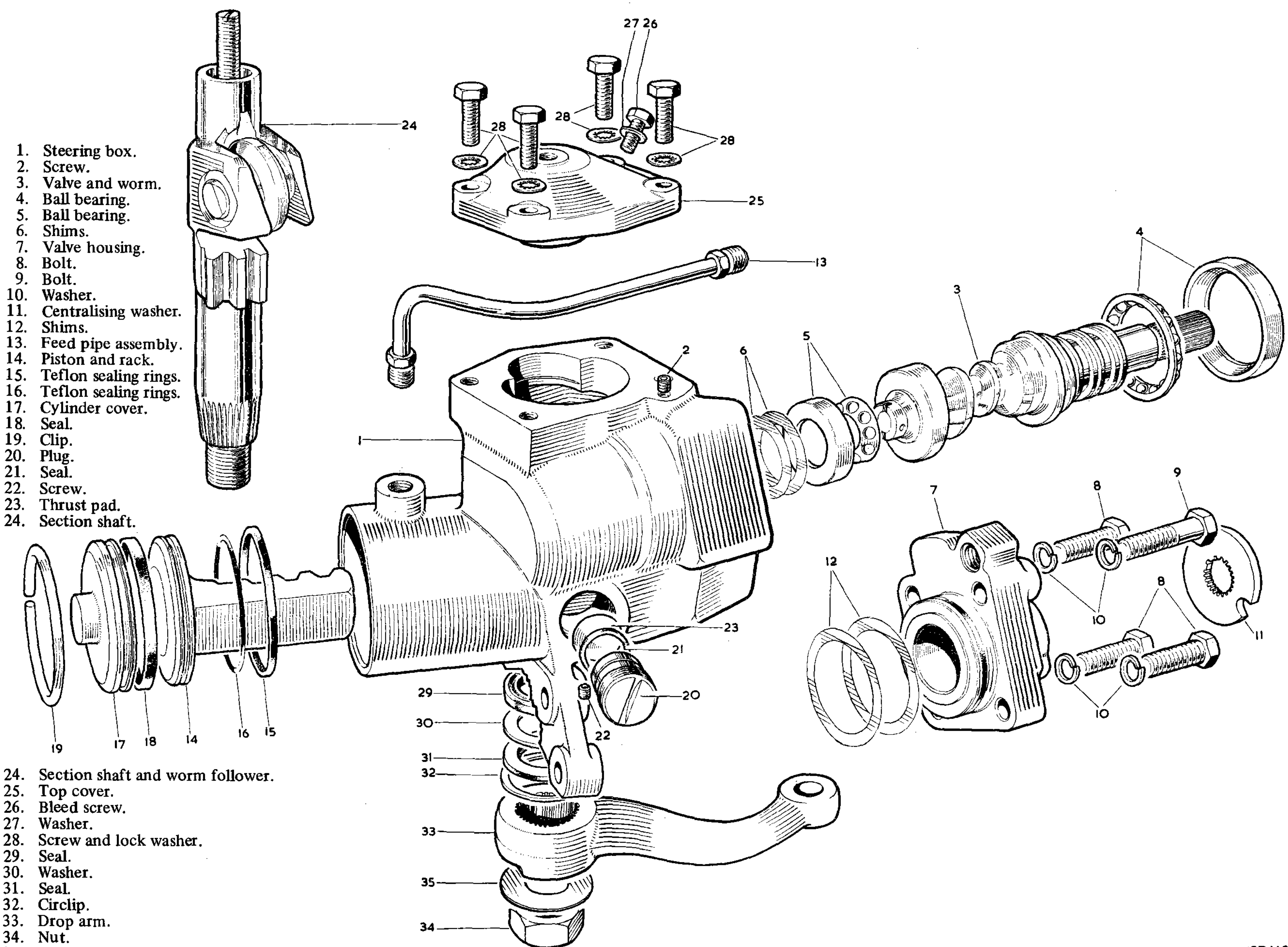


Fig. No. 39 Exploded view of the steering box.

Dismantling

Remove the nut (34) securing the drop arm (33) to the sector shaft (24). Mark the location of the drop arm to the shaft to ensure correct assembly. Using an extractor, withdraw the drop arm from the spline of the shaft. Invert the unit and drain the oil from the inlet orifice. Remove the feed pipe.

Set the input shaft to the straight ahead position. Slacken the screw (22) and remove the rack adjusting screw complete with thrust pad (23). Undo four bolts (28) retaining the top cover (25) and remove the sector shaft and top cover from the unit housing, tapping the bottom of the sector shaft with a rawhide mallet.

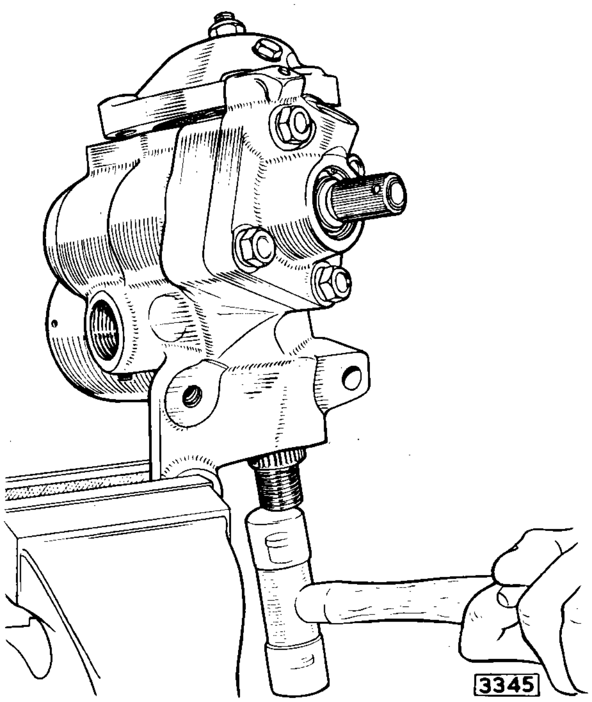


Fig. No. 40 Removing the sector shaft and top cover.

Separate the top cover from the sector shaft assembly (24) by removing the locknut and screwing the cover off the adjusting bolt.

Withdraw the centralising washer from the input shaft. Undo four bolts (8 and 9) and tap the valve housing (7) with a mallet. Collect the shims (12) between the housing and the bearing outer race. Remove the valve and worm assembly (3) complete with bearing (4).

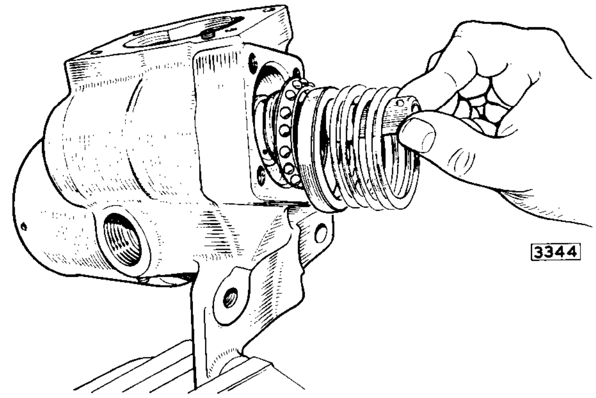


Fig. No. 41 Removing the valve and worm assembly.

Collect the inner race of the bearing (4). If the bearing is to be replaced, withdraw the outer race with an extractor. It is important that none of the shims behind the outer race is mislaid. DO NOT remove the "trim screw" shown in Fig. 42.

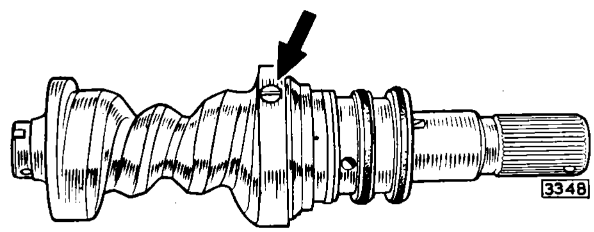


Fig. No. 42 Location of "trim screw".

Remove the cylinder cover retaining clip (19) by forcing it out of its groove with a short 3/16 in. (4.5mm.) steel punch. Once out of its groove, it can be eased clear with a screwdriver.

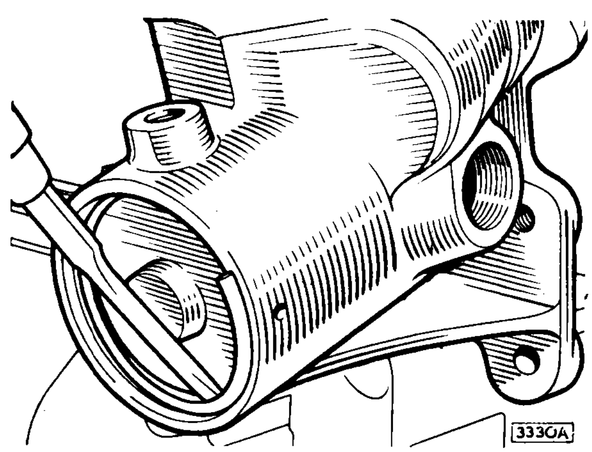


Fig. No. 43 Removing the cylinder cover retaining clip.

Remove the cylinder cover (17) complete with its seal by pulling on the boss in the centre of the cover with grips or pliers.

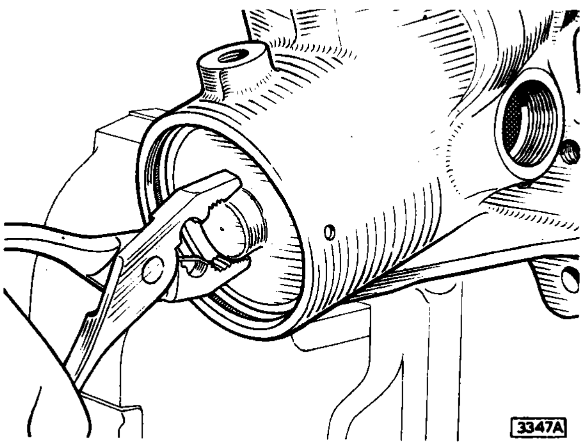


Fig. No. 44 Removing the cylinder cover.

Screw a long ½ in. UNC bolt or extractor into the tapped hole on the centre of piston and rack (14) and withdraw the assembly through the open cylinder end.

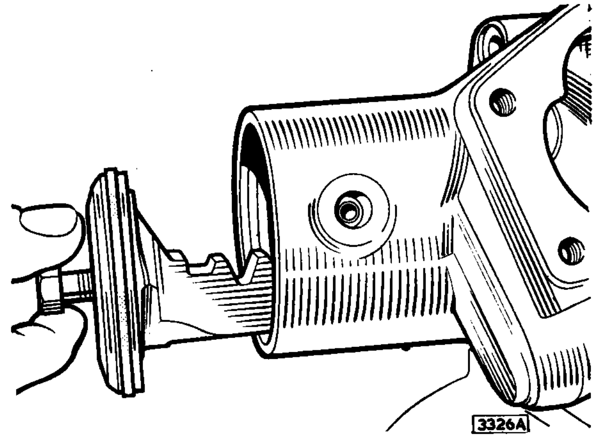


Fig. No. 45 Withdrawing the piston and rack assembly.

The gear is now stripped down to its basic components.

EXAMINATION OF COMPONENTS

Sector Shaft Assembly

If any wear or damage is found during the inspection points detailed below, the sector shaft must be replaced as an assembly.

Check roller for preload on thrust bearings; it should be free to rotate but slightly stiff with no side play.

Examine the three sector teeth for signs of excessive wear.

Examine the bearing areas on the top and bottom of sector shaft for excessive wear. Examine the seal area at the bottom of the sector shaft for wear, damage or grooving.

Cover Assembly

Examine sector shaft bush for wear. If excessive, the cover must be replaced. Renew cover sealing ring.

Housing Assembly

Examine sector shaft bush for wear. Examine cylinder bore for damage, wear or scoring. If unserviceable, the housing must be replaced.

Renew sector shaft seal.

Check the condition of the high and low pressure pipe seats in the housing and cover assemblies. If worn, cracked or damaged, these can be renewed by tapping a suitable thread in the internal bore of the seat and inserting a setscrew with an attached nut and plain washer. Tighten the nut down against the housing case and withdraw the seat.

Fit a new seat by inserting in the housing and tapping home square with a soft drift.

Valve and Worm Assembly

Examine the three teflon rings on the valve sleeve for damage. The rings should be a loose fit in their grooves and their outer diameter should be free from cuts, scratches and similar blemishes. Replace any damaged rings.

Carry out the following examinations; if, during any of these checks, the condition of the valve and worm assembly proves unsatisfactory, the assembly must be replaced as a unit.

Examine the valve and worm ball bearing tracks for wear or damage. Ensure that there is no relative movement at the trim pin between valve sleeve and worm. Check that there is no wear in the torsion bar assembly pins by ensuring that there is no free movement between the input shaft and the worm.

Examine the needle bearing area towards the outer end of the shaft for damage or wear; similarly, examine the seal area.

Piston and Rack

(a) Examine the teflon ring for damage etc.
(b) Examine rack teeth for signs of undue wear.
(c) Examine back face of rack, that is, behind the teeth for signs of wear caused by the rack adjuster pad.

Valve Housing

Examine the bore for signs of wear or damage particularly on rubbing surfaces of teflon rings.

Examine the needle roller bearing for damage and replace if necessary. Renew the seal.

ASSEMBLING

Valve and Worm Assembly

It is important that the worm is centred in the gear housing to ensure the correct relationship between the ratio curve, the preload peak and the central position of the steering gear. During manufacture, the critical dimension of both the worm and housing is measured in special fixtures–this dimension is effectively the distance from the small bore race to the centre of the worm. The checking fixture shows the amount in thousands of an inch that the box is deep and also the amount that the worm is short. This error is etched on the worm and stamped on the box, hence, a worm which is .006 in. (.15mm.) short and a box which is .004 in. (.14mm.) deep will need a total of .010 in. (.25mm.) shims to bring the datum into the correct position, that is, simply add the two datum errors together to give the correct thickness of shims in "Thous".

Having determined and selected the correct number of shims, these should be placed in the bottom of the recess in the race housing.

Press the outer race of the small bearing into the recess on top of the shims.

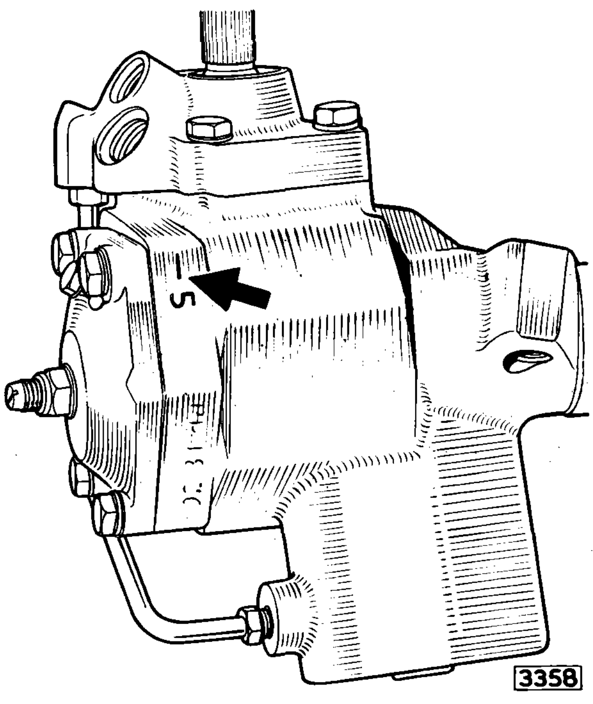


Fig. No. 46 Location of the depth reading of the box to facilitate the fitting of the valve shaft shims.

Fit the ball bearing assembly and cage (large) over the top of the worm. Take valve housing assembly and remove the large square sectioned "O" ring from the spigot. Fit the valve housing over the valve rotor, protecting the rotor seal from rotor splines with seal saver and check the input shaft for end-float. Remove the valve housing and add shims in sufficient quantities to provide a .0015 in. (.04mm.) gap between the valve housing and the gear housing.

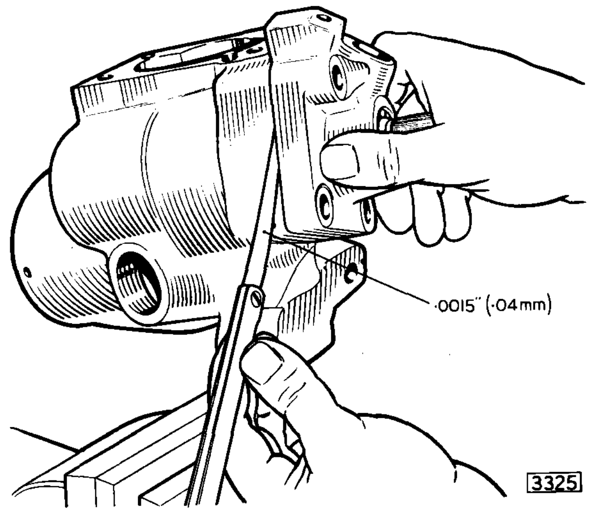


Fig. No. 47 Checking the gap between the valve and gear housings.

This gap should be measured whilst reasonable hand pressure is applied to the valve housing. Remove the valve housing and tighten down the four bolts.

The tightening down operation should increase the torque on the input shaft by 2 lb./in. (.02 kg.m.). If this torque increase is not achieved, then the shim pack must be altered accordingly.

Rack and Pinion Assembly

Always fit a new teflon piston ring with rubber "O" ring underneath it in the groove. Screw a long ½ in. UNC bolt into the tapped hole in the centre of the piston face. Press the piston into its cylinder bore with its teeth facing the sector shaft centre line. Push the piston into the bore until the piston top is 1.675 in. (42.5mm.) from the mouth of the cylinder. In order to obtain this dimension it is necessary to remove the end plate. Misalign the piston in the bore so that the back face of the rack is hard up against the gear casing adjacent to the rack adjuster screw bore.

Sector Shaft Assembly

Remove the self-locking nut from the top of the adjuster screw; screw the cover on to the adjuster screw as far as it will go. Fit seal saver on to the splined end of the sector shaft and insert the sector shaft into the housing with the roller positioned towards the middle of the worm.

Manoeuvre the sector shaft to engage the rack teeth and move the input shaft to and fro to engage the worm. Push the sector shaft fully home.

Note: Ensure that the square sectioned "O" ring seal is fully home in its recess before the top cover is bolted down.

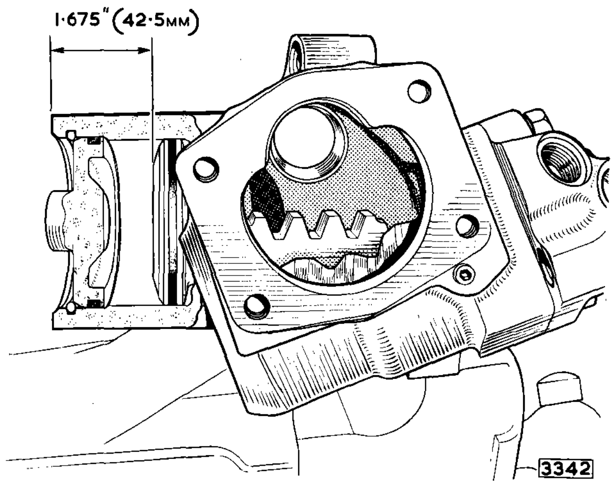


Fig. No. 48 Rack assembly.

Fit the four screws and spring washers and tighten, at the same time ensuring that the spigot of the top cover is hard up against its recess in the casing aperture. This is done by forcing the cover away from the worm bore, possibly having to tap with a hide mallet. Remove the long bolt from the piston face.

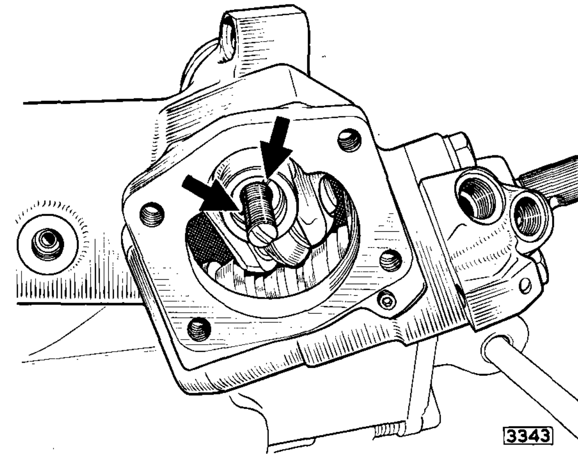


Fig. No. 49 Positioning the roller towards the middle of the cam. The arrows indicate the adjustment slots in the top of the sector shaft.

Rack Adjuster Screw

Position the pad in its seating in the rack adjusting screw. Fit a new seal into its recess and offer the assembly up into the screwed bore in the gear housing ensuring that the pad remains in position. The gear should be laid on its side and the assembly screwed up vertically. Fit rack screw loosely and fit locking screw into its tapped hole.

Cylinder Cover

Fit new seal to the cylinder cover and press into cylinder bore. Fit cylinder cover retaining clip.

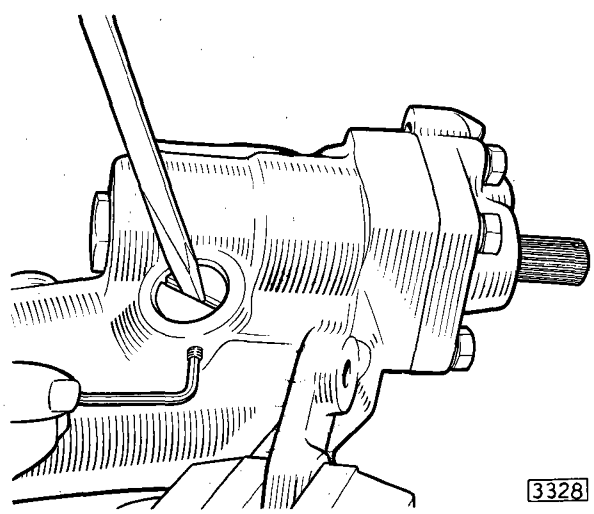


Fig. No. 50 Tightening the rack pad locking screw.

ADJUSTMENT OF REBUILT GEAR

Sector Shaft Adjustment

Using a torque wrench or just by "feel", turn the input shaft from lock to lock noting the position at which the wrench arm turns through centre. Note the torque felt one full turn from centre in either position.

Using a screwdriver, turn the adjusting bolt in a clockwise direction a little at a time, turning the input shaft through the centre position until an increase of 4 lb. in. over the torque previously noted is achieved at the centre position.

Hold the bolt stationary and lock in position with the nyloc nut.

Recheck the adjustment by turning from lock to lock. If adjustment is correct, there will be an increase of 4 lb. in. over that of a turn from centre in either direction.

Note: The rack adjusting screw should be slackened off during this operation or false readings will result.

Excessive preloading of the sector shaft assembly into the hour glass worm will result in possible poor return efficiency in the car and should, therefore, be avoided.

Rack Adjustment

Again, with the aid of a torque wrench, note the torque reading over centre of the gear (the position being found as under Sector Shaft Adjustment).

With the gear in this central position, screw in the rack adjustment screw firmly to ensure proper seating and then slacken off by about a quarter of a turn. Screw in a little at a time, turning the input shaft through centre until an increase of 4 lb. in. over the previous reading at centre torque is obtained. Rotate the input shaft from lock to lock and check that this adjustment has not produced an increase of torque at any other point in excess of 4 lb. in. If it has, the centre torque should be reduced until this maximum is achieved. Lock the rack adjusting screw by means of the small socket screw.

Finally, check the total torque reading for the whole assembly—this should not be more than 16 lb. in. at, or near, the centre position.

Remaining Parts

Fit the feed pipe assembly. Fit the drop arm to the sector shaft, noting the location mark as scribed on removal. Fit the washer and nut tightening the nut to a torque of 130 lb. ft.

Refitting

Refitting is the reverse of the removal procedure. Take care to ensure that connections are perfectly clean when refitting the low and high pressure hoses.

Refill the reservoir to the FULL mark on the dipstick with the recommended grade of automatic transmission fluid.

Bleed the system as follows: Release the hexagon plug in the steering unit top cover and start the engine. Close the plug when the air has been expelled.

With the engine running, turn the steering lock from lock to lock a few times to check for lumpiness. Check the fluid level in the reservoir. Top up if necessary.

REPLACEMENT OF EXTERNAL SEALS

Sector Shaft Seal

This seal can be replaced with the sector shaft in position but great care must be exercised to prevent damage to the seal from the shaft splines.

Input Shaft Seal

This seal cannot be replaced with the unit in the car.

Remove the steering unit. Remove the valve housing taking care not to mislay any of the large shims between the valve housing and the bearing. Withdraw the circlip and remove the seal.

REPLACEMENT OF INTERNAL SEALS

Dismantle the steering unit as detailed on page I.s.9. To replace worn or damaged teflon rings on the valve and worm proceed as follows:

Cut the old rings through with a sharp knife and remove from the groove.

Teflon rings have poor elastic properties: they can, however, be stretched and compressed if handled with care. To fit a ring into a particular groove, slide the ring on to the Valve Seal Expander (Tool No. J.32) and work it up to the large end. Slide the expander over the sleeve positioning the end cover over the groove. Push the ring over the end of the expander and into the groove.

Note: The expander will not fit over the sleeve when the rings are fitted to their grooves, so that it may be necessary to remove good rings in order to replace faulty ones.

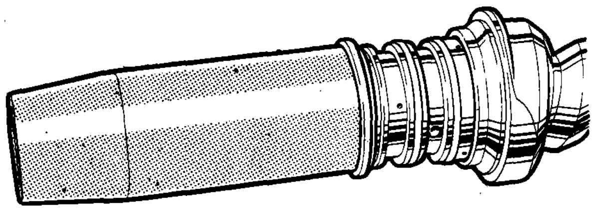


Fig. No. 51 Fitting a teflon ring using the valve seal expander (Tool No. J.32)

Having expanded the ring, it is necessary to compress it in the groove. This is done by gently working the sleeve assembly into the valve seal compressor (Tool No. J.33) starting with the end having the shallow taper and finishing with the other end which has the steep taper.

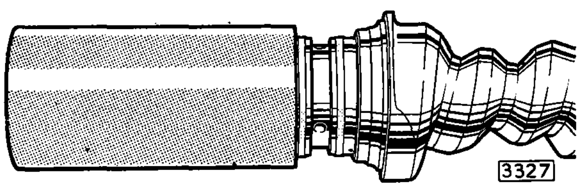


Fig. No. 52 The valve and teflon ring compressor (Tool No. J.33).

When the compressor is withdrawn, the rings should be fitting snugly in their grooves. They should be free to rotate, free from cuts and blemishes and have slight interference with the bore of the valve housing into which they fit when the steering unit is assembled.

Replacement of Piston Rings

If the telfon piston ring is found to be damaged or worn replace it with a new one. Cut the ring and remove from the groove; remove the rubber "O" ring which will be found underneath it. Expand a new rubber "O" ring and position it in the bottom of the groove. Take a new teflon ring and fit it into one side of the groove, working round the groove in both directions rather like fitting a tyre to a wheel rim. Care should be taken to avoid stretching the ring excessively.

Front Wheel Alignment

It is essential that the following instructions are observed when checking the front wheel alignment otherwise steering irregularities will result. It is important to note that the centre tie-rod is set to a fixed dimension of 16 7/16 in. (41.7mm.) and must not be used for setting the toe-in.

Inflate all tyres to the recommended pressures.

Each wheel must be individually adjusted by the outer tie-rod to give half the total toe-in of 0–1/8 in. (0–3.2mm.).

Set the front wheels in the straight ahead position. Centralise the steering unit as detailed on page I.s.6.

It is essential that the panhard rod setting is correct before checking toe-in. Details are given on page K.8.

Use light beam equipment to check toe-in.

Alternatively, if light-beam equipment is not available, use the following method.

Place a straight edge between the front and rear wheels on one side of the car. The straight edge should be positioned as high as possible on the wheels. Owing to the car having a wider track at the front, the straight edge will not contact the rear wheel. Adjust the track of the front wheel so that the gap between the straight edge and the front and rear wall of the rear tyre is equal. The front wheel will now be parallel with the rear wheel. Repeat the operation for the opposite side of the car.

Re-check the alignment after pushing the car forward until the wheels have turned half a revolution.

FAULT FINDING CHART

It is most important to check that the fluid reservoir is filled to the correct level before investigating any steering fault.

FAULT	POSSIBLE CAUSE	REMEDY
External oil leaks from steering box	Damage or wear to seals or incorrect tightening of unions and bolts	It is most important that the source of the leak be traced before any attempt is made to rectify. Once the leak is located, tighten the units or bolts or replace seals as necessary
External oil leaks from pump		Check that the reservoir is not overfilled
Leak at reservoir	"O" rings damaged or improperly fitted	Replace "O" rings
Oil leak at pressure fitting or filler cap	Cap not tightened sufficiently; damaged seals or hose seats	Tighten hoses or replace seats as necessary
Oil leak at pump shaft	Worm or damaged seals or damaged shaft	Replace components as necessary
Steering pulling to one side or other	Unbalanced front tyres. Faulty tyres. Incorrect tyre pressures. Steering gear out of trim	Balance front wheels. Replace tyres. Adjust to correct pressures. Replace worm and shaft if out of "trim"
Steering feels different to left and right but does not actually pull	Incorrectly centred worm and valve means that the worm and valve assembly will be on the wrong part of the ratio curve when driving straight ahead	Centralise as detailed on page I.s.6. It may be necessary to re-align the steering wheel after this operation
Heavy Steering (A) Heavy steering when driving	Low tyre pressures. Tightness or stiffness in the steering column and/or steering joints and suspension joints. Steering gear adjusted too tightly	Inflate. Grease or replace Re-adjust steering box as necessary
(B) Heavy steering when parking	Loose pump belt (nearly always accompanied by squealing). Insufficient pressure from pump due to restricted hoses or defective control valve. Insufficient pressure due to leaks in steering gear	Check belt and replace if necessary. Remove restriction or check control valve. Check for correct blow-off pressure. Confirm internal leaks by carrying out leak tests detailed on page I.s.7. If proved, remove gear and replace seals
Steering effort too light	Worn torsion bar pins or torsion bar broken	Remove steering box; remove worm and valve assembly; check that valve rotor has no free play relative to valve sleeve. Replace worm and valve assembly as necessary

FAULT FINDING CHART—continued

FAULT	POSSIBLE CAUSE	REMEDY
Unbalance of steering effort varying irregularly	Worn or loose trim screw Rotor sticking in valve sleeve	Replace worm and valve assembly. Remove steering box; remove worm and valve assembly. Hold worm in hand and rotate rotor to and fro feeling for sticking. Replace worm and valve assembly if necessary
Poor straight running	Incorrect tyre pressures. Incorrect toe-in. Steering gear requires adjustment:- (a) if there is lost motion in box (b) if the steering box has been over-adjusted	Inflate. Check wheel alignment. Adjust steering box as detailed on page I.s.13
Noise		
Pump	Belt loose indicated by squealing. Other pump noises are due to wear or damaged parts.	Check belt and replace as necessary. Replace pump
	Note that the pump pressure release valve is invariably noisy and will be heard when the steering is hard against the lock stops	No remedy for this noise
Steering gear	Hissing noises are present in all power steering systems. These do not effect the performance.	
	If the gear grunts when the steering is being turned, this could be due to a faulty damping ring in the valve assembly	Remove steering box and replace worm and valve assembly
Rattles		
General	Steering column joints	Check these first before investigating steering box.
A sharp light rattle when running straight ahead over smooth roads particularly noticeable at low speed. Can be heard and felt at steering wheel	Input shaft end-float. It should be possible to feel this—check as detailed on page I.s.6	Remove box; add shims between valve housing and bearing outer race as detailed on page I.s.11
As above but slightly muffled and caused by slightly rougher roads	Sector shaft end-float. This is due to clearance between the head of the adjuster screw and the sector shaft. Can be felt between shaft and gear housing when wheel is oscillated. Also, a pointer to this, the rattle will be more pronounced on left hand turns with a R.H. drive car and vice versa	Remove steering box; replace sector shaft

FAULT FINDING CHART—continued

FAULT	POSSIBLE CAUSE	REMEDY
Heavy muffled flutter which appears when running straight ahead over bumpy roads most easily detected at approx. 20 m.p.h. (32 k.p.h.). Also steering will probably thump or pulse when the steering wheel is turned rapidly	Clearance between piston rack and sector shaft teeth	Tighten as detailed on page I.s.12

SECTION J

FRONT SUSPENSION

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

INDEX *(continued)*

FRONT SUSPENSION

DESCRIPTION

The front suspension assemblies fitted to the 2.4 litre, 3.4 litre and 3.8 litre models are of similar construction but differ in respect of the coil springs.

The assembly comprises a fabricated pressed steel cross-member to which are attached the wishbones, stub axle carriers, coil springs and hydraulic dampers. The steering unit and idler assembly, together with the track rod and tie rods, are also attached to this cross-member.

The coil springs are housed in " turrets " at each end of the suspension cross-member and are retained at the lower ends by seat pans bolted to the lower wishbone.

Each coil spring is controlled by a telescopic direct acting hydraulic damper which is mounted in the centre of the spring. The top of the damper is attached directly to the cross-member turret ; the bottom of the damper is bolted to a mounting bracket which in turn is attached to the coil spring seat pan.

The upper wishbone levers are of pressed steel (later cars are fitted with forged wishbone levers) and are mounted at the fulcrum shaft end on rubber/steel bonded bushes. The outer ends of the wishbone levers are bolted to the upper wishbone ball joint which in turn is attached to the stub axle carrier.

The lower wishbone is a one piece forging, the inner ends of which are mounted on rubber/steel bonded bushes. The outer end of the lower wishbone is bolted to the lower ball joint which in turn is attached to the stub axle carrier.

The wheel hub is supported on two tapered roller bearings the inner races of which fit on a shaft located in a tapered hole bored in the stub axle carrier.

An anti-roll bar fitted between the two lower wishbones, is attached to the chassis side members by rubber insulated brackets.

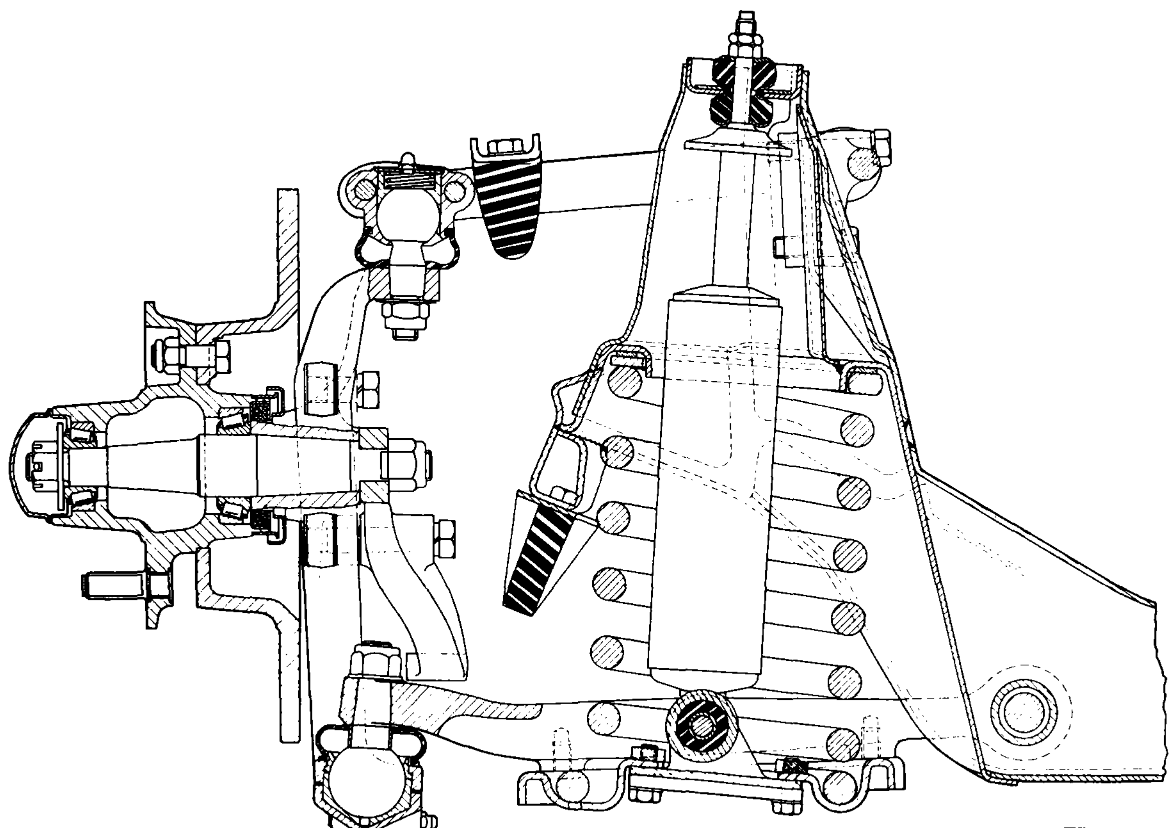


Fig. 1. Sectioned view of the Front Suspension Assembly.

FRONT SUSPENSION

The front suspension assembly is attached to the body underframe at four points. The two longitudinal members are attached to brackets at the front end of the chassis side members via flat rubber/steel bonded mountings. The transverse member is attached to the chassis side members via two " V " shaped rubber/steel bonded mountings.

DATA

Type	Independent—Coil spring
Dampers	Telescopic hydraulic
Castor angle	$0° \pm \frac{1}{2}°$
Camber angle	$\frac{1}{2}° \pm \frac{1}{2}°$ positive
Swivel inclination	$3\frac{1}{2}°$

	2.4 litre	3.4 and 3.8 litre
Coil springs—		
—no. of coils (approx.)	$6\frac{1}{2}$	$6\frac{1}{2}$
—diameter of bar	.63" (16 mm.)	.635" (16.13 mm.)

Note : Later production cars are fitted with forged upper wishbone levers in place of pressed steel levers.
The forged wishbone levers can be used to replace the pressed steel type provided the following parts are used:

Part Number		No. off per side
C.17176	Upper wishbone lever	1
C.17177	Upper wishbone lever	1
C.17171	Long bolt for ball joint	1
C.17172	Rebound stop rubbers	1
C.17170	Stop bolt	2
FG.106/X	Spring Washer	2

KEY TO FIG. 2

1. L.H. front suspension assembly
2. Front suspension cross member
3. Rubber plug
4. Rubber mounting
5. Bump stop
6. Rubber mounting
7. Upper wishbone
8. Upper wishbone lever
9. Upper wishbone lever
10. Fulcrum shaft
11. Distance washer
12. Rubber bush
13. Slotted nut
14. Special washer
15. Split pin
16. Ball joint
17. Distance piece
18. Shim
19. Rebound stop
20. Shim (camber angle)
21. Bolt (short)
22. Bolt (long)
23. Lower wishbone lever
24. Fulcrum shaft
25. Bush
26. Special washer
27. L.H. seat assembly
28. Front suspension coil
29. Packing ring
30. Bracket
31. Set screw
32. Tab washer
33. Tab washer
34. Front shock absorber
35. Rubber buffer
36. Inner washer
37. Outer washer
38. Spacing collar
39. Nut
40. Locknut
41. Ball pin
42. Spigot
43. Railko socket
44. Shim
45. Cap
46. Bolt
47. Tab washer
48. Grease nipple
49. Washer
50. Rubber gaiter
51. Plastic insert
52. Ring
53. Stub axle carrier
54. Water deflector
55. Stub axle shaft
56. Oil seal
57. Water deflector
58. Inner bearing
59. Outer bearing
60. L.H. front hub
61. Grease nipple
62. L.H. hub cap
63. L.H. hub cap
64. Tool for removing/fitting hub caps
65. L.H. tie rod lever
66. L.H. outer tie rod
67. Tie rod tube
68. Clamp
69. End assembly
70. Nut
71. Special washer
72. Anti-roll bar (heavy duty)
73. Bracket
74. Rubber bush
75. Keeper plate
76. Packing block
77. Link
78. Rubber bush
79. Rubber pad
80. Distance tube
81. Retaining washer
82. Steering box
83. Steering idler
84. Bracket
85. Idler spindle
86. Nut
87. Tab washer
88. "D" washer
89. End cap
90. Bearing
91. Bearing
92. Felt seal
93. Retainer
94. Abutment washer
95. Abutment ring
96. Idler lever
97. Nut
98. Washer
99. Set screw
100. Nut

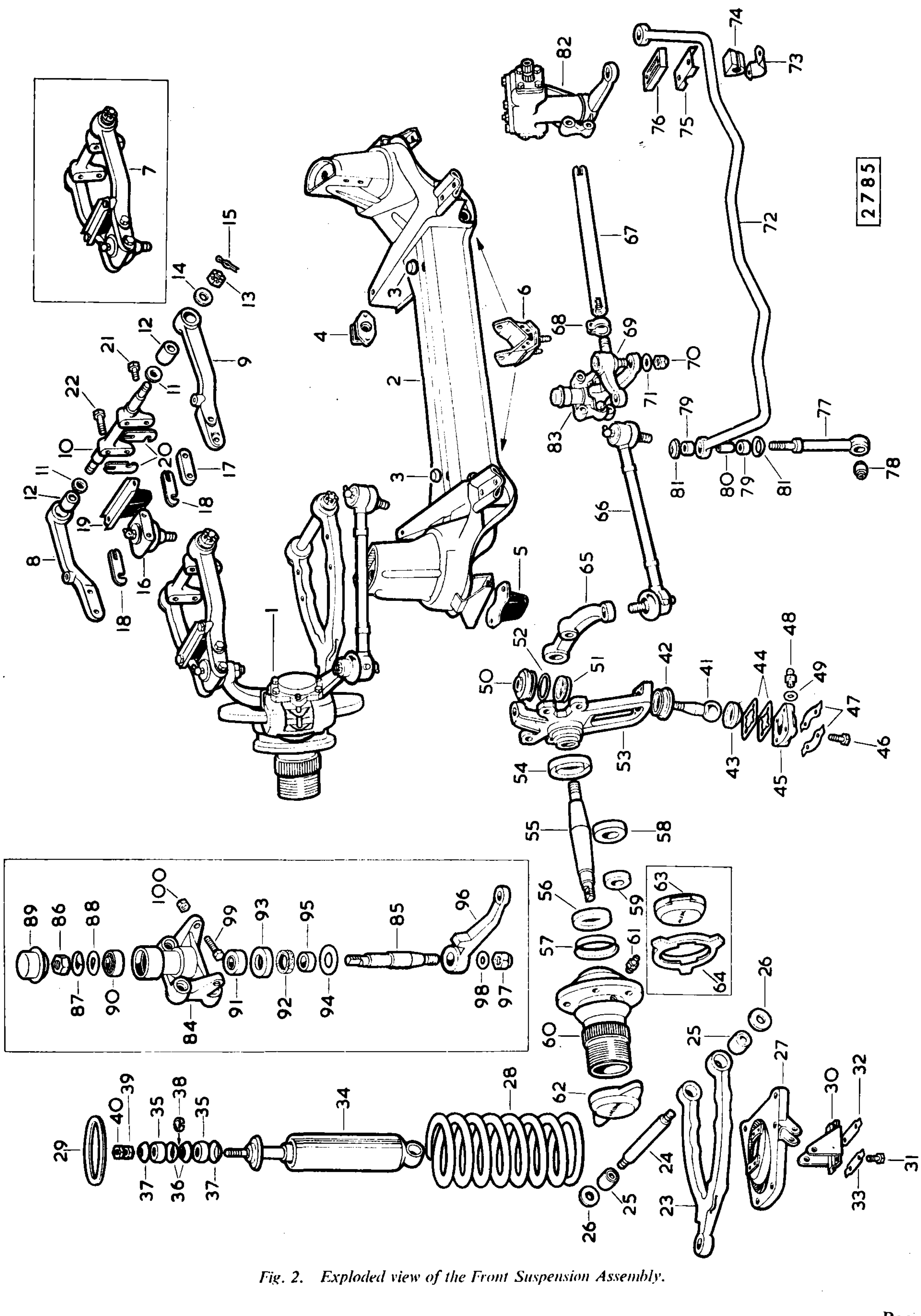


Fig. 2. Exploded view of the Front Suspension Assembly.

ROUTINE MAINTENANCE

The front suspension wishbone levers and anti-roll bar are supported in rubber bushes which do not require any attention ; the suspension coil springs also do not require maintenance attention.

Hydraulic Dampers

The hydraulic dampers are of the telescopic type and no replenishment with fluid is necessary or provided for.

EVERY 2,500 MILES (4,000 KM.)

Wheel Swivels

Lubricate the nipples (four per car) fitted to the top and bottom of the wheel swivels.

The nipples are accessible from underneath the front of the car.

Lack of lubrication at these points may cause stiff steering.

EVERY 10,000 MILES (16,000 KM.)

Wheel Bearings (Early Cars)

At the recommended intervals it is necessary to dismantle the front wheel hubs, thoroughly clean out the old grease and repack the taper roller bearings with one of the recommended high melting point greases.

Do NOT pack the hub with grease but apply a coating to the inside of the hub between the outer races of bearings. Apply a light coat of grease to the stub axle shaft ; do not fill the hub end cap.

When the hub has been refitted, adjust the bearing end float as described on page J.14.

Recommended Lubricants

	Mobil	Castrol	Shell	Esso	B.P.	Duckham	Regent Caltex/Texaco
Wheel Bearings	Mobilgrease MP	Castrolease LM	Retinax A	Esso Multi-Purpose Grease H	Energrease L.2	LB 10	Marfak All-Purpose

FRONT SUSPENSION ASSEMBLY

There are two methods of removing the front suspension assembly. One method entails supporting the body on stands and drawing out the assembly, less the road wheels, on a jack. This method is suitable when this operation is to be carried out on the floor.

The other method which can be carried out on a lift or on the floor entails removing the radiator and raising the body by means of lifting tackle attached to a cross-bar placed under the chassis side members ; the assembly is then rolled out from underneath the body on its road wheels.

Removal with car on floor

Jack up under the front suspension cross-member until the road wheels are clear of the ground. Remove the road wheels.

Support the weight of the car under the front jacking sockets by means of blocks not less than 16″ (40 cm.) in height, leaving the jack in position under the front cross-member.

Remove the two bolts securing the front suspension rear mountings to the chassis side members.

Remove the four nuts and bolts securing the front mountings to the brackets at the front ends of the chassis side members.

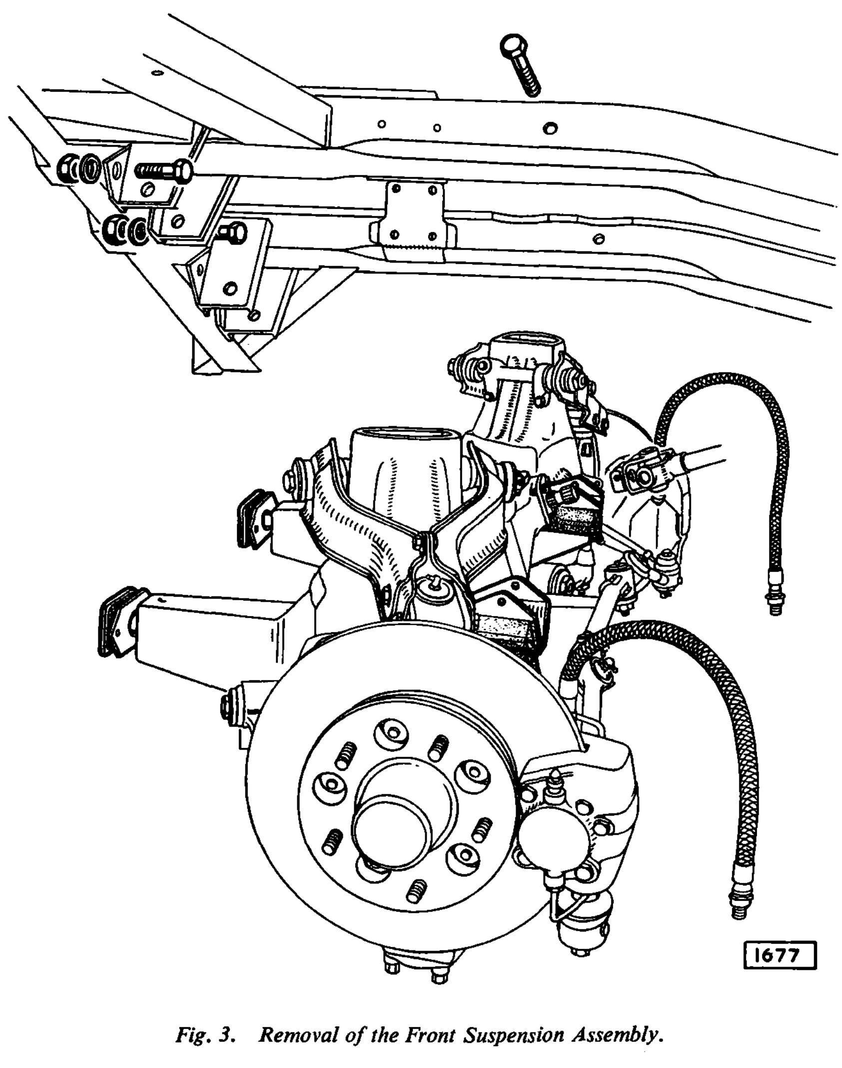


Fig. 3. Removal of the Front Suspension Assembly.

Disconnect the two anti-roll bar mountings from the body underframe members.

Disconnect the flexible brake hoses at the brackets on the body.

Remove the clamping bolt securing the steering column universal joint to the steering box shaft.

Lower the front suspension cross-member assembly on the jack until the front suspension assembly can be drawn forward.

Removal with car on lift

Mark the bonnet with the positions of the hinges to facilitate reassembly. Remove the four set bolts and washers attaching the bonnet to the hinges. Remove the bonnet.

Drain the radiator.

Remove the coil by unscrewing the two nuts and removing the shakeproof washers. Hang the coil on the side of the cylinder head.

On the 3.4 and 3.8 litre models remove the four nuts and washers attaching the fan cowl to the radiator. The drain tap remote control rod bracket at the top of the radiator should be removed. Hang the fan cowl on the fan.

Slacken off the clips and remove the top and bottom hoses from the radiator.

Withdraw the set bolts and remove the shakeproof and plain washers, spacers and mounting rubbers from the top radiator mountings.

From underneath the car, unscrew the self-locking nut and withdraw the plain washer, spacer and mounting rubber from each of the lower radiator mountings. Collect the other two mounting rubbers when the radiator has been removed.

Tilt the top of the radiator towards the cylinder head and withdraw the radiator from its mountings, taking care not to foul the fan.

Place a bar under the chassis side members and attach the lifting tackle to it.

Remove the two bolts securing the front suspension rear mountings to the chassis side members.

Remove the four nuts and bolts securing the front mountings to the brackets at the front ends of the chassis side members.

Disconnect the two anti-roll bar mountings from the body underframe members.

Disconnect the flexible brake hoses at the brackets on the body.

Remove the clamping bolt securing the steering column universal joint to the steering box shaft.

Raise the front of the car by means of the lifting tackle and roll out the front suspension assembly from underneath the body.

Refitting

When refitting the front suspension cross-member assembly ensure that the brake discs are in the straight ahead position and that the steering wheel spokes are in the three and nine o'clock positions with the horn ring at the bottom.

After the front suspension assembly has been completely refitted it will be necessary to " bleed " the brake hydraulic system as described in section L—" Brakes."

SUSPENSION BUMP STOP.

A progressive type of bump stop, which consists of a tapered rubber block, is attached to a welded bracket beneath each suspension cross-member turret.

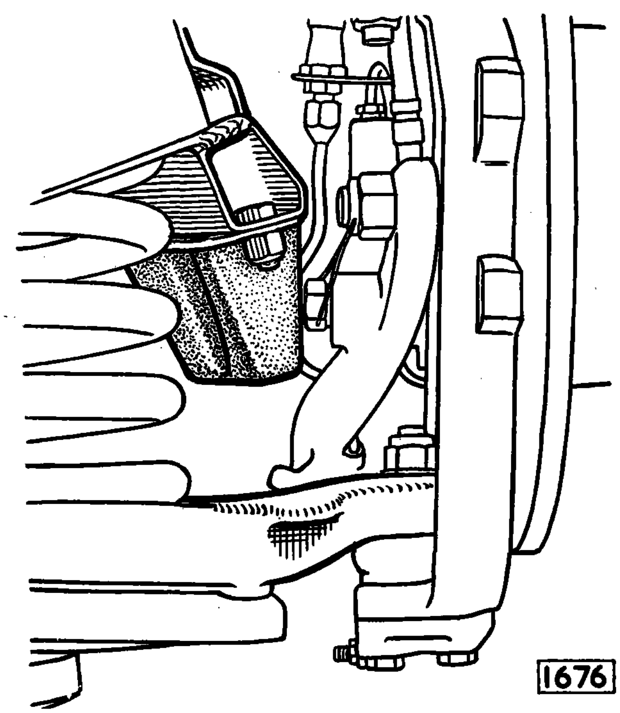


Fig. 4. The Bump Stop.

HYDRAULIC DAMPERS

The telescopic hydraulic dampers are of the sealed type with no provision for adjustment or " topping up " with fluid. Therefore, in the event of a damper being unserviceable a replacement must be fitted.

Before fitting a damper to a car it is advisable to carry out the following procedure to " bleed " any air from the pressure chamber that may have accumulated due to the damper having been stored in a horizontal position. Hold the damper in its normal vertical position with the shroud uppermost and make several short strokes (not extending more than halfway) until there is no lost motion and finish by extending the damper to its full length once or twice. Do not extend the damper fully until several short strokes have been made first. After the operation of "bleeding" the hydraulic dampers should be kept in their normal upright position until they are fitted to the car.

Removal

Removal of the hydraulic dampers will be facilitated if the wishbone levers are kept approximately horizontal, by either interposing a fibre packing piece between the upper wishbone levers and the cross-member turret (as illustrated in Fig. 6) or by placing a support under the lower wishbone and partly lowering the jack to compress the spring.

Jack up the car under the front suspension cross-member until the wheels are clear of the ground. Remove the road wheel.

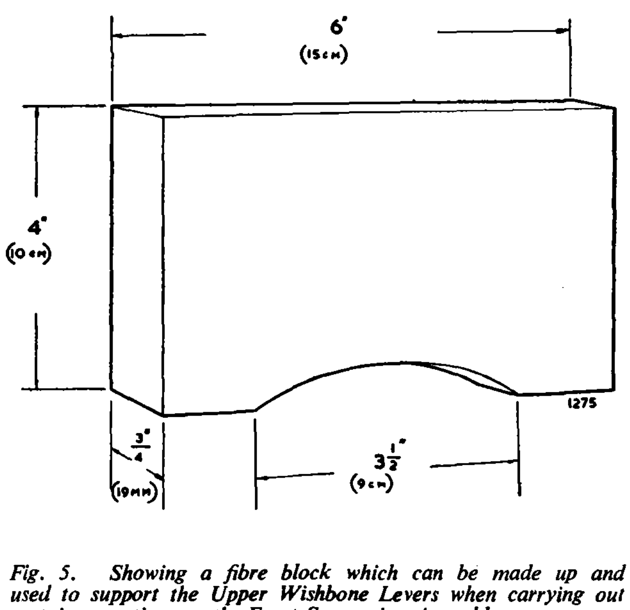


Fig. 5. Showing a fibre block which can be made up and used to support the Upper Wishbone Levers when carrying out certain operations on the Front Suspension Assembly.

Remove the locknut and nut from the top mounting of the damper and withdraw the outer washer, rubber buffer and inner washer ; note the difference between the inner and outer washer.
Note : A distance piece is fitted to the damper top mounting hole which may become displaced during the removal of the damper.

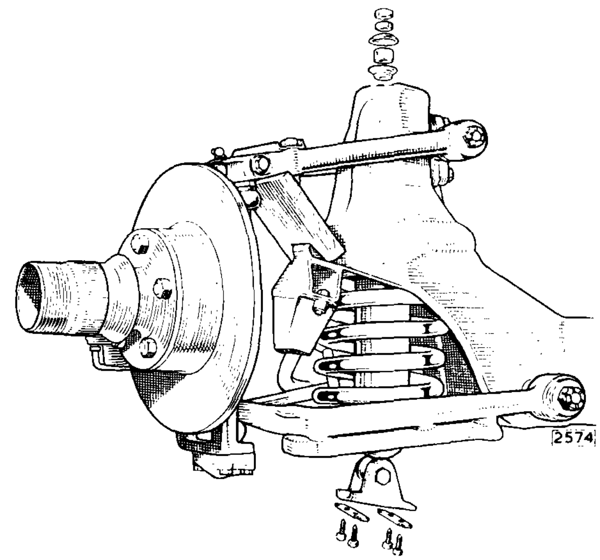


Fig. 6. Removal of the Hydraulic Damper.

Bend back the tab washers on the four set-bolts attaching the hydraulic damper mounting bracket to the coil spring seat. Remove the bolts when the damper can be withdrawn.

Refitting

Refitting is the reverse of the removal procedure. Ensure that the distance piece is in position in the top mounting hole in the cross-member turret.

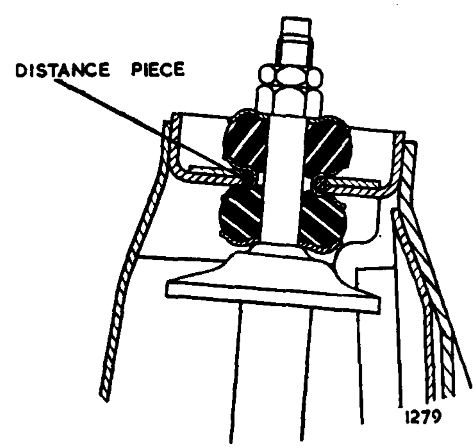


Fig. 7. When refitting an Hydraulic Damper ensure that the distance piece is in position.

COIL SPRINGS

The coil springs are marked with coloured paint strips (which may be covered by tape) to denote springs of the same static load. It is, therefore, important that the two front springs fitted to a car are of the same colour code.

The colour code also serves to distinguish the 2.4 litre spring from the 3.4 and 3.8 litre spring (see under "Coil Spring Packing Pieces").

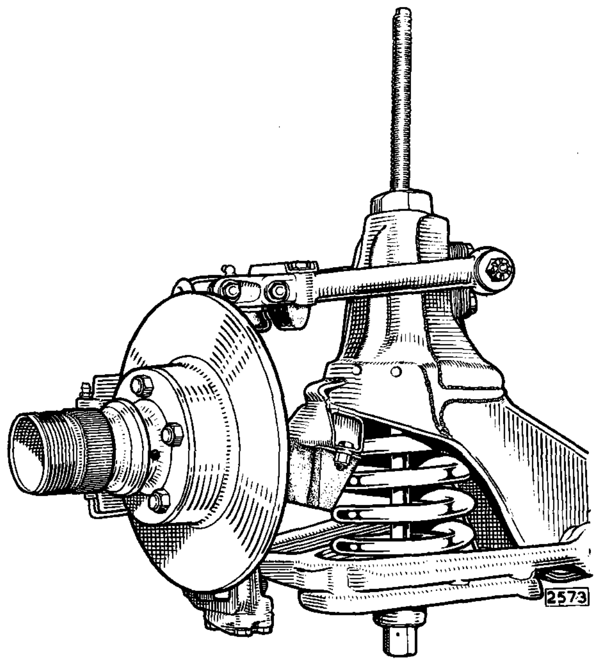


Fig. 8. Showing the compressor in position prior to the removal of the Coil Spring.

Removal

Remove the hydraulic damper as described on page J.11.

Insert a suitable coil spring compressor (Part number J.6B) through the centre of the spring and compress the spring sufficiently to relieve the load on the spring seat pan screws.

Detach the anti-roll bar link arm from the bracket welded to the rear edge of the spring pan by withdrawing the nut and bolt.

Remove the six setscrews and spring washers which secure the seat pan to the lower wishbone.

Release the coil spring compressor until the load of the spring is completely relieved. Completely unscrew the compressor when the coil spring and seat pan can be removed.

Note : On some cars a packing piece may be fitted at the top of the spring, see "Coil Spring Packing Pieces" overleaf.

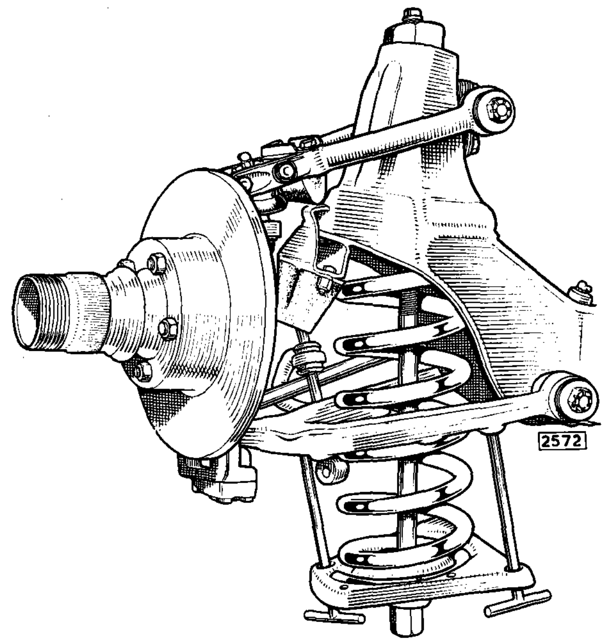


Fig. 9. Refitting the coil spring with a compressor ; the pilot studs facilitate alignment of the seat pan securing bolt holes.

Refitting

Refitting is the reverse of the removal procedure. Alignment of the seat pan holes with the tapped holes in the lower wishbone will be facilitated if 8" (20 cm.) long pilot studs (threaded $\frac{3}{8}$" U.N.F.) are fitted as illustrated in Fig. 9.

Coil Spring Packing Pieces

Packing pieces may be fitted above the coil springs of some cars, their purpose being to accommodate the manufacturing variations in the length of the springs which are graded into three groups and identified by a colour patch on its middle coil as previously mentioned.

Effective from the following chassis numbers :—

	R.H. Drive	L.H. Drive
2.4 litre model	100731	125269
3.4 litre model	150562	175292
3.8 litre model	200301	211041

the front suspension coil springs are increased in length by $\frac{1}{8}$" and the packing fitted above the spring reduced by $\frac{1}{8}$" (3.2 mm.).

Colour code of spring.	Thickness of packing. 2.4 litre	
	Up to above chassis Nos.	After above chassis Nos.
White	$\frac{3}{8}$" (9.5 mm.)	$\frac{1}{4}$" (6.4 mm.)
Blue	$\frac{1}{4}$" (6.4 mm.)	$\frac{1}{8}$" (3.2 mm.)
Green	$\frac{1}{8}$" (3.2 mm.)	None fitted.
	3.4 litre and 3.8 litre	
	Up to above chassis Nos.	After above chassis Nos.
Red	$\frac{3}{8}$" (9.5 mm.)	$\frac{1}{4}$" (6.4 mm.)
Yellow	$\frac{1}{4}$" (6.4 mm.)	$\frac{1}{8}$" (3.2 mm.)
Purple	$\frac{1}{8}$" (3.2 mm.)	None fitted

WHEEL HUBS

Removal

Firmly apply the handbrake, jack up the front of the car and remove the roadwheel.

Remove the caliper from the front stub axle carrier, noting the shims fitted at the mounting points for centralisation of the disc within the caliper.

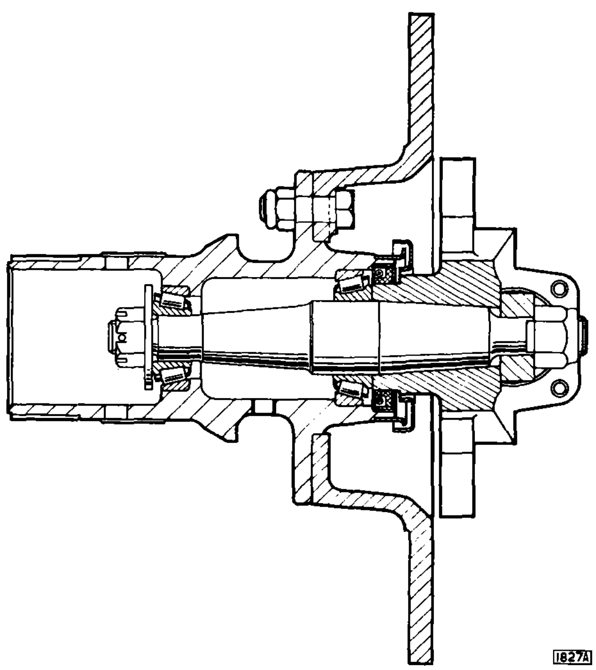


Fig. 10. Sectioned plan view of the disc brake hub arrangement.

Remove the split pin retaining the hub nut. On cars with disc wheels the split pin is accessible after prising off the end cap ; cars with wire spoke wheels are provided with holes in the side of the hub through which the split pin can be withdrawn.

Remove the slotted nut and plain washer from the end of the stub axle shaft. The hub can now be withdrawn by hand.

Dismantling

Extract the grease seal. Withdraw the inner races of the taper roller bearings. If new bearings are to be fitted the outer races can be drifted out, grooves being provided in the abutment shoulders in the hub.

Refitting

Refitting is the reverse of the removal procedure but it will be necessary to re-lubricate the bearings as detailed in " Routine Maintenance " at the beginning of this section and adjust the end float of the hub bearings as described under the next heading.

Refit the brake caliper, ensuring it is correctly aligned and bleed the brake hydraulic system as detailed in Section L " Braking System ".

Bearing end-float adjustment

The correct end-float of the wheel bearings is .003" to .005" (.07 mm. to .13 mm.). On cars with disc brakes it is particularly important that the end-float does not exceed .005" (.13 mm.) otherwise the brakes may tend to drag and not function correctly.

The wheel bearing end-float can be measured with a dial indicator gauge, mounted with the plunger against the end of the hub. If a gauge is not available proceed as follows :—

Tighten the hub nut until there is no end-float, that is when rotation of the hub feels slightly "sticky".
Slacken back the hub nut between one and two flats depending on the position of the split pin hole relative to the slots in the nut.

Temporarily attach the road wheel and check that the wheel spins freely.

If satisfactory, fit a new split pin and turn over the ends.

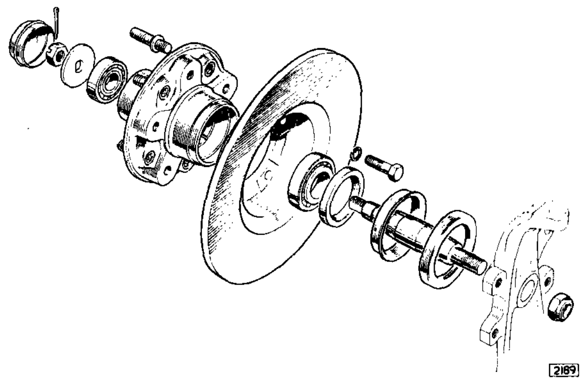


Fig. 11. Exploded view of the Wheel Hub.
(latest condition)

STUB AXLE CARRIERS

Removal

Jack up under the lower wishbone lever and remove the road wheel.

Remove the caliper from the stub axle carrier, noting the shims fitted at the mounting points, and remove the front wheel hub complete with disc brake as described on page 13.

Remove the self-locking nut and plain washer securing the upper ball joint to the stub axle carrier. Drift out the ball pin from the stub axle carrier in which it is a taper fit.

Remove the split pin, nut and plain washer which secure the ball joint to the lower wishbone.

Drift out the ball pin from the lower wishbone, in which it is a taper fit, when the stub axle carrier can be removed.

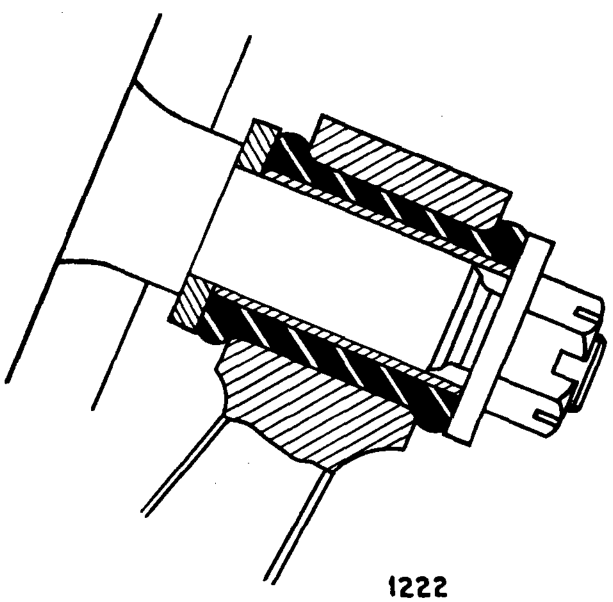


Fig. 12. Section through one of the lower wishbone rubber/ steel mounting bushes.

Refitting

Refitting is the reverse of the removal procedure.

LOWER WISHBONE

Removal

Remove the coil spring as described on page J.12.

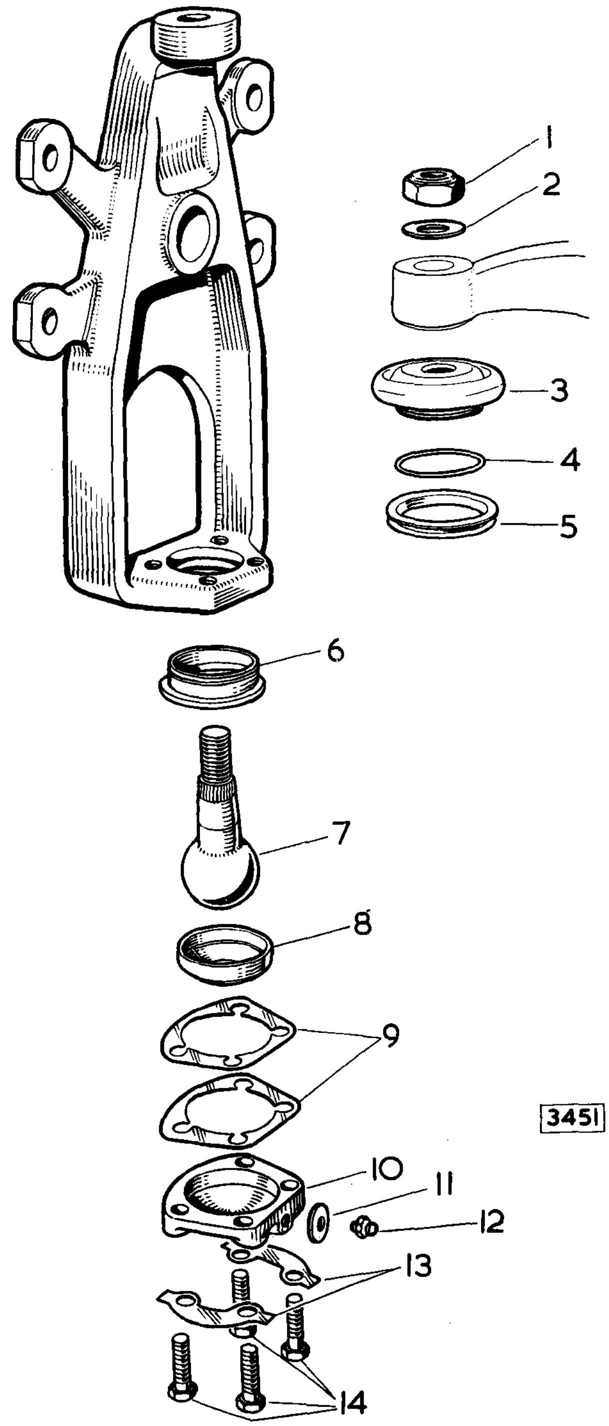


Fig. 13. Exploded view of the Lower Wishbone Ball Joint.
(latest condition)

Remove the stub axle carrier as described on page J.14.

Withdraw the split pin, slotted nut and washer from one end of the lower wishbone fulcrum shaft. The shaft can now be drifted out.

Fitting the Rubber/Steel Bushes

Drift out or press out the bush from the wishbone eye. Press the new bush into the eye, ensuring that the bush projects from each side by an equal amount. Fitting of the bush will be facilitated if a lubricant, made up of twelve parts of water to one part of liquid soap, is used.

Refitting

Refitting is the reverse of the removal procedure. When refitting the fulcrum shaft the car should be in the normal riding position before the units at each end of the shaft are fully tightened. Omitting to carry out this procedure will result in undue torsional loading of the rubber bushes with possible premature failure.

LOWER WISHBONE BALL JOINT

Removal

Remove the stub axle carrier complete with the lower wishbone ball joint as described on page J.14.

Dismantling

Release the wire clip and remove the rubber gaiter. Withdraw the retainer from the top of the ball pin.

Tap back the tab washers and unscrew the four setscrews securing the ball pin cap to the stub axle carrier.

Remove the cap, shims, ball pin socket, spigot and ball pin.

Later cars have a plastic ring securing the rubber gaiter to the ball pin spigot with a further insert between the ball pin spigot and gaiter.

Reassembling

Reassembling is the reverse of the dismantling procedure but, if necessary, re-shim the ball joint to obtain the correct clearance of .004″—.006″ (.10 mm.—.15 mm).

Note : Shims should not be removed to take up excessive wear in the ball pin and socket ; if these parts are badly worn, replacements should be fitted.

Adjustment of the ball joint

The correct clearance of the ball pin in its sockets is .004″—.006″ (.10 mm.—.15 mm.). Shims for adjustment of the ball joint are available in .002″ (.05 mm.) and .004″ (.10 mm.) thicknesses.

To adjust the ball pin clearance to the correct figure, remove shims one by one until, with ball cap fully tightened, the ball is tight in its sockets. Fit shims to the value of .004″—.006″ (.10 mm.—.15 mm.) which should enable the shank of the ball pin to be moved by hand.

Refitting

Refit the stub axle carrier complete with the lower wishbone ball joint as described on page J.15.

UPPER WISHBONE

Removal

Jack up under the lower wishbone and remove the road wheel.

Remove the two bolts, nuts and plain washers securing the ball joint to the upper wishbone levers. Note the relative positions of the packing piece and shims as these control the castor angle. Alternatively, remove the self-locking nut and drift out the ball joint from the stub axle carrier. Tie-up the stub axle carrier to the suspension cross-member so that the flexible brake hose does not become extended.

Remove the four set bolts which secure the upper wishbone fulcrum shaft to the suspension cross-member turret. Note the relative positions of the shims as these control the camber angle.

The upper wishbone assembly can now be removed.

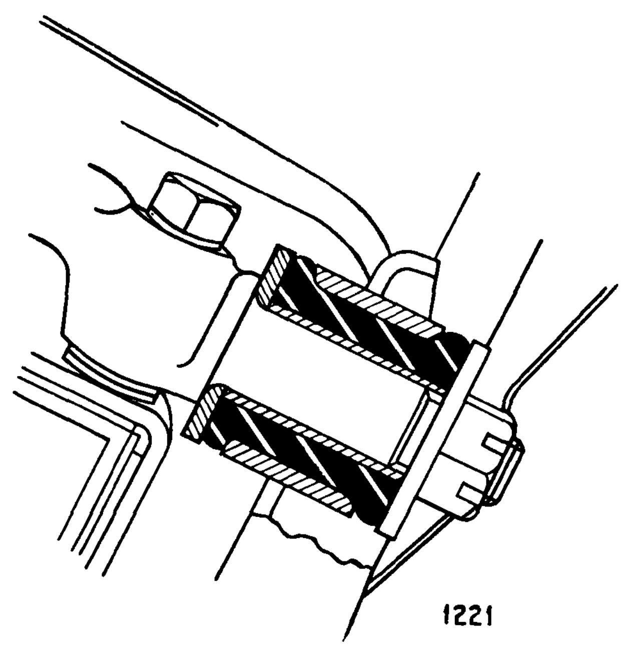


Fig. 14. Section through one of the upper wishbone rubber/steel mounting bushes.

Dismantling

Remove the nuts, bolts and distance pieces securing the rebound stop bracket to the upper wishbone levers.

Extract the split pin and remove the slotted nuts and plain washers which secure the wishbone levers to the fulcrum shaft. The wishbone levers can now be removed from the fulcrum shaft.

Fitting the Rubber/Steel Bushes

Drift out or press out the bush from the wishbone eye. Press the new bush into the eye, ensuring that the bush projects from each side by an equal amount. Fitting of the bush will be facilitated if a lubricant, made up of twelve parts of water to one part of liquid soap, is used.

Reassembling

The reassembly of the upper wishbone assembly is the reverse of the dismantling procedure but the slotted nuts securing the wishbone levers to the fulcrum shaft must not be tightened until the upper wishbone assembly has been refitted and the full weight of the car is on the suspension. Omitting to carry out the procedure will result in undue torsional loading of the rubber bushes with possible premature failure.

Refitting

Refitting is the reverse of the removal procedure.

UPPER WISHBONE BALL JOINT

The upper wishbone ball joint cannot be dismantled and, if worn, the complete assembly must be replaced.

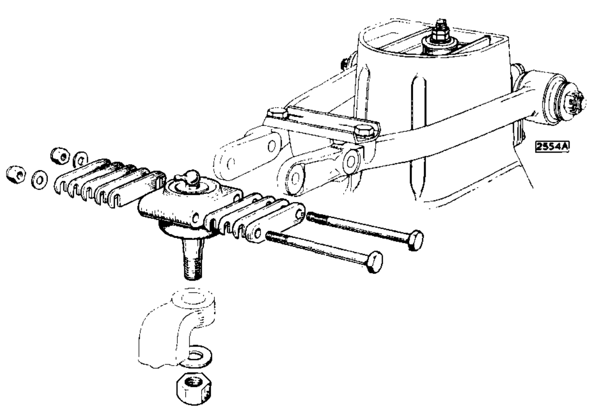


Fig. 15. Removal of the Upper Wishbone Ball Joint.

Removal

Jack up the car under the lower wishbone and remove the road wheel.

Remove the two bolts, nuts and plain washers securing the ball joint to the upper wishbone levers. Note the relative positions of the packing piece and shims as these control the castor angle.

Remove the self-locking nut and plain washer which secure the ball joint to the stub axle carrier.

The ball joint can now be drifted out of the stub axle carrier in which it is a taper fit.

Note : When carrying out the above operation do not allow the flexible brake hose to become extended ; tie up the stub axle carrier to the cross-member turret.

Refitting

Refitting is the reverse of the removal procedure. Ensure that the packing piece and shims are refitted in their original positions otherwise the castor angle will be upset.

CASTOR ANGLE ADJUSTMENT

Check that the car is full of petrol, oil and water. If not, additional weight must be added to compensate for, say, a low level of petrol (the weight of 10 gallons of petrol is approximately 80 lbs—36.0 kg.).

Ensure that the tyre pressures are correct and that the car is standing on a level surface.

Using an approved gauge, check the castor angle.

Castor Angle . . . . .$0° \pm \frac{1}{2}°$

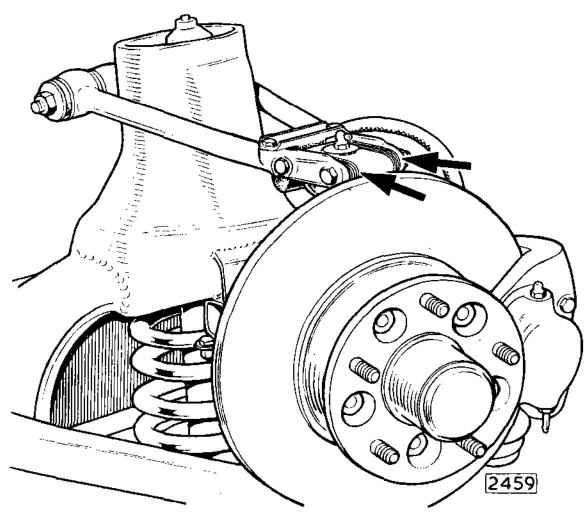


Fig. 16. The Castor Angle is adjusted by means of the shims and packing piece indicated by the arrows.

Note : The two front wheels must be within a $\frac{1}{2}°$ of each other.

Adjustment is effected by either transposing the shims from the rear of the upper wishbone ball joint to the front, or transposing the packing piece and shim(s).

To decrease negative castor or increase positive castor transpose shims from the rear to the front ; the holes in the shims are slotted and therefore it will only be necessary to slacken the two bolts securing the upper wishbone members to enable the shims to be removed.

To increase negative castor or decrease positive castor, transpose the packing piece and shims as necessary. As the holes in the packing piece are not slotted it will be necessary to remove the two bolts after first having placed a support under the brake disc or lower wishbone.

The shims are $\frac{1}{16}''$ (1.6 mm.) thick and it should be noted that $\frac{1}{16}''$ (1.6 mm.) of shimming will alter the castor angle by approximately $\frac{1}{4}°$.

The front of the car should be jacked up when turning the wheels from lock to lock during checking.

If any adjustment is made to the castor angle, the front wheel alignment should be checked and, if necessary, re-set.

Note : A packing piece and 8 shims must be always fitted between the wishbone levers and the upper ball joint ; their relative positions may, of course, not always be the same.

CAMBER ANGLE ADJUSTMENT

Check that the car is full of petrol, oil and water. If not, additional weight must be added to compensate for, say, a low level of petrol (the weight of 10 gallons of petrol is approximately 80 lbs.—36.0 kg.).

Ensure that the tyre pressures are correct and that the car is standing on a level surface.

Line up the front wheel being checked parallel to the centre line of the car. Using an approved gauge, check the camber angle. Rotate the wheel being checked through 180° and re-check.

Camber Angle . . . . $\frac{1}{2}° \pm \frac{1}{2}°$ positive.

Note : The two front wheels must be within a $\frac{1}{2}°$ of each other.

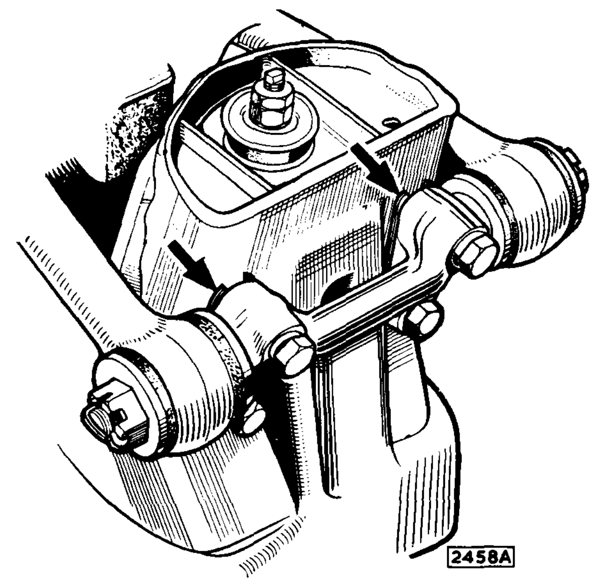


Fig. 17. The Camber Angle is adjusted by means of the shims indicated by the arrows. Remove or add an equal thickness of shims from each position.

Adjustment is effected by removing or adding shims at the front suspension top wishbone bracket ; the holes in the shims are slotted and it is therefore only necessary to slacken the setscrews securing the bracket to enable the shims to be removed. Inserting shims decreases positive camber ; removing shims decreases negative camber or increases positive camber. Remove or add an equal thickness of shims from each position, otherwise the castor angle will be affected. Shims for the adjustment of camber are available in $\frac{1}{32}''$ (.8 mm.) $\frac{3}{64}''$ (1.2 mm.) and $\frac{1}{16}''$ (1.6 mm.) thicknesses and it should be noted that $\frac{1}{16}''$ (1.6 mm.) of shimming will alter the camber angle by approximately $\frac{1}{4}°$.

Check the other front wheel in a similar manner. If any adjustment is made to the camber angle, the front wheel alignment should be checked and, if necessary, reset.

ANTI-ROLL BAR

Removal

Raise the car on a lift to enable work to be carried out underneath. Remove the four bolts (2) (Fig. 18) from the anti-roll bar support brackets (3) on the chassis side members.

Remove the self-locking nut (5) and remove the bolt (6) attaching the link arm (7) to the coil spring seat. Repeat for the other side.

To separate the anti-roll bar (1) from the link arms (7) remove the self-locking nuts (9), upper cup washers and rubbers (10 and 11). Care should be taken to replace the spacer (12) when refitting.

The anti-roll bar bracket rubbers (4) are split to enable them to be removed.

Fitting the Link Arm Bush.

Drift out or press out the bush from the link arm eye.

Press the new bush into the eye, ensuring that the bush projects from each side by an equal amount. Fitting of the bush will be facilitated if a lubricant, made up of twelve parts of water to one part of liquid soap, is used.

Refitting

Refitting is the reverse of the removal procedure. It is important when attaching the support brackets to the chassis side members, to have the full weight of the car on the road wheels.

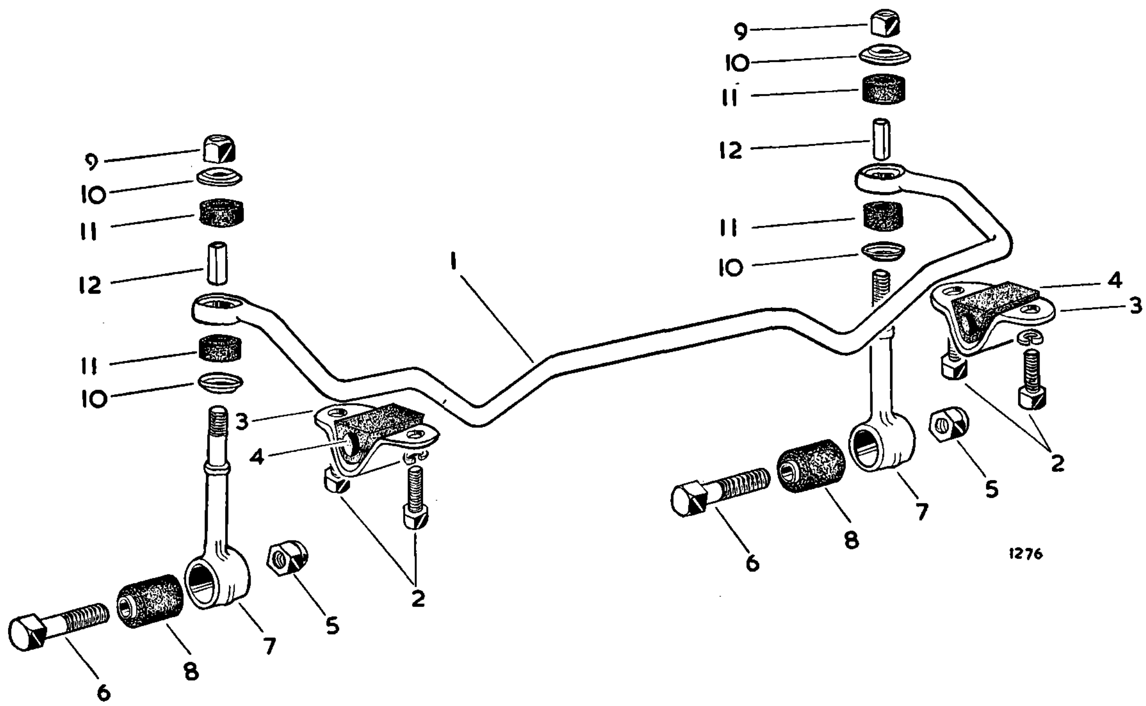


Fig. 18. Exploded view of the Anti-Roll Bar

ACCIDENTAL DAMAGE

The following dimensioned drawings are provided to assist in assessing accidental damage. A component suspected of being damaged should be removed from the car, cleaned off, and the dimensions checked and compared with those given in the appropriate illustration.

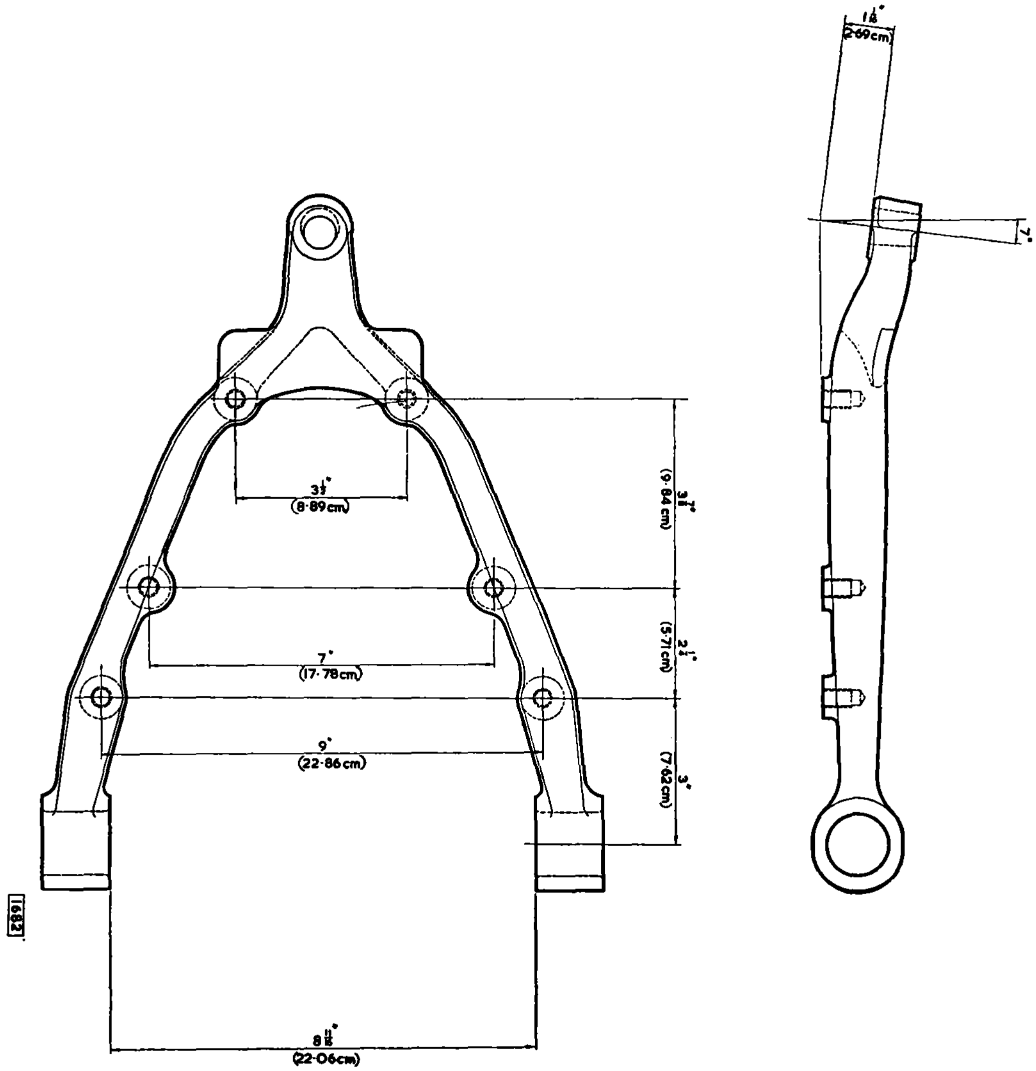


Fig. 19. Lower Wishbone.

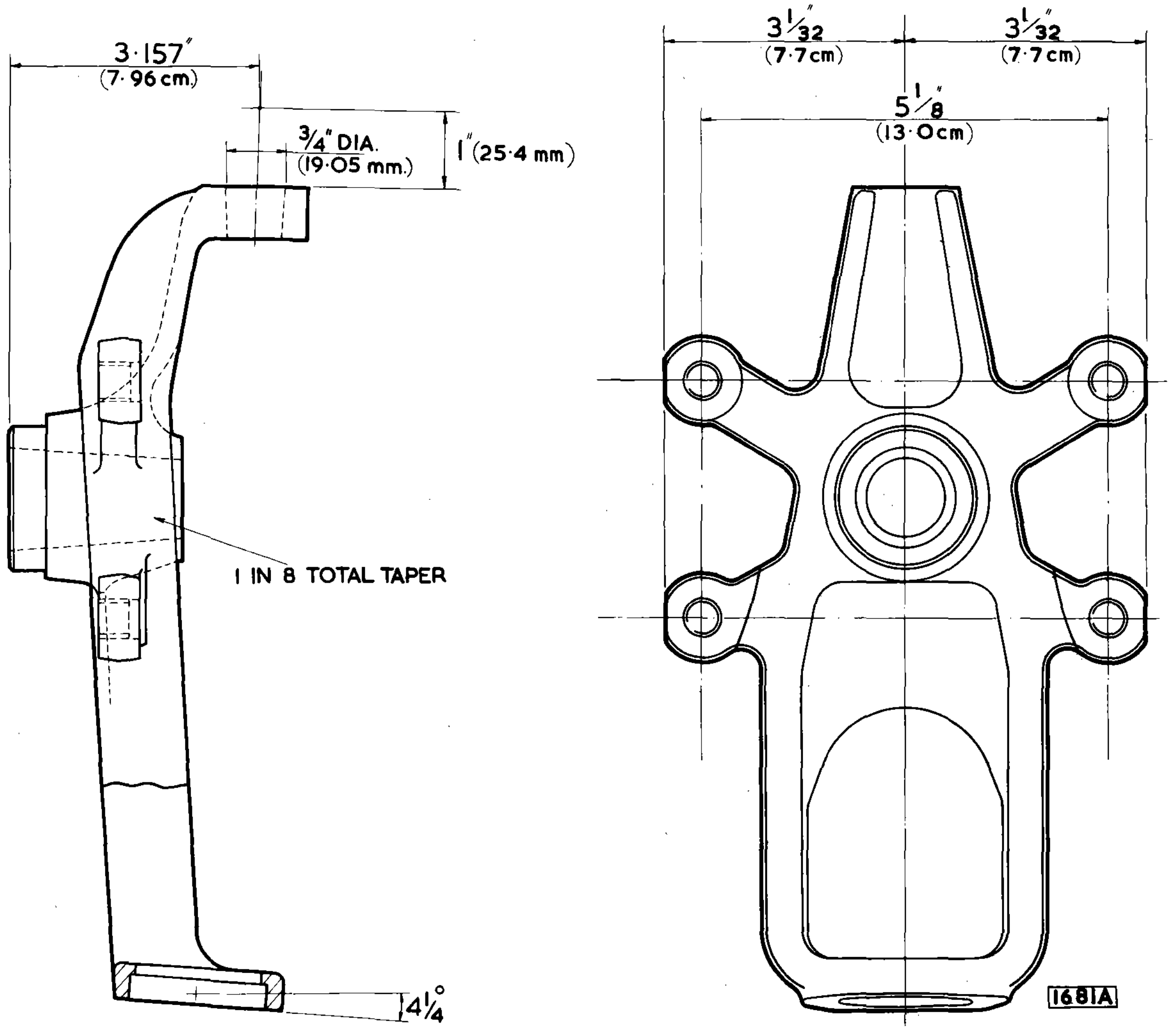


Fig. 20. Stub Axle Carrier.

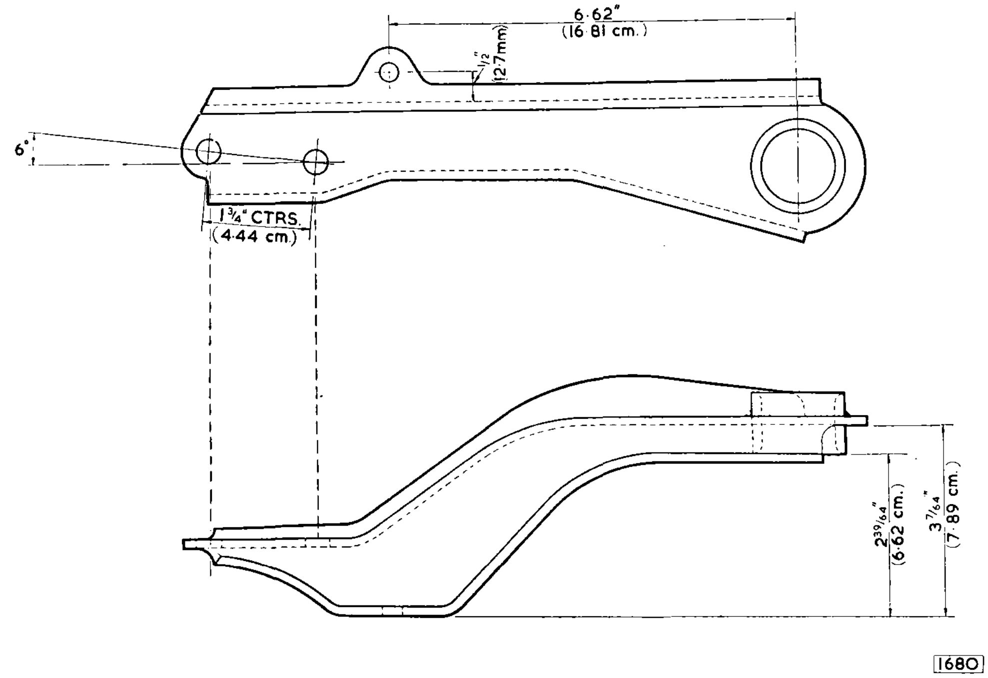


Fig. 21. Upper Wishbone Lever (Pressed steel type).

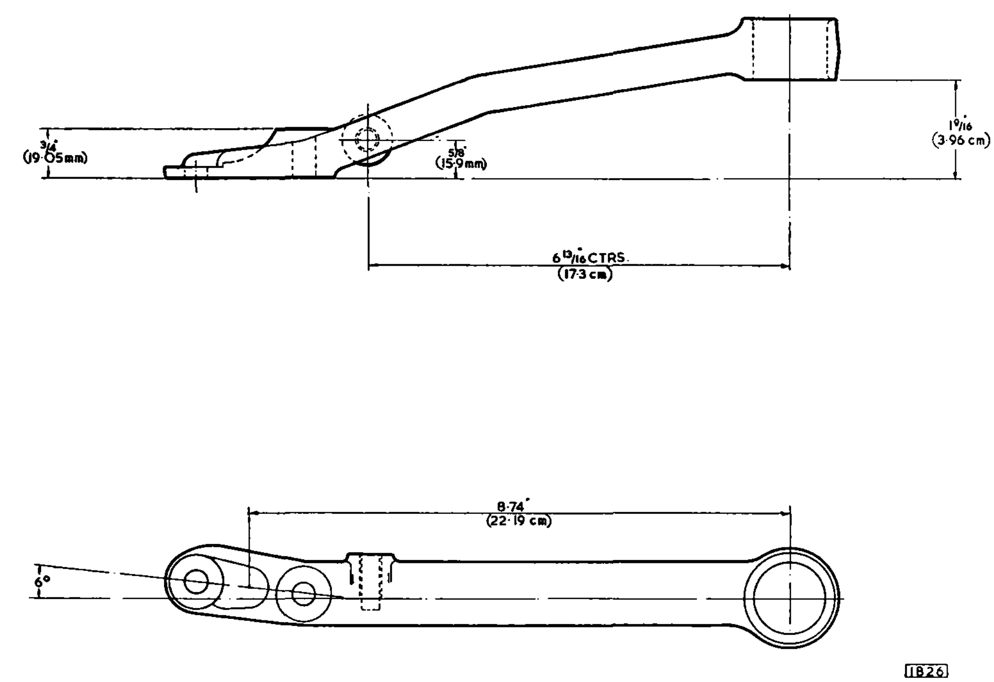


Fig. 22. Upper Wishbone Lever (Forged type).

AMENDMENTS

TO

SECTION J - FRONT SUSPENSION

Ref: page J.16, 17

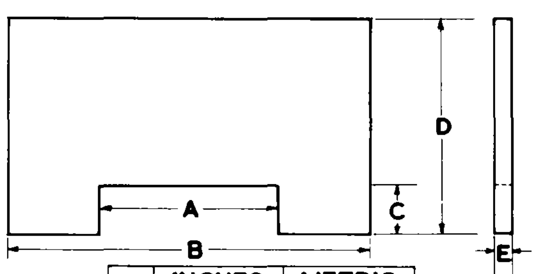
Castor and Camber Angle Adjustment

An improved method of checking the castor and camber angles has been developed which adopts the mid-laden position of the suspension as a datum line. This new procedure should be followed in preference to the instructions previously issued.

Before checking castor and chamber angles, examine all rubber/steel bushes for signs of deterioration or distortion. Check the upper and lower wishbone ball joints for excessive wear. Check the shock absorbers and mountings. Check that all tyres are inflated to correct pressures. Ensure that the car is standing on a perfectly level surface.

Make up two setting blocks and two links to the dimensions shown in Figs. 23 and 24. Lock the front suspension in the mid-laden position by compressing the suspension and placing the setting blocks under the upper wishbone adjacent to the pump stop rebound rubber and over the bracket welded to the bottom of the "turret" and shown in Fig. 23. Hook one end of the special link over the body bracket at the rear suspension; depress the body and place the opposite end of the link under the shock absorber mounting as shown in Fig. 24.

Check the castor and camber angles using an approved gauge, adjusting, if necessary, by the methods described on page J.17.



	INCHES	METRIC
A	2⅜"	6·03 CM
B	6"	15·2 CM
C	1"	25·4 MM
D	4⅜"	11·1 CM
E	¼"	6·3 MM

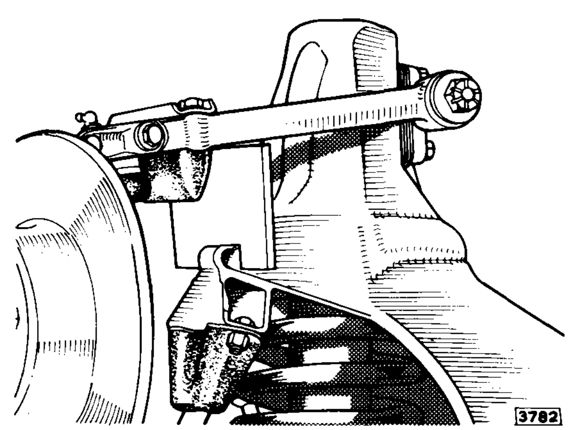
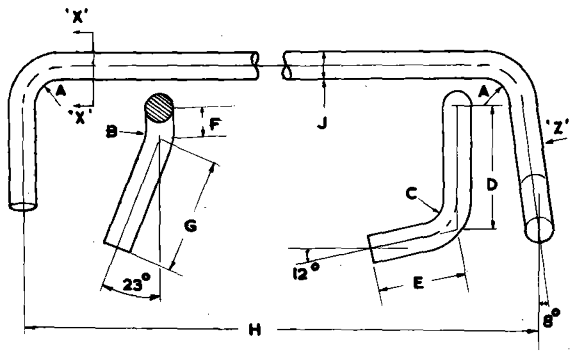


Fig. No. 23 Dimensions for setting block–front suspension.



	INCHES	METRIC
A	5/16" RAD	7·9 MM
B	1/2" RAD	12·7 MM
C	9/16" RAD	14·2 MM
D	1 15/16"	4·92 CM

	INCHES	METRIC
E	1 3/8"	3·5 CM
F	1/2"	12·7 MM
G	1 13/16"	4·6 CM
H	13 7/16"	34·14 CM
J	7/16" DIA	11·1 MM

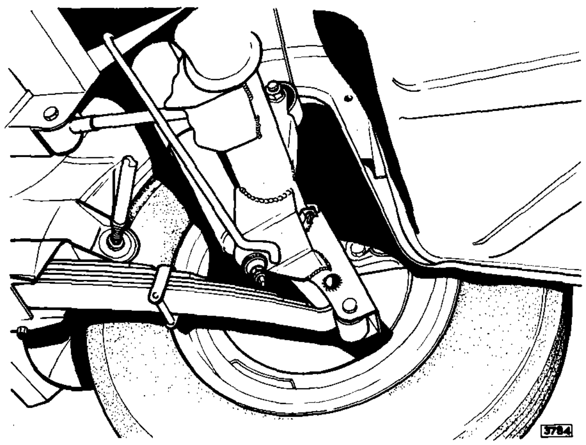


Fig. No. 24 Dimensions for setting link–rear suspension.

SUPPLEMENTARY INFORMATION TO SECTION J "FRONT SUSPENSION"

HUB BEARING WATER DEFLECTOR

A water deflector has been introduced on later cars to prevent the ingress of water. A service deflector (Part Number C.18642) can be fitted to earlier cars by carrying out the following procedure.

Remove the front roadwheel, brake caliper, brake disc and hub as described in Section J "Front Suspension".

Using a suitable extractor, withdraw the hub inner bearing inner race.

The water deflector should now be fitted to the unmachined portion of the stub axle carrier inboard of the oil seal track using an epoxy resin adhesive such as "Araldite".

The outer lip of the deflector faces outwards and thus shrouds the hub bearing and oil seal.

Replace the brake disc, hub and brake caliper. Set the hub bearing end float and bleed the braking system.

INTRODUCTION OF GREASE NIPPLES ON FRONT HUBS OF DISC WHEEL CARS

		Commencing Chassis No.	
		R.H. Drive	**L.H. Drive**
2.4 Litre Mark 2	..	117370	127486
3.4 Litre Mark 2	..	166075	179733
3.8 Litre Mark 2	..	232331	223447

Cars bearing the above chassis numbers and onwards have grease nipples fitted to the front hubs of disc wheel cars and it will no longer be necessary therefore, to dismantle the front hubs and re-pack with grease.

The front hubs should be lubricated with a grease gun every 10,000 miles (16,000 km.). Care should be taken not to over-lubricate the hubs causing the seals to "blow". A bleed hole is provided in the end of the dust cap to indicate when sufficient lubricant has been applied.

SECTION K

REAR SUSPENSION

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

REAR SUSPENSION

DESCRIPTION

The rear springs are of the semi-elliptic cantilever type with rubber inserts between the ends of the spring leaves. At the rear end of the spring an eye is formed into which fits a rubber/steel bonded bush ; the spring eye is bolted to a bracket welded to the rear axle tube. The front end of the spring carries a circular rubber pad which bears directly on to an inclined plate attached to the chassis side member. The centre of the spring is fitted with rubber pads top and bottom which are clamped between plates in the box section at the rear of the chassis side member.

Torque arms with large rubber/steel bonded bushes at each end are fitted between brackets welded to the top of the rear axle and to a body cross-member at the back of the rear seat panel.

Lateral location of the suspension is by means of a rubber mounted panhard rod fitted between brackets on the rear axle and the right hand chassis side member.

Damping of the rear suspension is by telescopic hydraulic dampers located between brackets on the rear axle and the front of the luggage compartment floor. The dampers incorporate the bump and rebound stops which limit the movement of the rear suspension.

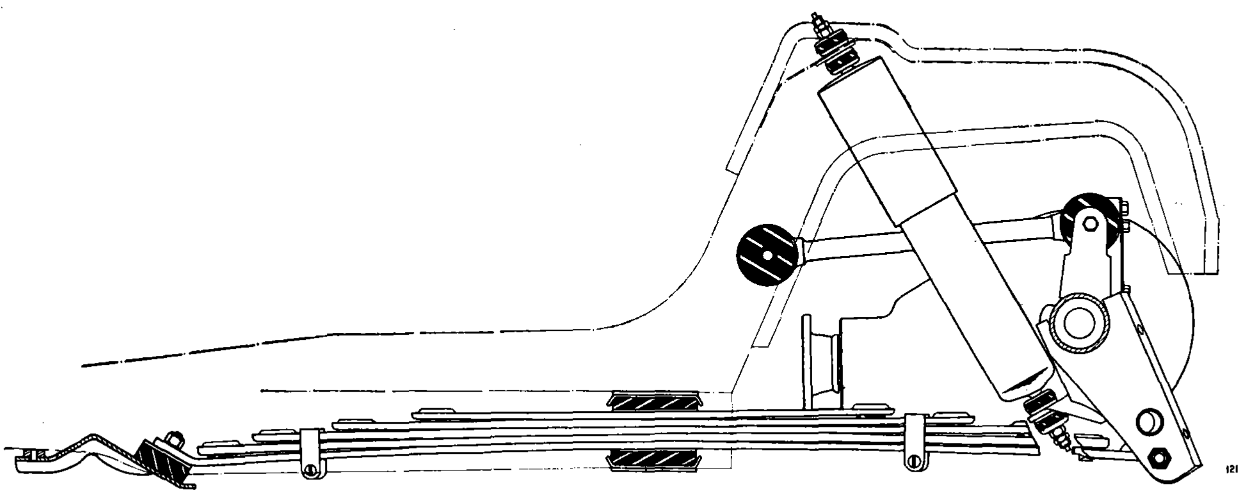


Fig. 1. Rear suspension arrangement.

DATA

Number of leaves	5
Width of leaves	2¼″ (57 mm.)
Thickness of leaves	
—bottom three	9/32″ (7 mm.)
—top two	¼″ (6.3 mm.)
—total thickness	1.11/32″ (34 mm.)
Diameter of spring eye	1″ (25.4 mm.)
Free Camber (see Fig. 2)	3.45″ to 3.7″ (87.5 to 94 mm.)

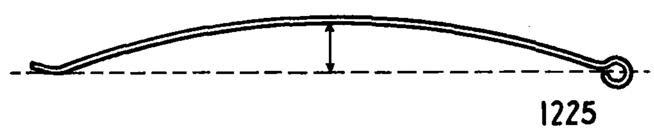


Fig. 2. Method of measuring free camber.

ROUTINE MAINTENANCE

EVERY 5,000 MILES (8,000 KM.)

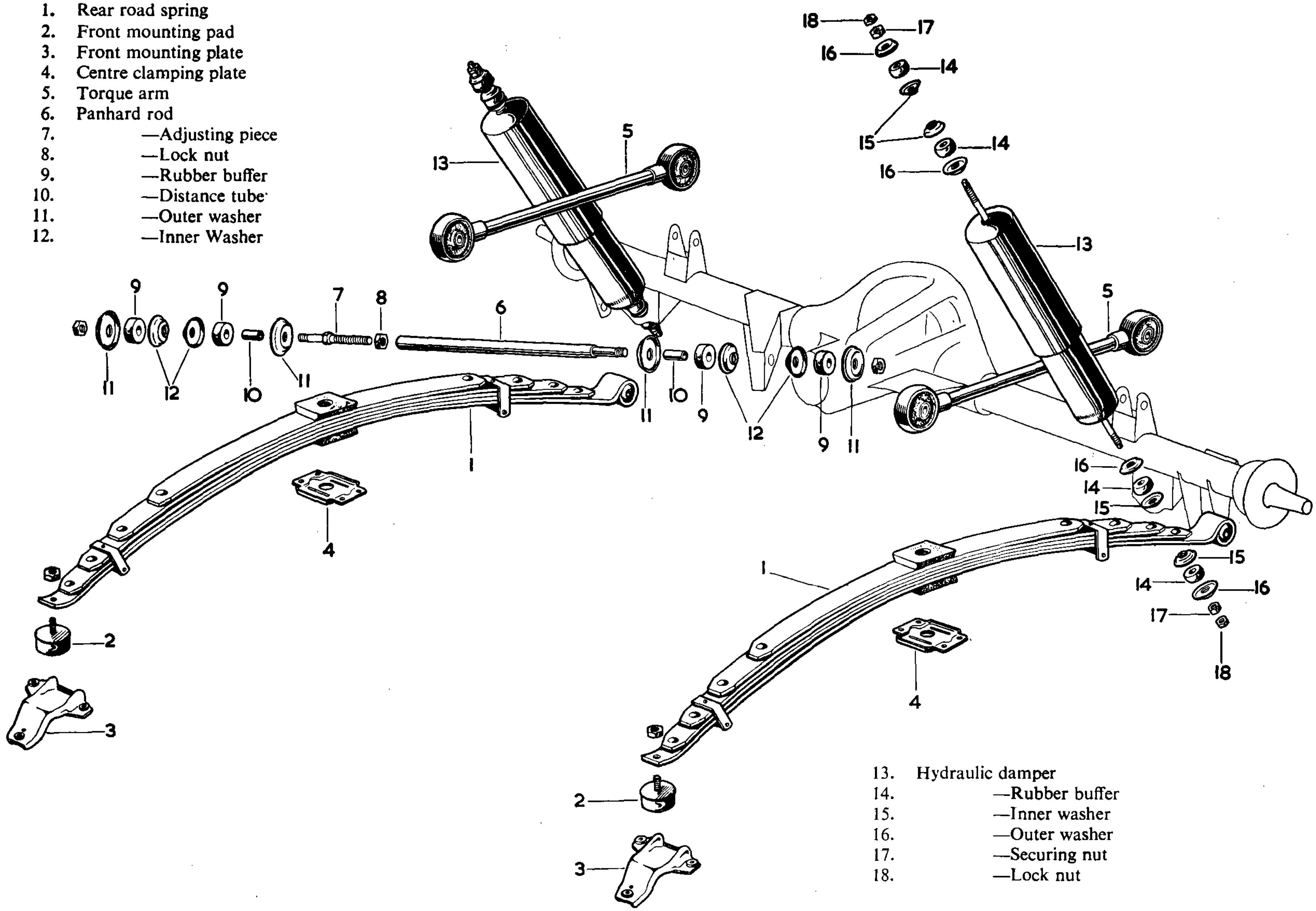
Rear Springs

Spray the rear spring leaves sparingly with penetrating oil keeping the oil away from the rubber mountings at the ends and centre of each spring.

Hydraulic Dampers

The hydraulic dampers are of the sealed type and no replenishment with fluid is necessary or provided for.

1. Rear road spring
2. Front mounting pad
3. Front mounting plate
4. Centre clamping plate
5. Torque arm
6. Panhard rod
7. —Adjusting piece
8. —Lock nut
9. —Rubber buffer
10. —Distance tube
11. —Outer washer
12. —Inner Washer



13. Hydraulic damper
14. —Rubber buffer
15. —Inner washer
16. —Outer washer
17. —Securing nut
18. —Lock nut

Fig. 3. Exploded view of rear suspension.

REAR SPRINGS

The rear road springs are rubber mounted at the front, centre and rear. When the springs are removed for any reason they should be examined for deterioration of the rubber mountings and replacement parts fitted if necessary.

When refitting the rear springs or torque arms, final tightening of the bolts securing the rubber/steel bonded bushes must be carried out with the car in its normal riding position, that is, with the full weight on the suspension. Omitting to carry out this procedure will result in undue torsional loading of the rubber bushes with possible premature failure.

Removal

Jack up the car under the rear axle and lower on to a stand placed under the chassis side member forward of the front mounting point of the rear spring. Insert a suitable wooden block between the body and the stand to distribute the load.

Place a bottle jack under the spring eye. Raise the jack to relieve the spring pressure on the centre mounting clamp plate. Detach the centre mounting clamp plate by removing the four nuts and bolts. Unscrew the nut and drift out the spring eye bolt and lower jack. The rear spring can now be withdrawn from the front mounting plate.

Dismantling

File off the peened over ends of the two spring clip setscrews. Hold the spring in a vice to compress the spring leaves.

Unscrew the spring clip setscrews and collect the distance pieces. Remove the nut and plain washer from the centre bolt. Drift out the centre bolt and detach the two rubber mountings ; collect the spacing washer from the recess in the main leaf.

Release the vice and separate the spring leaves ; collect the rubber inserts.

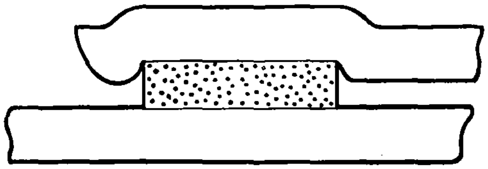


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Fig. 4. Section through the end of a spring leaf showing the rubber insert.

Assembling

Assembling is the reverse of the dismantling procedure. Fit new setscrews to the spring clips, tighten fully and peen over the ends.

Refitting

Offer up the front end of the spring to the front mounting plate. Align the holes in the spring eye bush with the hole in the rear axle bracket. Fit the bolt but do not tighten nut. With a jack under the spring eye raise the rear spring until the centre mounting clamp plate can be fitted. With the full weight of the car on the road wheels tighten the spring eye bolt nut.

CENTRE MOUNTING RUBBERS

The centre mounting rubbers are bonded to plates which are attached to the top and bottom of the spring by the centre bolt.

Removal

Remove the rear spring as described above.

Hold the rear spring in a vice as close to the centre mounting rubbers as possible. Remove the nut and plain washer from the centre bolt. Drift out the centre bolt from the spring leaves when the two mounting rubbers can be detached from the spring. Collect the spacing washer from the recess in the main leaf.

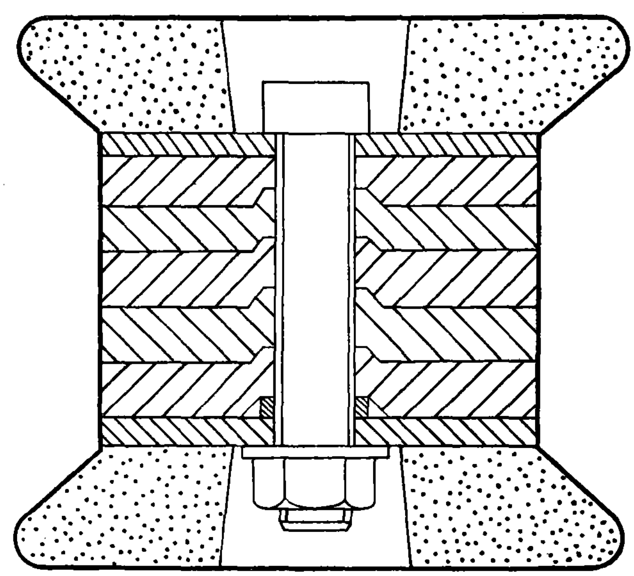

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Fig. 5. Section through the spring centre bolt.

Refitting

Replace the rubber mountings at the top and bottom of the spring with the spacing washer interposed between the main leaf and the lower mounting. Refit the centre bolt, plain washer and nut ; tighten securely.

FRONT MOUNTING RUBBERS

Removal

Remove the rear road spring as described above. Unscrew the self-locking nut when the rubber mounting can be detached from the main leaf.

Refitting

Refitting is the reverse of the removal procedure.

TORQUE ARMS

Removal

Raise the car on a lift so that work can be carried out underneath the car.

Unscrew the self-locking nuts from the bolts securing the torque arms to the brackets on the rear axle and body ; remove the plain washers. Drift out the bolts and remove the torque arms.

Refitting

Refitting is the reverse of the removal procedure but the securing bolt nuts must only be tightened when the full weight of the car is on the road wheels.

SPRING EYE BUSH

Removal

Remove the rear road spring as described above.

Drift out or press out the rubber/steel bonded bush from the spring eye.

Refitting

Press the new bush into the spring eye ensuring that the bush projects from each side of the spring by an equal amount.

HYDRAULIC DAMPERS

The telescopic hydraulic dampers are of the sealed type with no provision for adjustment or " topping up " with fluid. Therefore, in the event of a damper being unserviceable a replacement unit must be fitted.

Before fitting a damper to a car it is advisable to carry out the following procedure to " bleed " any air from the pressure chamber that may have accumulated due to the damper having been stored in a horizontal position. Hold the damper in its normal vertical position with the shroud uppermost and make several short strokes (not extending more than halfway) until there is no lost motion and finish by extending the damper to its full length once or twice. Do not extend the damper fully until several short strokes have been made first. After the operation of "bleeding" the hydraulic dampers should be kept in their normal upright position until they are fitted to the car.

Removal

Open the luggage compartment lid and remove the floor covering when the top attachments of the hydraulic dampers will be visible. Remove the two nuts, inner and outer washers and rubber buffer from the top of the damper.

Raise the car on a lift so that work can be carried out underneath the car.

Remove the two nuts, the inner and outer washers and the rubber buffer from the damper attachment bracket on the rear axle.

Compress the hydraulic damper until it can be removed from its mountings and collect the remaining washers and rubber buffers.

Refitting

Refitting is the reverse of removal procedure.

PANHARD ROD

Removal

Raise the car on a lift so that work can be carried out underneath the car. Remove the securing nut at each end of the panhard rod and withdraw the rubber buffers and washers. Loosen the lock nut and screw along to the end of the threaded adjusting piece. Screw the adjusting piece into the panhard rod tube by means of the flats provided until the panhard rod can be disengaged from its mounting brackets.

Refitting

Screw the adjusting piece into the panhard rod tube. Fit one rubber buffer with a distance piece and inner and outer washers at each end of the panhard rod. Offer up the panhard rod to its mounting brackets and screw out the adjusting piece until the rod is retained in its brackets.

Ensure that the full weight of the car is on the wheels.

Fit the inner washer, rubber buffer and outer washer to the bracket at the rear axle end ; fit the nut but do not tighten fully.

Fit the inner washer, rubber buffer and outer washer at the body bracket end ; hold the adjusting piece securely with a spanner on the flats provided and tighten the securing nut.

Adjustment

Place a straight edge across one rear tyre and check the distance to the flange of the chassis side member at the point at which the rear spring centre clamping plate is bolted ; repeat for the other side. The point of the chassis side member flange at which the dimension should be taken is between the two bolts which secure the rear spring centre clamping plate.

The dimension at each side (A, Fig. 6) must be the same. If they are not, adjust the length of the panhard rod until the two dimensions are equal by rotating the panhard rod tube with a pair of grips. Fully tighten the securing nut at the rear axle bracket end and re-check the adjustment. Finally, tighten the nut locking the adjusting piece to the panhard rod tube.

Note: The rear tyres must be of the same type and set at the same pressure when carrying out this check.

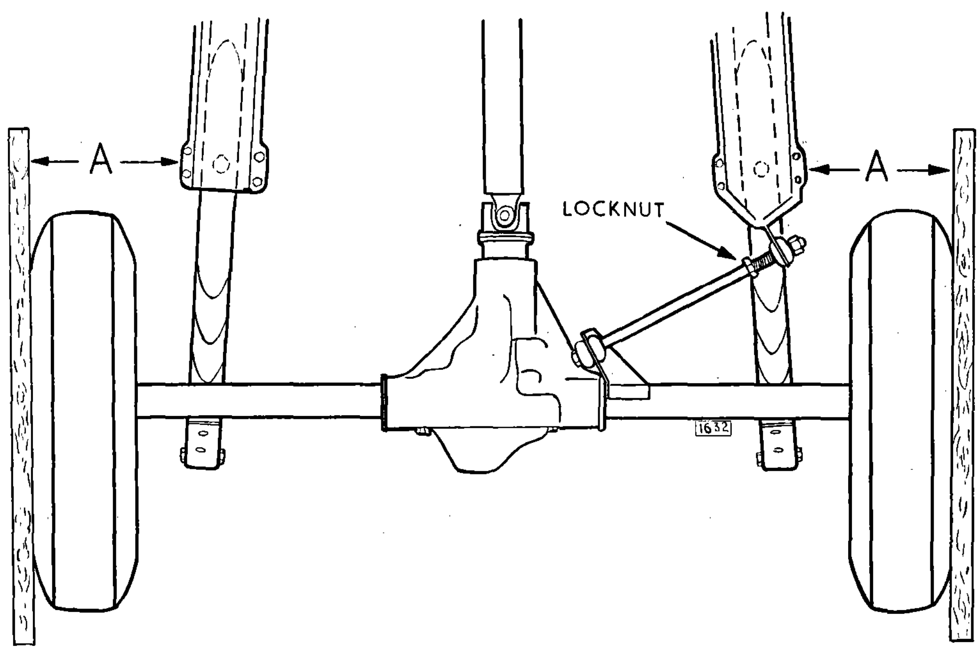

Fig. 6. Panhard rod adjustment. Dimension "A" must be the same at both sides.

SECTION L

BRAKES

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

INDEX *(continued)*

The Lockheed $6\frac{7}{8}''$ Vacuum Servo Unit

THE BRAKING SYSTEM

DESCRIPTION

Each wheel brake unit comprises a hub mounted disc rotating with the wheel, and a braking unit rigidly attached to the suspension member. The brake unit consists of a caliper which straddles the disc and houses a pair of rectangular friction pad assemblies, each comprising a pad and a securing plate. These assemblies locate between a keep plate bolted to the caliper bridge and two support plates accommodated in slots in the caliper jaw. Cylinder blocks bolted to the outer faces of the caliper accommodate piston assemblies which are keyed to the friction pad assemblies. A spigot formed on the outer face of each piston locates in the bore of a backing plate with an integral boss grooved to accommodate the collar of a flexible rubber dust seal. The outer rim of the seal engages a groove around the block face and so protects the assembly from intrusion of moisture and foreign matter. A piston seal is located between the piston inner face and a plate secured by peen locked screws. A counterbore in the piston accommodates a retractor bush which tightly grips the stem of a retractor pin. This pin forms part of an assembly which is peened into the base of the cylinder bore. The assembly comprises a retractor stop bush, two spring washers, a dished cap and the retractor pin ; it functions as a return spring and maintains a " brake-off " working clearance of approximately 0.008/0.010 in. (.20—.25 mm.) between the pads and the disc throughout the life of the pads.

Handbrake

The mechanical handbrake units are mounted on and above the caliper bodies of the rear roadwheel brakes by means of pivot bolts.

Each handbrake unit consists of two carriers, one each side of the brake disc and attached to the inside face of each carrier by means of a special headed bolt is a friction pad. The free end of the inner pad carrier is equipped with a pivot seat to which the forked end of the operating lever is attached. A trunnion is also mounted within the forked end of the operating lever and carries the threaded end of the adjuster bolt on the end of which is a self-locking nut. Located on the shank of the adjuster bolt and in a counterbore in the inside face of the inner pad carrier is the operating lever return spring held under load by a nut retained by a spring plate riveted to the inside face of the inner carrier. The adjuster bolt passes through the outer pad carrier and its hemispherically shaped head seats in a suitable recess in the outer carrier.

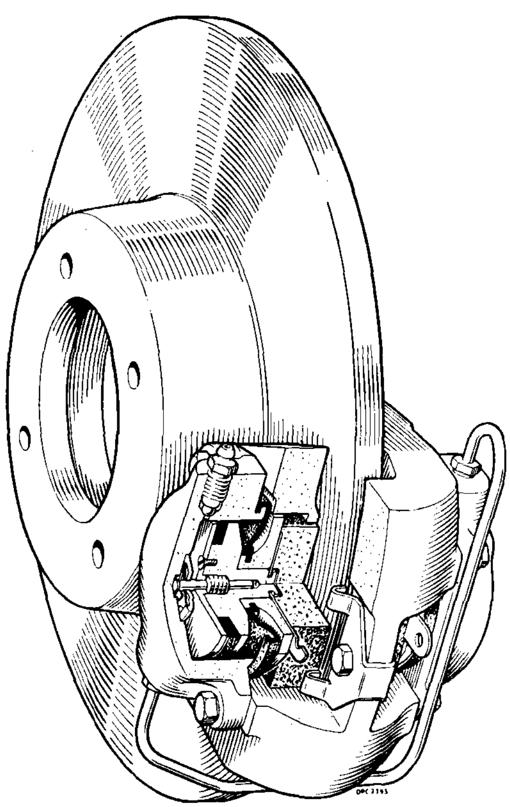

Fig. 1. Sectional view of front disc brake.

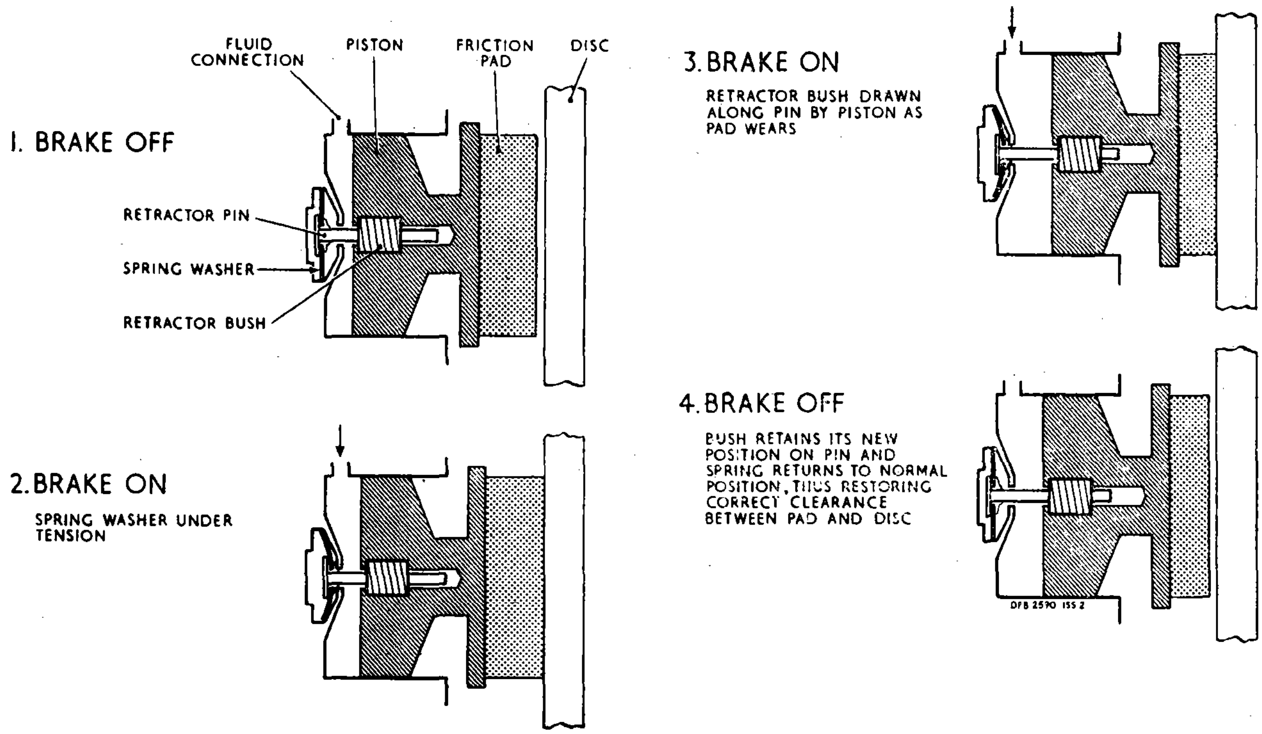

Fig 2. Operation of self-adjusting mechanism (Early Cars).

DATA

Make	Dunlop
Type	Bridge type calipers with quick change pads.
Brake disc diameter—front	11″ (27.9 cm.)
rear	$11\frac{3}{8}$″ (28.9 cm.)
Master cylinder bore diameter	$\frac{7}{8}$″ (22.22 mm.)
Master cylinder stroke	$1\frac{3}{8}$″ (35 mm.)
Brake cylinder bore diameter—front	$2\frac{1}{8}$″ (53.97 mm.)
Brake cylinder bore diameter—rear	$1\frac{1}{2}$″ (38.1 mm.)
Servo unit type	Lockheed $6\frac{7}{8}$″ (Suspended Vacuum Type)
Main friction pad—material	Mintex M.33
Handbrake friction pad—material	Mintex M.34

Special Tools

Piston Re-setting Lever	Part Number 7840

ROUTINE MAINTENANCE

WEEKLY

Brake Fluid Level

The fluid reservoir for the hydraulic brakes is attached to the wing valance on the driver's side of the car.

At the recommended intervals check the level of fluid in the reservoir which should be $1\frac{1}{4}''$ (31.5 mm.) below the top of the filler neck.

First, disconnect the two electrical cables from the " snap-on " terminals. Unscrew the filler cap and " top up " if necessary to the recommended level. Insert the combined filler cap and float slowly into the reservoir to allow for displacement of fluid and screw down the cap. Wipe off any fluid from the top of the cap and connect the cables to either of the two terminals.

Note: An indication that the fluid level is becoming low is provided by an indicator pin situated between the two terminals.

First, press down the pin and allow it to return to its normal position ; if the pin can then be lifted with the thumb and forefinger the reservoir requires topping up immediately.

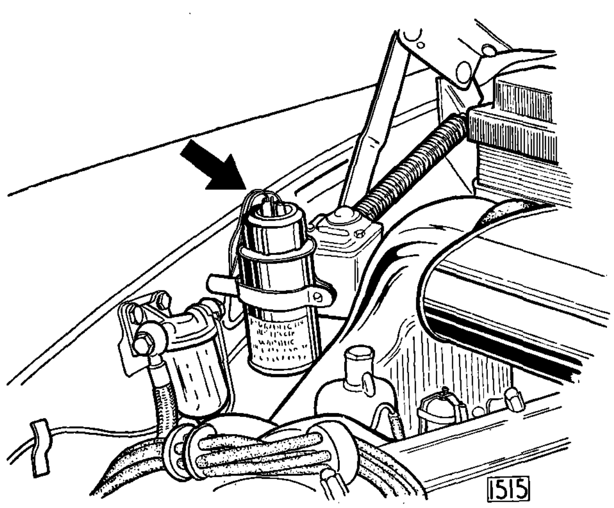

Fig. 3. Location of the hydraulic brake fluid reservoir on right-hand drive cars.

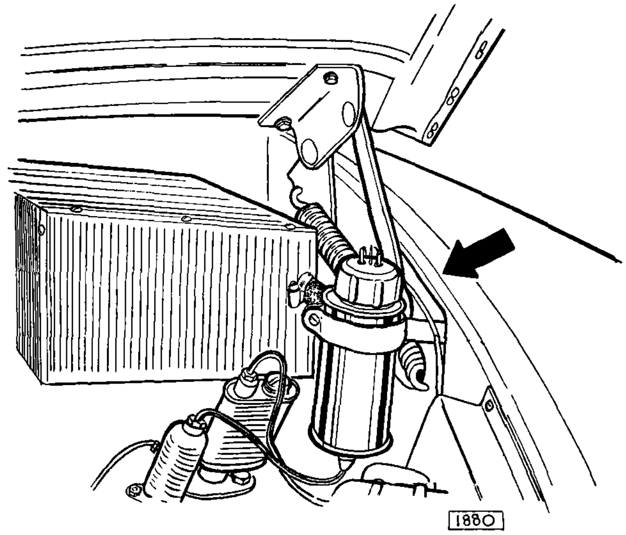

Fig. 4. Location of the hydraulic brake fluid reservoir on left-hand drive cars.

Brake Fluid Level Warning Light

A warning light (marked " Brake Fluid—Handbrake ") situated on the facia behind the steering wheel, serves to indicate if the level in the brake fluid reservoir has become low, provided the ignition is " on ". As the warning light is also illuminated when the handbrake is applied, the handbrake must be fully released before it is assumed that the fluid level is low. If with the ignition " on " and the handbrake fully released the warning light is illuminated the brake fluid must be " topped up " immediately.

As the warning light is illuminated when the handbrake is applied and the ignition is " on " a two-fold purpose is served. Firstly, to avoid the possibility of driving away with the handbrake applied. Secondly, as a check that the warning light bulb has not " blown "; if on first starting up the car with the handbrake fully applied, the warning light does not become illuminated the bulb should be changed immediately.

Note: If it is found that the fluid level falls rapidly indicating a leak from the system, the car should be taken immediately to the nearest Jaguar Dealer for examination.

EVERY 2,500 MILES (4,000 KM.)

Footbrake Adjustment

Both the front wheel and rear wheel brakes are so designed that no manual adjustment to compensate for brake friction pad wear is necessary as this automatically takes place when the footbrake is applied.

Handbrake Adjustment (Early Cars)

The mechanically operated handbrakes are attached to the rear caliper bodies but form an independent mechanically actuated system carrying their own friction pads and individual adjustment.

To adjust the handbrakes to compensate for friction pad wear, which will be indicated by excessive handbrake lever travel, carry out the following procedure.

Unscrew the adjuster bolt and insert a .004" (.10 mm.) feeler gauge between the face of one handbrake pad and the disc. Screw in the adjuster bolt until the feeler gauge is just nipped. Withdraw feeler gauge and check disc for free rotation. Repeat for the other side.

If, after carrying out the above adjustment, satisfactory travel of the handbrake lever is not obtained, the handbrake cable should be adjusted as follows :—

Screw in the handbrake adjuster bolt at each rear brake until the handbrake pads are in hard contact with the brake discs.

Fully release the handbrake lever. Remove the clevis pin securing the fork end to the compensator at the rear end of the main cable. Slacken the locknut and adjust the position of the fork end so that with the clevis pin refitted there is no slack in the main cable and the two cross cables. It is, however, important to ensure that the cables are not under tension.

Reset the handbrake clearance with a .004" (.10 mm.) feeler gauge as described above.

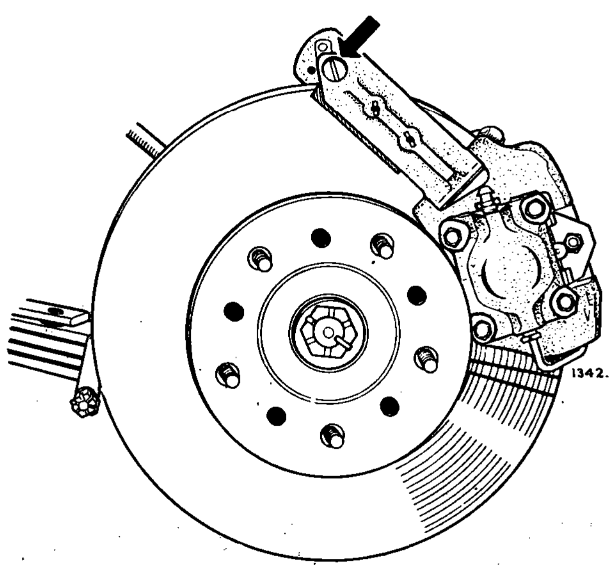

Fig. 5. Handbrake adjuster bolt (Early Cars).

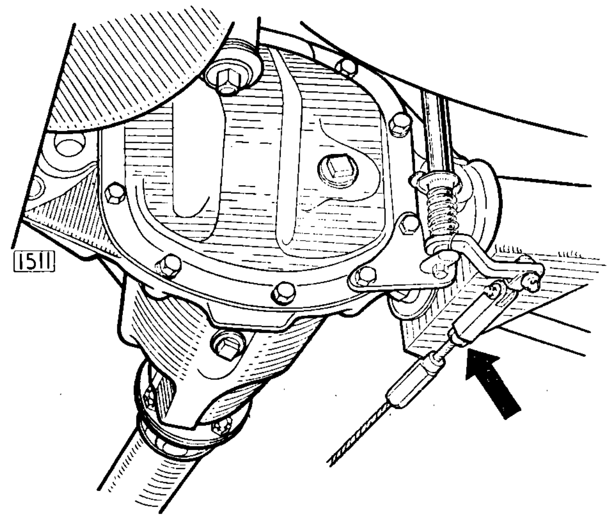

Fig. 6. Handbrake cable adjustment.

EVERY 5,000 MILES (8,000 KM.)

Friction Pads—Examination for Wear

At the recommended intervals, or if a loss of braking efficiency is noticed, the brake friction pads (2 per brake) should be examined for wear ; the ends of the pads can be easily observed through the apertures in the brake caliper. When the friction pads have worn down to a thickness of approximately $\frac{1}{4}$" (7 mm.) they need renewing.

Friction Pads—Renewal

To remove the friction pads, unscrew the nut from the bolt attaching the friction pad retainer to the caliper and extract the bolt. Withdraw the pad retainer.

Insert a piece of strong cord (or wire) through the hole in the metal tag attached to the friction pad and withdraw the pad by pulling on the cord.

To enable the new friction pads to be fitted it will be necessary to force the pistons back into the cylinder blocks by means of two screwdrivers.

Before doing this, it is advisable to half empty the brake supply tank, otherwise forcing back the friction pads will eject fluid from the tank with possible damage to the paintwork. When all the new friction pads have been fitted, top up the supply tank to the recommended level.

Insert the new friction pads into the caliper ensuring that the slot in the metal plate attached to each pad engages with the button in the centre of the piston.

Finally, refit the friction pad retainer and secure with the bolt and nut. Apply the footbrake a few times to operate the self-adjusting mechanism, so that normal travel of the pedal is obtained.

Brake Servo Air Cleaner

At the recommended intervals the brake servo air cleaner, which is attached to the right-hand wing valance, should be removed and washed in **methylated spirits**. After drying out re-lubricate the wire mesh with **brake fluid.**

RECOMMENDED BRAKE FLUIDS

Preferred Fluid

Castrol/Girling Crimson Clutch/Brake Fluid.
(S.A.E. 70 R3.)

Alternative Fluids

Recognised brands of brake fluid conforming to specification S.A.E. 70 R3.

In the event of deterioration of the rubber seals and hoses due to the use of an incorrect fluid all the seals and hoses must be replaced and the system thoroughly flushed and refilled with one of the above fluids.

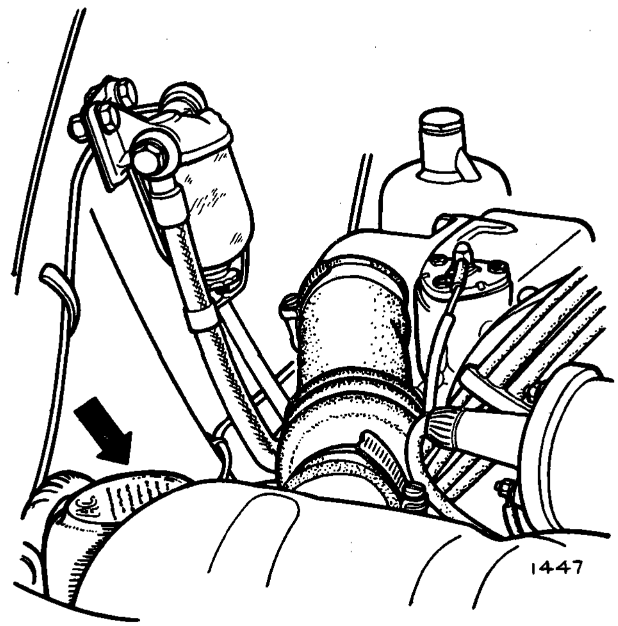

Fig. 7. The brake servo air cleaner

BLEEDING THE BRAKE SYSTEM

The following procedure should be adopted either for initial priming of the system or to bleed in service if air has been permitted to enter the system. This latter condition may occur if connections are not maintained properly tightened, or if the master cylinder periodic fluid level check is neglected. During the bleeding operation it is important that the level in the reservoir is kept topped up to avoid drawing air into the system. It is recommended that new fluid be used for this purpose.

Check that all connections are tightened and all bleed screws closed.

Fill the reservoir with brake fluid of the correct specification.

Attach the bleeder tube to the bleed screw on the near side brake and immerse the open end of the tube in a small quantity of brake fluid contained in a clean glass jar. Slacken the bleed screw and operate the brake pedal slowly backwards and forwards through its full stroke until fluid pumped into the jar is reasonably free from air bubbles. Keep the pedal depressed and close the bleed screw. Release the pedal.

Repeat for each brake in turn.

Repeat the complete bleeding sequence until the brake fluid pumped into the jar is completely free from air bubbles.

Lock all bleed screws and finally regulate the fluid level in the reservoir.

Apply normal working load on the brake pedal for a period of two or three minutes and examine the entire system for leaks.

BRAKE OVERHAUL—PRECAUTIONS

The complete brake system is designed to require the minimum of attention and providing the hydraulic fluid in the reservoir is not allowed to fall below the recommended level no defects should normally occur. Fluid loss must be supplemented by periodically topping up the reservoir with fluid of the same specification of that in the system. If the recommended brand of brake fluid is not available and it is intended to use one of the alternative approved brands, the complete system must be drained before the substitution of one fluid for another. It is not permissible to top up the reservoir with an alternative approved brand of fluid.

The inclusion of air in a system of this type will be indicated by sluggish response of the brakes and spongy action of the brake pedal. This condition may be due to air induction at a loose joint or at a reservoir in which the fluid has been allowed to fall to a very low level. These defects must be immediately remedied and the complete system bled. Similarly, bleeding the system is equally essential following any servicing operation involving the disconnecting of part or whole of the hydraulic system.

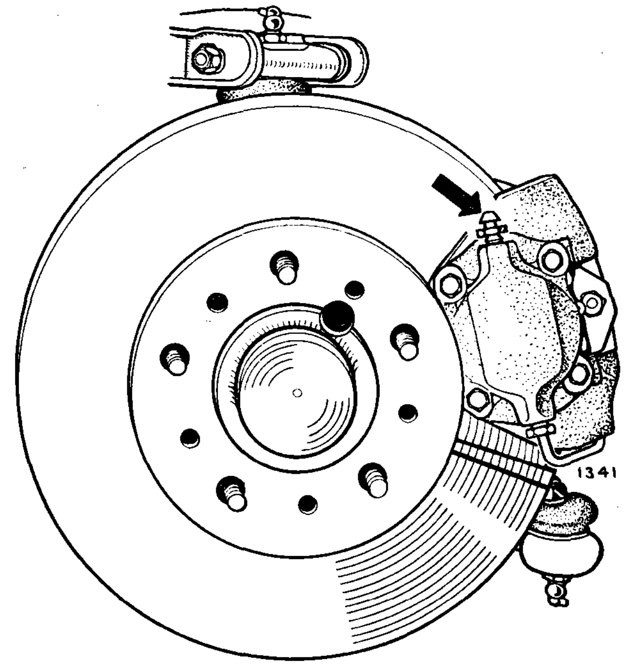

Fig. 8. Brake bleed nipple.

The following instructions detail the procedure for renewal of component parts and for complete overhaul of the disc brakes, handbrakes and master cylinder. The units should be thoroughly cleaned externally before dismantling. Brake system fluid should be used for cleaning internal components and, except where otherwise stated in these notes, the use of petrol, paraffin or chemical grease solvents should be avoided as they may be detrimental to the rubber components. Throughout the dismantling and assembling operation it is essential that the work bench be maintained in a clean condition and that the components are not handled with dirty or greasy hands. The precision parts should be handled with extreme care and should be carefully placed away from tools or other equipment likely to cause damage. After cleaning, all components should be dried with clean lint-free rag.

When it is not the intention to renew the rubber components, they must be carefully examined for serviceability. There must be no evidence of defects

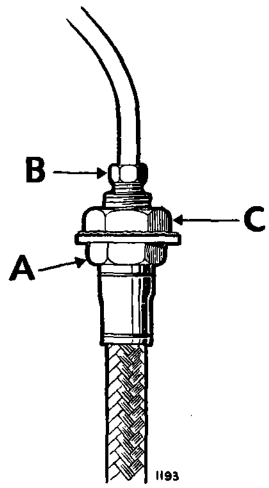

Fig. 9. Flexible hose connection. Hold hexagon ' A ' with spanner when removing or refitting locknut ' C '.

such as perishing, excessive swelling, cutting or twisting, and where doubt exists comparison with new parts may prove to be of some assistance in making an assessment of their condition. The flexible pipes must show no signs of deterioration or damage and the bores should be cleaned with a jet of compressed air. No attempt should be made to clear blockage by probing as this may result in damage to the lining and serious restriction to fluid flow. Partially or totally blocked flexible pipes should always be renewed. When removing or refitting a flexible pipe, the end sleeve hexagon (A, Fig. 9) should be held with the appropriate spanner to prevent the pipe from twisting. A twisted pipe will prove detrimental to efficient brake operation.

THE MASTER CYLINDER

The master cylinder is mechanically linked to the footbrake pedal and, at a ratio proportional to the load applied, provides the hydraulic pressure necessary to operate the brakes. The components of the master cylinder are contained within the bore of a body which at its closed end has two 90° opposed integral pipe connection bosses. Integrally formed around the opposite end of the cylinder is a flange provided with two holes for the master cylinder attachment bolts. In the unloaded condition a spring loaded piston, carrying two seals (see Fig. 10) is held against the underside of a circlip retained dished washer at the head of the cylinder. A hemispherically ended push-rod seats in a similarly formed recess at the head of the piston. A fork end on the outer end of the push-rod provides for attachment to the pedal. A rubber dust excluder, the lip of which seats in a groove, shrouds the head of the master cylinder to prevent the intrusion of foreign matter.

A cylindrical spring support locates around the inner end of the piston and a small drilling in the end of the support is engaged by the stem of a valve. The larger diameter head of the valve locates in a central blind bore in the piston. The valve passes through the bore of a vented spring support and interposed between the spring support and an integral flange formed on the valve is a small coiled spring. A lipped rubber seal registers in a groove around the end of the valve. This assembly forms a recuperation valve which controls fluid flow to and from the reservoir.

When the foot pedal is in the OFF position the master cylinder is fully extended and the valve is held clear of the base of the cylinder by the action of the main spring. In this condition the master cylinder is in fluid communication with the reservoir, thus permitting recuperation of any fluid loss sustained, particularly during the bleeding operation of the brake system.

When a load is applied to the foot pedal the piston moves down the cylinder against the compression of the main spring. Immediately this movement is in excess of the valve clearance the valve closes under the influence of its spring and isolates the reservoir. Further loading of the pedal results in the discharge of fluid under pressure from the outlet connection, via the pipe lines to the brake system.

Removal of the load from the pedal reverses the sequence, the action of the main spring returns the master cylinder to the extended position.

Removal

Drain the brake fluid reservoir and detach the inlet and outlet pipes from the brake master cylinder, the right-hand of the two inside the engine compartment, by withdrawing the two union nuts. Detach the master cylinder push-rod from the brake pedal by discarding the split pin and withdrawing the clevis pin. Remove the brake master cylinder from the housing situated inside the engine compartment by removing two nuts.

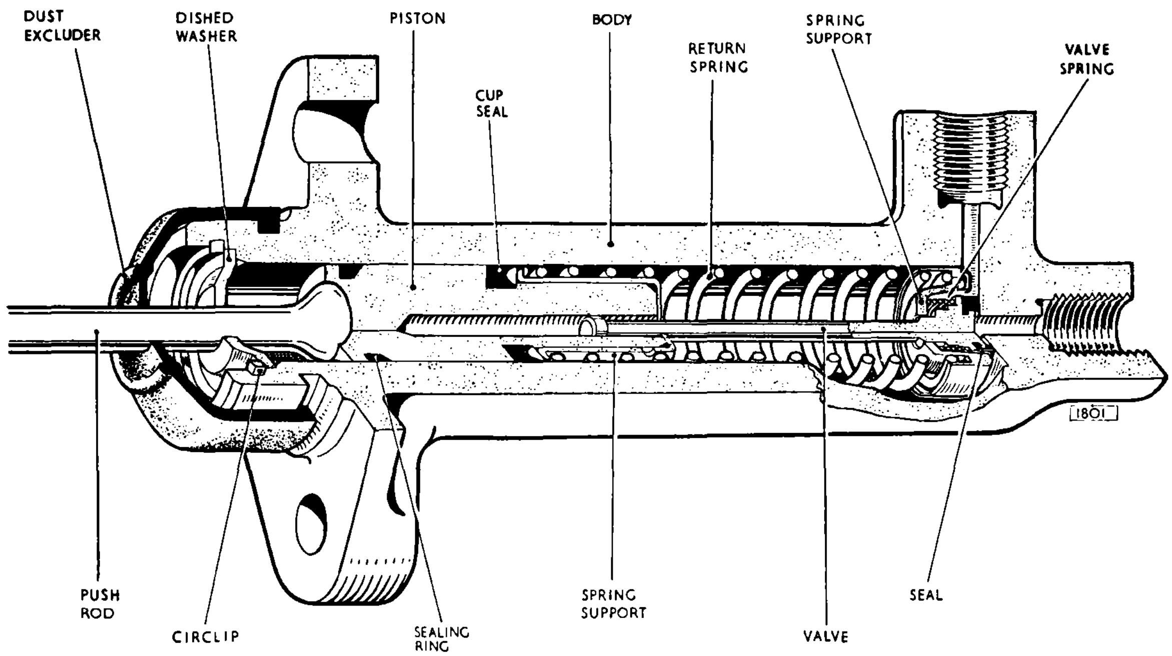

Fig. 10. Sectioned view of master cylinder.

Renewing the Master Cylinder Seals

Ease the dust excluder clear of the head of the master cylinder.

With suitable pliers remove the circlip ; this will release the push rod complete with dished washer.

Withdraw the piston and remove both seals.

Withdraw the valve assembly complete with springs and supports. Remove the seal from the end of the valve.

Lubricate the new seals and the bore of the cylinder with brake fluid, fit the seal to the end of the valve ensuring that the lip registers in the groove. Fit the seals in their grooves around the piston.

Insert the piston into the spring support, ensuring that the head of the valve engages the piston bore.

Lubricate the piston with Wakefield Rubber Grease H. 95/59 and slide the complete assembly into the cylinder body taking particular care not to damage or twist the seals. The use of a fitting sleeve is advised.

Position the push-rod and depress the piston sufficiently to allow the dished washer to seat on the shoulder at the head of the cylinder. Fit the circlip and check that it fully engages the groove.

Fill the dust excluder with clean Wakefield H. 95/59 Rubber Grease.

Reseat the dust excluder around the head of the master cylinder.

Master Cylinder Push-rod—Free Travel

When the brake pedal is in the " off " position it is necessary that the master cylinder piston is allowed to return to the fully extended position, otherwise pressure may build up in the system causing the brakes to drag or remain on.

To ensure that this piston returns to the fully extended position clearance is provided between the enlarged head of the push-rod, the piston and dished washer. As this washer also forms the return stop for the brake pedal, no means of adjustment is necessary.

The push-rod clearance will give approximately $\frac{1}{4}''$ (7 mm.) free movement at the brake pedal pad and can be felt if the pedal is depressed gently by hand.

THE BRAKE ASSEMBLY

Assembling

The assembly of the disc brake to the car should be carried out as follows :—

Secure the disc to the hub. Five bolts are provided secured by spring washers and nuts.

Fit the hub to the stub axle or half shaft, as applicable. Check the end-float of the wheel hub bearings which must be .003″ to .005″ (.07 to .13 mm.) for both front and rear hubs. It is most important that the end-float does not exceed .005″

(.13 mm.), otherwise the brakes may tend to drag and not function correctly. Adjustment of the front wheel bearings is effected by means of the hub nut at the end of the stub axle shaft. Adjustment of the rear wheel bearings is effected by the insertion or extraction of shims interposed between the flanges of the axle tubes and the brake caliper mounting plates.

Check the disc for true rotation by clamping a dial test indicator to the chassis so that the needle pad bears on the face of the disc. " Run-out " should not exceed 0.006″ (.15 mm.) gauge reading. Manufacturing tolerances on the disc and hub should maintain this truth and in the event of the " run-out " exceeding this value the components should be examined for damage.

Locate the caliper body (complete with cylinder assemblies) in position and secure with two bolts and locking wire.

Check the gap between each side of the caliper and the disc. The difference should not exceed 0.010″ (.25 mm.) and shims may be fitted to centralise the caliper.

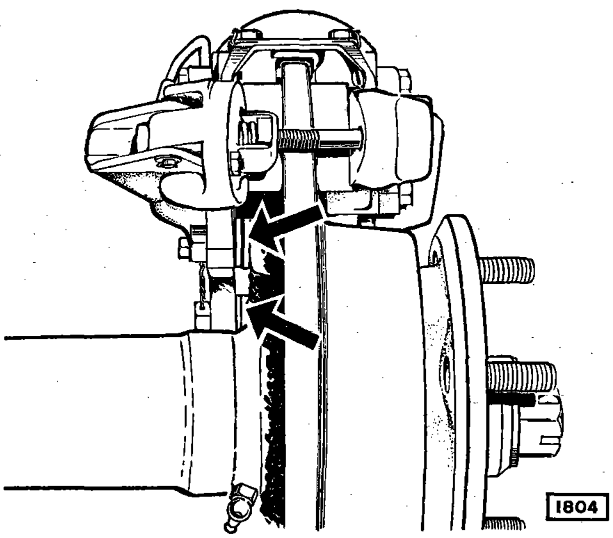

Fig. 11. Disc brake caliper adjustment shims.

If not already fitted, fit the bridge pipe connecting the two cylinder assemblies. Connect the supply pipe to the cylinder block and ensure that it is properly secured.

Important

It is essential that the bridge pipe is fitted with the " hairpin " bend end to the inboard cylinder block, that is, furthest from the road wheel (see Fig. 1). The bridge pipe carries a rubber identification sleeve marked " Inner Top "

Renewing the Friction Pads

Brake adjustment is automatic during the wearing life of the pads. The pads should be checked for wear every 5,000 miles (8,000 km.) by visual observation and measurement ; when wear has reduced the pads to the minimum permissible thickness of ¼″ (7 mm.), the pad assemblies (complete with securing plates) must be renewed. If checking is neglected the need to renew the pads will be indicated by a loss of brake efficiency. The friction pads fitted have been selected as a result of intensive development, and it is essential at all times to use only factory approved

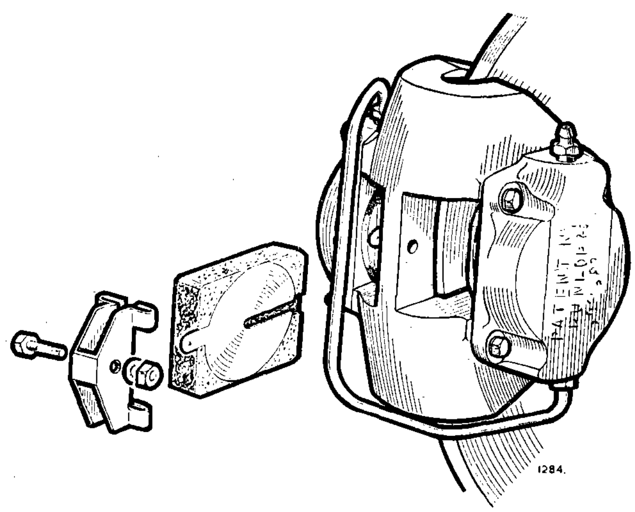

Fig. 12. Friction pad removal.

material. To fit the new friction pad assemblies proceed as follows :—

Remove the nut, washer and bolt securing the keep plate and withdraw the plate.

With a suitable hooked implement engaged in the hole in the lug of the securing plate withdraw the defective pad assemblies.

Thoroughly clean the backing plate, dust seal, and the surrounding area of the caliper.

With the aid of the special tool press in the piston assemblies to the base of the cylinder bores as shown in Fig. 13.

Note: Before doing this, it is advisable to half empty the brake supply tank, otherwise forcing back the friction pads will eject fluid from the tank with possible damage to the paintwork. When all the new friction pads have been fitted, top up the supply tank to the recommended level.

Insert the forked end of the piston resetting lever into the space between the caliper bridge and one of the piston backing plates, with the fork astride the projecting piston spigot and its convex face bearing on the piston backing plate. Locate the spigot end of the lever pin in the keep plate bolt hole in the bridge. Pivot the lever about the pin to force the piston to the base of its cylinder. Insert the new friction pad assembly. Repeat this operation for the opposite piston assembly.

Replace the keep plate and secure it with the bolt, washer and nut.

Renewing the Brake Piston Seals (Early Cars)

Leakage past the piston seals will be denoted by a fall in level in the fluid reservoir or by spongy pedal travel. It is recommended that the dust seal be renewed when fitting a new piston seal. Proceed as follows :—

Withdraw the brake pads as described in the previous paragraphs.

Disconnect and blank off the supply pipe and remove the bridge pipe.

Remove the mounting bolts securing the cylinder blocks to the caliper and withdraw the cylinder blocks. Thoroughly clean the blocks externally before proceeding with further dismantling.

Disengage the dust seal from the groove around the cylinder block face.

Connect the cylinder block to a source of fluid supply and apply pressure to eject the piston assembly.

Remove the screws securing the plate to the piston, lift off the plate and piston seal, withdraw the retractor bush from within the piston bore. Carefully cut away and discard the dust seal.

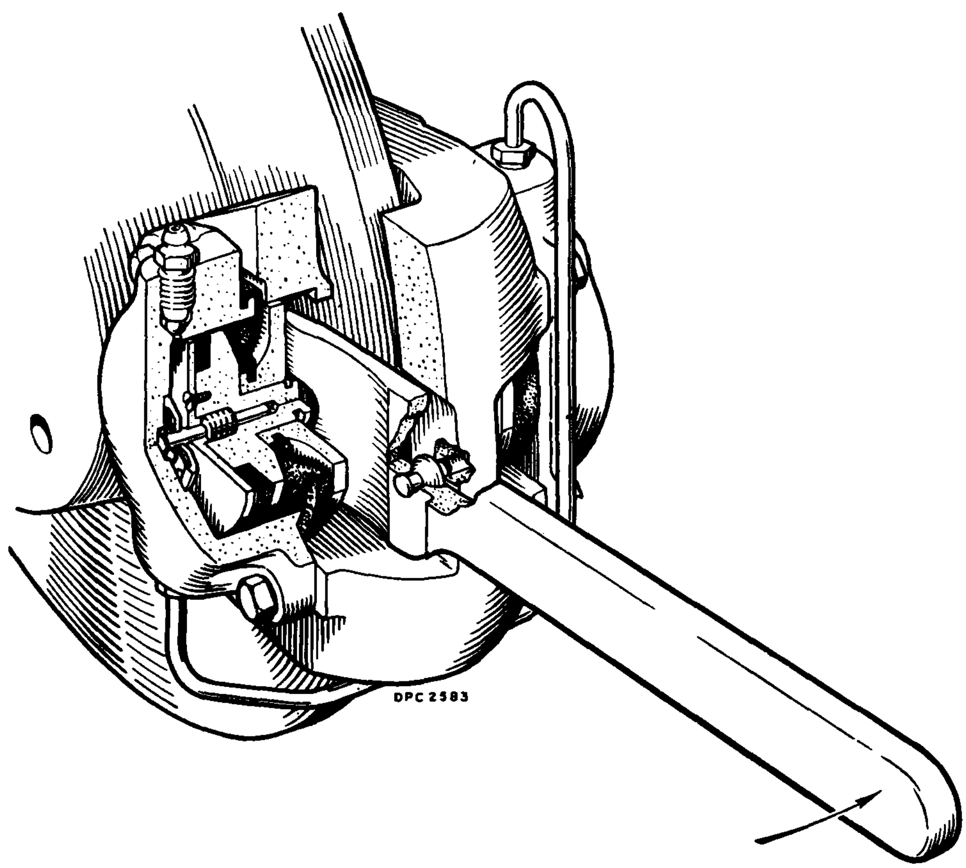

Fig. 13. Resetting the pistons with special tool (Part No. 7840).

Support the backing plate on a bush of sufficient bore diameter to just accommodate the piston. With a suitable tubular distance piece placed against the end of the piston spigot and located around the shouldered head, press out this piston from the backing plate. Care must be taken during this operation to avoid damaging the piston.

Engage the collar of a new dust seal with the lip on the backing plate avoiding harmful stretching.

Locate the backing plate on the piston spigot and, with the piston suitably supported, press the backing plate fully home.

Insert the retractor bush into the bore of the piston. Lightly lubricate a new piston seal with brake fluid, and fit it to the piston face. Attach and secure the plate with the screws and peen lock the screws.

Check that the piston and the cylinder bore are thoroughly clean and show no signs of damage. Locate the piston assembly on the end of the retractor pin. With the aid of a hand press slowly apply an even pressure to the backing plate and press the assembly into the cylinder bore. During this operation ensure the piston assembly is in correct alignment in relation to the cylinder bore, and that the piston seal does

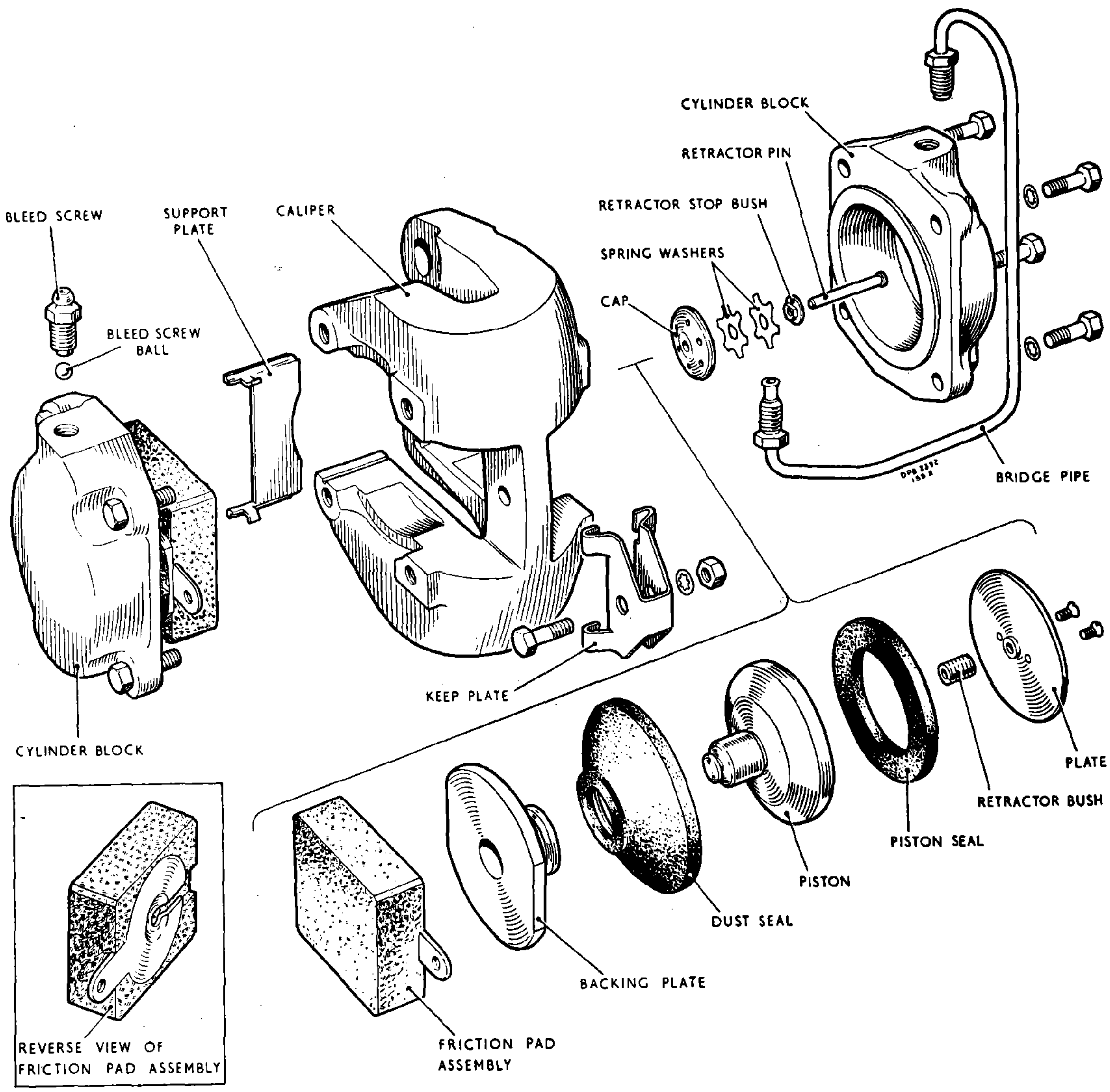

Fig. 14. Exploded view of front brake caliper (Early Cars).

not become twisted or trapped as it enters. Engage the outer rim of the dust seal in the groove around the cylinder block face. Ensure that the two support plates are in position.

Re-assemble the cylinder blocks to the caliper. Fit the bridge pipes ensuring that they are correctly positioned. Remove the blank and reconnect the supply pipe. Bleed the hydraulic system.

Important

It is essential that the bridge pipe is fitted with the " hairpin " bend end to the inboard cylinder block, that is, furthest from the road wheel (see Fig. 1). The bridge pipe carries a rubber identification sleeve marked " Inner Top ".

THE HANDBRAKE (Early Cars)

Description (Fig. 15)

The mechanical handbrake units are mounted on and above the caliper bodies of the rear roadwheel brakes by means of pivot bolts and forked retraction plates.

Each handbrake unit consists of two carriers, one each side of the brake disc and attached to the inside face of each carrier by means of a special headed bolt is a friction pad. The free end of the inner pad carrier is equipped with a pivot seat to which the forked end of the operating lever is attached. A trunnion is also mounted within the forked end of the operating lever and carries the threaded end of the adjuster bolt on the end of which is a self-locking nut. Located on the shank of the adjuster bolt and in a counterbore in the inside face of the inner pad carrier is the operating lever return spring held under load by a nut retained by a spring plate rivetted to the inside face of the inner carrier. The adjuster bolt passes through the outer pad carrier and its hemispherically shaped head seats in a suitable recess in the outer carrier.

The handbrake units require periodical adjustment and a slot for this purpose is provided in the head of the adjuster bolt.

Handbrake Friction Pads—Renewing

Securely chock the front roadwheels, release the handbrake and select neutral gear. Jack up the rear of the car and remove the rear road wheels. Slacken off the handbrake adjuster bolt situated at the top of the outside handbrake pad carrier until its end becomes flush with the nut on the inner handbrake pad carrier. Withdraw the two friction pads, one from each pad carrier by slackening off the nuts in the side faces of the pad carrier and utilizing a hooked tool in the drilling of the friction pad securing plate.

Insert the two friction pad assemblies into the friction pad carriers short face upward ensuring each pad securing plate locates the head of the retaining bolt protruding through the inside face of the pad carriers and secure by tightening the nuts on the outside faces. Reset the forked shaped retraction plates by lifting the locking tabs, slackening and retightening the two pad carrier pivot bolts and lock the bolt head by turning up the second pair of tabs on the locking plate.

Repeat the foregoing procedure with the second pair of handbrake friction pads and adjust the handbrake as previously detailed.

Friction Pad Carriers—Removal

Securely chock the front roadwheels, release the handbrake, select neutral gear, jack up the rear of the car and remove the rear roadwheels. Detach the brake cable from the handbrake operating lever by discarding the split pin and withdrawing the clevis pin. Remove the two handbrake friction pads from the carriers by slackening the nuts, one in the outer face of each pad carrier and utilizing a hooked tool in the drilling of the friction pad securing plate. Detach the two friction pad carriers from the top of the caliper bridge by withdrawing the two pivot pins and retraction plate.

Friction Pad Carriers—Dismantling

Separate the friction pad carriers by withdrawing the adjuster bolt exercising care to control the run of the self-locking nut in the forked end of the operating lever. Detach the pivot seat from the forked end of the operating lever by discarding the split pin and withdrawing the clevis pin. Do not attempt to remove the spring or squared nut unless either are observed to be damaged and when this action is necessary, clamp the spring cage to the pad carrier while drilling out the rivets. The pressings of the operating lever are spot welded together with the trunnion block in position, thus it cannot be removed.

Friction Pad Carriers—Assembling (Fig. 15)

The assembling is the reverse of the dismantling procedure but particular attention must be given to the following points :—

(i) That the trunnion block in the forked end of the operating lever has complete freedom of movement.

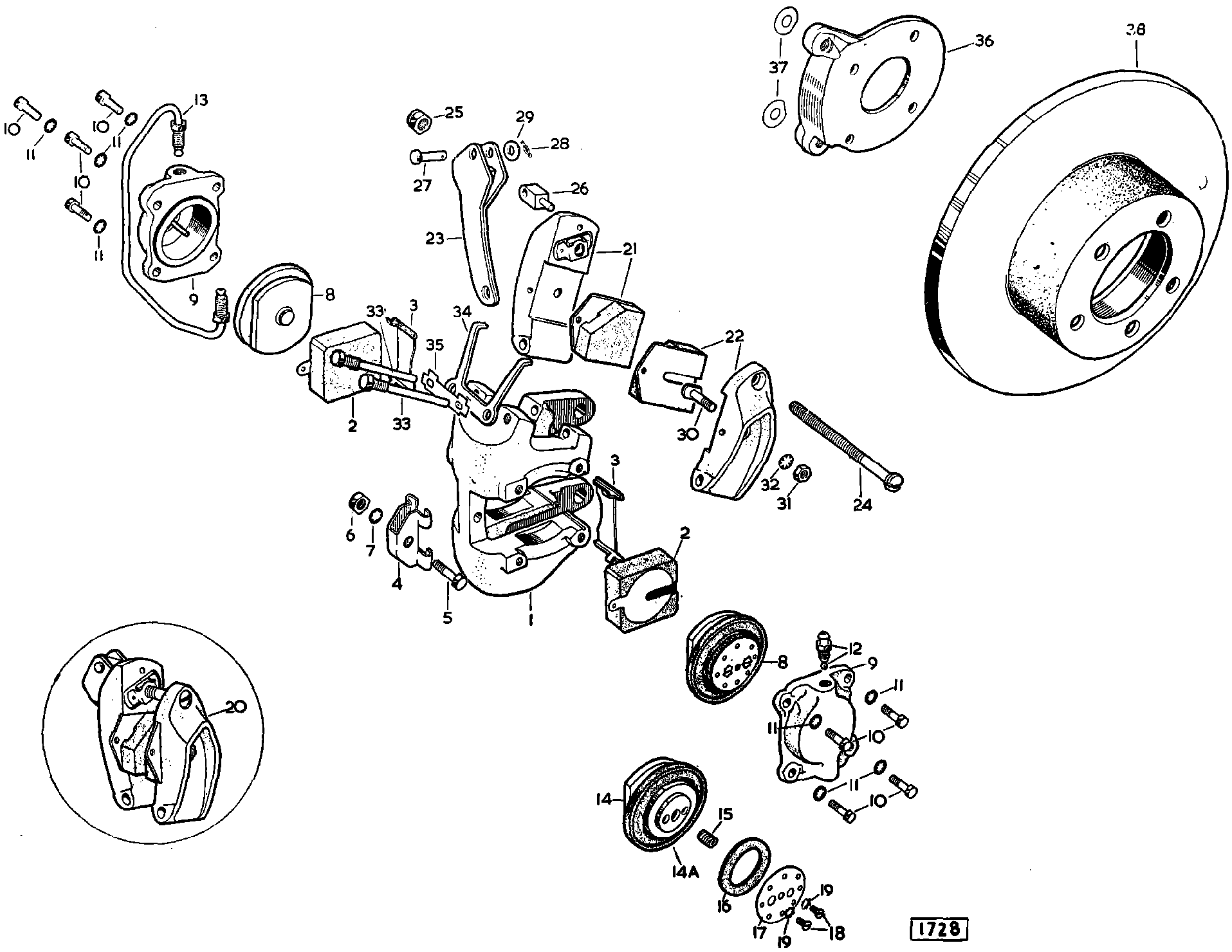

Fig. 15. Exploded view of rear brake caliper (Early Cars).

1. Brake caliper body
2. Friction pad
3. Support plate
4. Retaining plate
5. Retaining bolt
6. Nut
7. Shakeproof washer
8. Piston assembly
9. Cylinder block
10. Cylinder bolt
11. Shakeproof washer
12. Bleed screw and ball
13. Bridge pipe
14. Piston and backing plate

14a. Rubber dust excluder

15. Retractor bush
16. Piston seal
17. Piston seal plate
18. Screw
19. Shakeproof washer
20. Handbrake pad carriers
21. Inner pad carrier and friction pad
22. Outer pad carrier and friction pad
23. Operating lever
24. Adjuster bolt
25. Self-locking nut
26. Pivot seat
27. Clevis pin
28. Split pin
29. Washer
30. Handbrake friction pad securing bolt
31. Nut
32. Shakeproof washer
33. Pivot bolts
34. Retraction plate
35. Tab washer
36. Caliper mounting plate
37. Caliper centring shim
38. Brake disc

(ii) That the spring is fitted with the recess in the inner friction pad carrier, followed by the nut and both components are held firmly in place with the retaining cage while the latter is rivetted to the pad carrier.

(iii) That the spigot of the pivot seat is a sliding fit in the drilling at the extreme end of the carrier friction pad carrier on the opposite side of the spring retaining cage and between the forked end of the operating lever.

(iv) That the clevis pin is a sliding fit in the eye of the pivot seat also the drillings in the extreme forked end of the operating lever and together with the spigot seat it is not fitted until the adjuster bolt has been fitted.

(v) That the adjuster bolt is fed through the spring retaining nut and spring, the operating bolt is then offered up to the outside face of the inner friction pad carrier and the shank of the adjusting screw is fed through the bore of the trunnion until the tip of the bolt shank is almost flush with the outer face of the trunnion. The spring is preloaded by inserting a screwdriver blade between the spring retaining nut and cage (Fig. 16), the end of the bolt shank is then reset so it becomes flush with the trunnion face. The self-locking nut is offered up to the face of the trunnion and the adjuster bolt is screwed in ensuring the latter engages the self-locking nut with the first thread. When the adjuster bolt becomes flush with the second face of the self-locking nut, withdraw the preloading screwdriver and fit the pivot seat.

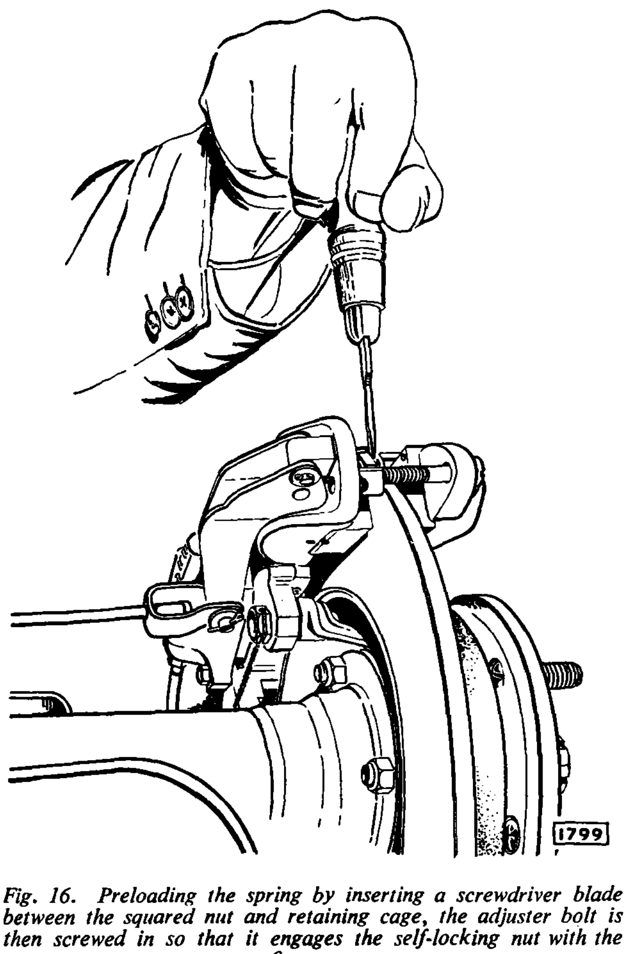

Fig. 16. Preloading the spring by inserting a screwdriver blade between the squared nut and retaining cage, the adjuster bolt is then screwed in so that it engages the self-locking nut with the first turn.

Refitting

The refitting is the reverse of the removal procedure but particular attention must be given to the following point :—

That the locking plate under the heads of the two pad carrier pivot bolts are replaced with new ones, even though the second pair of locking tags have still to be used.

Handbrake Cable Lengths

Right-hand side	17.125" (43.5 cm.)
Left-hand side	27.875" (71.28 cm.)

THE HANDBRAKE COMPENSATOR LEVER ASSEMBLY

Removal (Fig. 18)

Securely chock the front roadwheels, release the handbrake and jack up the rear of the car. Detach the two transverse and the primary cables from the top and bottom ends of the balance lever respectively.

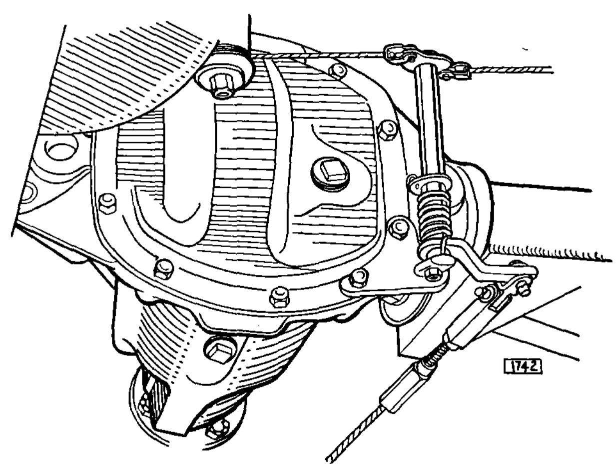

Fig. 17. Location of handbrake compensator lever on rear axle.

Remove the compensator lever assembly from the rear of the axle differential casing by withdrawing two bolts.

Dismantling

Remove the compensator lever mounting bracket from the fulcrum pin assembly by rotating it anti-clockwise, the felt seal can be removed when it is seen to be unserviceable. Grip the fulcrum pin assembly in a vice and while holding the head of the spindle assembly steady remove the nut from beneath the fulcrum pin assembly. Remove the balance lever and spring from the fulcrum pin by withdrawing the spindle assembly and removing the straight end of the spring from within the tube in the fulcrum pin assembly, detach the spring from the balance lever only if necessary. Eject the two bushes, one at each end of the balance lever when they are observed to be well worn.

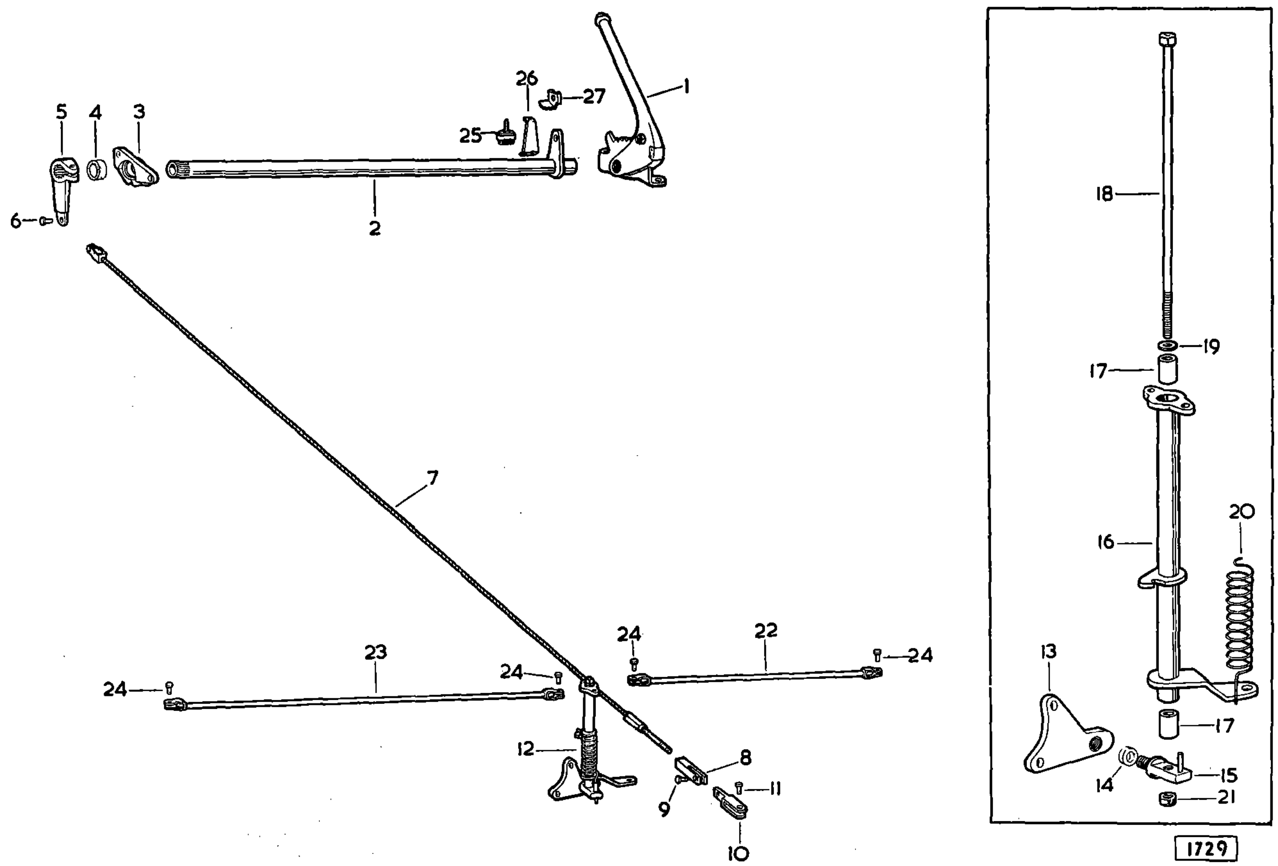

Fig. 18. Exploded view of handbrake actuating mechanism

1. Handbrake lever assembly
2. Cross shaft assembly
3. Shaft housing
4. Rubber seal
5. Handbrake lever to cable
6. Clevis pin
7. Primary cable
8. Rear forkend
9. Clevis pin
10. Universal jaw
11. Clevis pin
12. Compensator lever assembly
13. Rear axle bracket
14. Felt seal
15. Fulcrum pin assembly
16. Balance lever assembly
17. Bush bearing
18. Spindle assembly
19. Washer
20. Return spring
21. Nut
22. R.H. cable assembly
23. L.H. cable assembly
24. Clevis pin
25. Interrupter switch
26. Switch bracket
27. Switch operating bracket

Assembling

The assembling is the reverse of the dismantling procedure but particular attention must be given to the following points :—

(i) That the spring, hooked end first, is wound or screwed over the lever at the bottom end of the balance lever assembly until the straight end locates the face of the lever, the hooked end is left unattached at this juncture.

(ii) That the inside of the balance lever is well lubricated and the fulcrum pin assembly is fitted so the bottom lever is to the right-hand side of the spring anchoring tube, with the threaded shank furthest away and the straight end of the spring is fed into the spring anchoring tube.

(iii) The spindle is fitted and tightened sufficiently to remove all end float but still allow complete freedom of movement and then the lock nut on the underside of the fulcrum pin is fitted.

(iv) That the threaded boss of the mounting plate is well lubricated, the felt seal soaked in oil and then screwed on to the threaded shank of the fulcrum pin assembly to its fullest extent and then slackened off one full turn.

(v) That the fulcrum pin assembly is gripped in a vice and the spring preload sufficiently to hold the bottom lever onto the spring anchoring tube and then the spring is then hooked onto the anchorage in the centre of the balance lever assembly.

Refitting

The refitting is the reverse of the removal procedure but particular attention must be given to the following points :—

(i) That there is complete freedom of movement for all working parts.

(ii) That, after fitting, the handbrake is checked for correct adjustment.

THE BRAKE FLUID LEVEL AND HANDBRAKE WARNING LIGHT

Description

The brake fluid level and handbrake warning light, situated in the side facia panel, will indicate after the ignition has been switched on whether the brake fluid in the reservoir is at a low level or the handbrake has not reached the fully off position. This is effected by two switches, one in the top of the fluid reservoir and a second on the handbrake lever, being in circuit with a single warning lamp which is included in the ignition circuit.

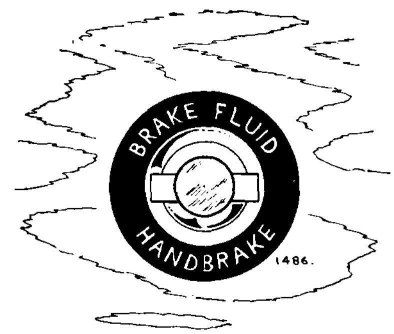

Fig. 19. Brake fluid level and handbrake warning light.

When the ignition is switched on and while the handbrake remains applied, the warning light will glow but will become extinguished when the handbrake is fully released with the brake fluid in the reservoir at a high level.

Should the warning light continue to glow after the handbrake has been fully released, it indicates that the brake fluid in the reservoir is at a very low level and the cause must be immediately determined and eliminated. Should the brake fluid be at a high level, the cause of the handbrake remaining on must be investigated.

Handbrake Warning Light Switch—Setting

A bracket mounted interrupter switch is attached to the floor assembly adjacent to the handbrake lever and a small right angle bracket on the latter contacts and depresses the plunger of the interrupter switch when the handbrake is placed in the " off " position.

Should the warning light fail to extinguish when the handbrake is in the " off " position, ensure the handbrake is moving the full length of its travel or the switch bracket has not become inadvertently off set before examining the leads for short circuiting or resetting the interrupter switch.

Examine the handbrake for full travel and the interrupter switch brackets for misplacement. Apply the handbrake and switch on the ignition when the warning light should glow, depress the plunger in the centre of the interrupter switch while observing the warning light ; should the light still continue to glow, check the brake fluid in the reservoir which may be at a low level and top up to the correct level. When the warning light ceases to glow re-position the switch in the mounting bracket by slackening and tightening the two nuts on the threaded shank of the switch.

THE VACUUM RESERVOIR AND CHECK VALVE

Description (Fig. 20)

The vacuum reservoir is incorporated in the vacuum line between the inlet manifold and the vacuum servo unit and it is located together with a stone guard in the front section of the right-hand front roadwheel arch. Its purpose is to provide a reserve of vacuum in the event of braking being required after the engine has stalled.

A vacuum check valve is fitted in the bottom end of the front face of the vacuum reservoir with the bottom-most connection communicating with the inlet manifold while the second connection communicates directly with the vacuum port of the vacuum servo unit thus any reduction of pressure inside the reservoir is conveyed to the vacuum servo unit.

Included in the inlet port of the check valve is a flat rubber spring-loaded valve and when there is a depression in the inlet manifold the valve is drawn away from its seat against its spring loading thus the interior of the reservoir becomes exhausted. When the depression in the reservoir becomes equal to that of the inlet manifold the valve spring will return the valve to its seat thus maintaining the highest possible degree of vacuum in the reservoir.

Removal

Firmly apply the handbrake, jack up the front of the car and remove the right-hand front roadwheel. Detach the vacuum reservoir and stone guard from the front of the roadwheel arch by removing three nuts and bolts. Identify and remove the two pipes from the check valve by slackening one hose clip each. Remove the stone guard from the vacuum reservoir by withdrawing four nuts and bolts. Unscrew the check valve from the bottom of the vacuum reservoir when necessary.

Refitting

The refitting is the reverse of the removal procedure but particular attention must be given to the following points :—

(i) That the rubber hose from the vacuum servo unit is attached to the pipe of the check valve having the two grooves in its body ; it is also the pipe nearest the screwed connection.

(ii) That the rubber hose from the inlet manifold is attached to the pipe of the check valve having two annular ribs in its body ; this pipe is moulded into the centre of the check valve cap.

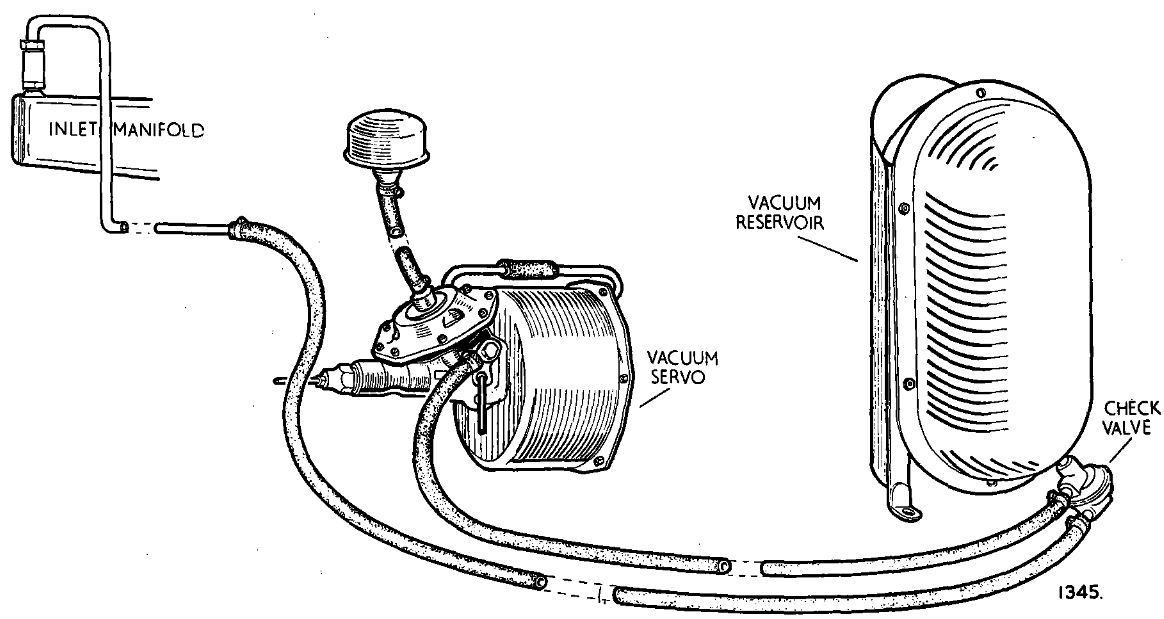

Fig. 20. Layout of vacuum servo system with reservoir.

THE LOCKHEED $6\frac{7}{8}''$ VACUUM SERVO UNIT

Description

The vacuum servo unit provides the driver with a degree of assistance when applying the foot brakes and it is installed in the hydraulic system between the master cylinder and the four brake calipers. The servo unit consists mainly of a servo piston, a hydraulic slave cylinder and an air control valve ; power for its operation is supplied by matching atmospheric pressure against the partial vacuum from the inlet manifold.

When the servo unit is in the released position, the servo piston is held " off " by means of a spring and whatever degree of vacuum exists in the vacuum reservoir is also present on each side of the booster piston.

As the brake pedal is depressed, hydraulic pressure created by the master cylinder causes the air control valve to admit atmospheric pressure which acts upon the outer face of the servo piston driving it inward and a rod attached to its centre boosts the hydraulic pressure within the slave cylinder thus assisting the driver in applying the brakes without any increase of foot pressure.

Operation (Fig. 21)

When the vacuum servo is at rest the air valve piston D and diaphragm assembly A are in the normal position with the vacuum valve B, of the combined vacuum and air valve B and C, open and with the air valve C closed, the latter being maintained in that position by a conical spring.

A pipe connection included in the slave cylinder body communicates with the vacuum reserve tank so that when the engine is running, vacuum is present within the chambers P and Q. Additionally, whatever degree of vacuum exists within chamber P will also be present in chamber N, through drillings in the conical centre of the diaphragm assembly A and in the chamber R through the external pipe. The air valve C, at the top end of the combined vacuum and air valve B and C, is held closed not only by the aforementioned spring but by the pressure differential across it, as atmospheric pressure is also present on the spring side.

Upon depressing the brake pedal, brake fluid is displaced from the master cylinder to the brake calipers via the slave cylinder incorporated in the vacuum servo unit and passes through a central drilling in the slave cylinder piston H, cup J, spring guide K and to the pipe line through adaptor M.

Meanwhile the hydraulic pressure generated by the master cylinder is felt upon the inner face of the air valve piston D which is displaced against the load of the centre diaphragm spring, this movement deflects the central portion of the diaphragm A until it closes to the vacuum valve B and the seal thus formed isolates the vacuum source from the chamber N, the pipe F and the chamber R.

Continued movement of the air valve piston D, due to a further build-up of pressure in the hydraulic system opens the air valve C, at the top of the combined air valve B and C permitting air to enter chamber N and pass to the chamber R via the external pipe F.

This reduction in the degree of vacuum, outward of the servo piston, causes the latter to move inward transmitting movement to the push rod E allowing it to contact the slave cylinder piston H, seal off the drilling in its centre, thus creating a locked line of brake fluid in the hydraulic system between the slave cylinder and the brake calipers when continued movement of the servo piston will increase the hydraulic pressure in the slave cylinder and the hydraulic system to the brake calipers, thereby assisting the driver in applying the brakes.

The reduction of the vacuum within the chamber N results in the creation of a pressure difference across the diaphragm A in opposition to the force applied by the master cylinder to the air valve piston D, when these opposing forces balance, the inward deflection of the diaphragm A allows the air valve C, at the top of the combined air valve B and C, to close on its seat and prevent any further entry of air.

Greater effort upon the brake pedal increases the hydraulic pressure upon the air valve piston D which re-opens the air valve C, at the top of the combined air valve B and C and allows more air to enter chamber R and thus a greater effort is performed by the servo piston ; when opposing forces on the diaphragm A are once more in balance the air valve C will again close on its seat. It will be apparent therefore, that the diaphragm A acts as a proportioning device, ensuring that the performance of the vacuum servo unit is substantially progressive.

When the brake pedal is released, hydraulic pressure is removed from the air valve piston D, allowing the diaphragm spring to return the diaphragm A to its normal position and thereby reconnecting the chambers N and R to the vacuum reserve tank. The return spring in the servo cylinder is then able to move the vacuum servo piston to the " off " position, causing the push-rod E to move away from the slave cylinder piston and so permit the brake fluid to return to the master cylinder and fluid reservoir.

It will be appreciated from the foregoing that although the servo assistance achieved is largely due to the vacuum supply, it will be realised that with the absence of outside air no such assistance would ever be maintained. Therefore, the cleanliness of the vacuum servo air cleaner cannot be over emphasized and it must be cleaned at the interval specified and when, after cleaning, a substantial increase of brake efficiency is noticed, the air cleaner must be serviced more frequently.

Removal

Open the engine compartment, firmly apply the handbrake, jack up the front of the car, remove the right-hand roadwheel and drain the hydraulic system at that brake caliper.

Remove the air cleaner hose from the central port in the air valve cover by slackening the hose clip, detach the vacuum reserve tank hose from the large

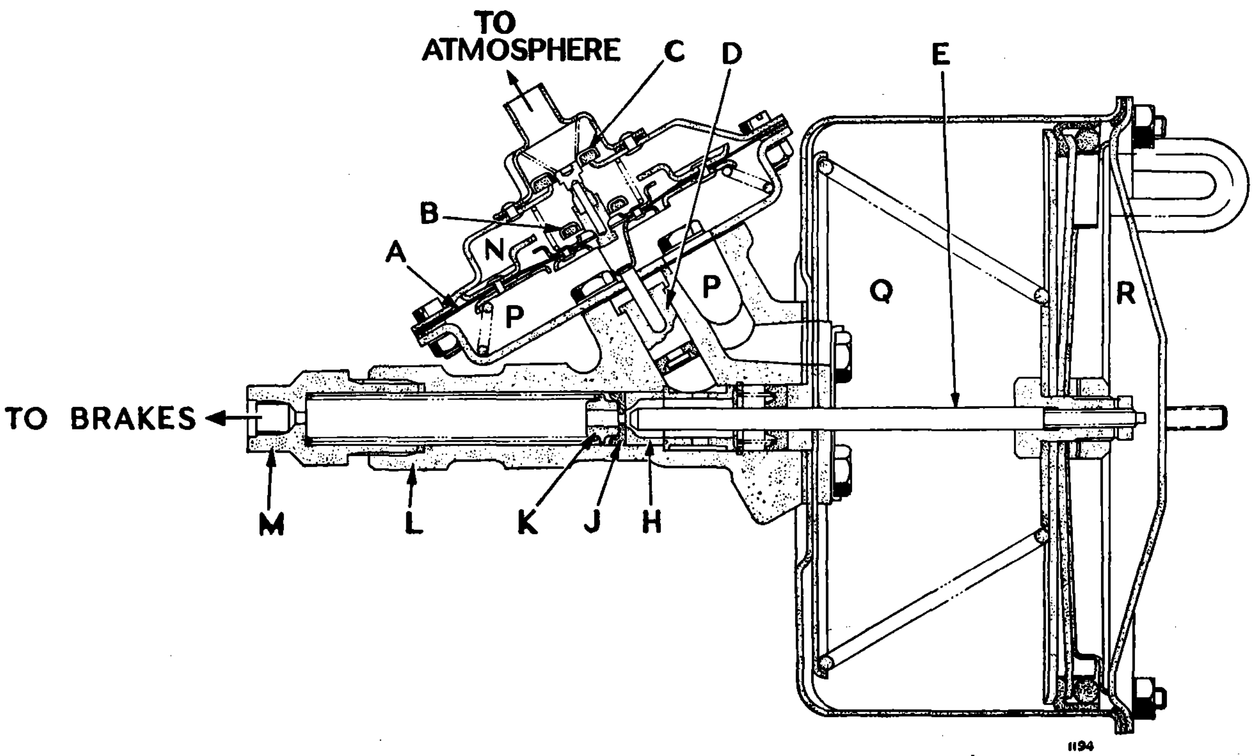

Fig. 21. Sectioned view of 6⅞" servo unit

A. Diagram assembly
B. Vacuum valve
C. Air valve
D. Air valve piston
E. Servo piston push rod
H. Slave cylinder piston
J. Rubber cup
K. Spring guide
L. Vacuum passage between chambers P and Q
M. Adaptor
N. Chamber, above diaphragm assembly
P. Chamber, below diaphragm assembly
Q. Chamber, inner (vacuum) side of servo piston
R. Chamber, outer side of servo piston ; vacuum when brakes are off, atmospheric pressure when brakes are being applied.

slave cylinder connection by withdrawing a banjo bolt, remove the rigid hydraulic pipe lines from the top and end slave cylinder connections by withdrawing the two union nuts.

Detach the servo unit clamp and support block on the cylindrical body of the slave cylinder from the right-hand wing valance inside the engine compartment by removing two nuts and bolts. Withdraw the vacuum servo unit and supporting cowl from inside the right-hand front roadwheel arch by removing eight bolts. Detach the vacuum servo unit from the supporting cowl by removing three nuts.

Dismantling (Fig. 22)

Ease the flexible hose on the air valve cover to servo cylinder pipe to one side. Identify the circumferential position of the servo cylinder end cover and the position of the three long bolts. Remove the servo cylinder end cover and gasket from the servo cylinder, exercising care to control the released tension of the servo piston slave cylinder push rod assembly and return spring from the servo cylinder. Do not disturb the position of the slave cylinder push rod unless it is absolutely necessary, this can be effected by tapping the push rod to the hexagon head of the centre piece.

Grip the slave cylinder push rod in the protected jaws of a vice and remove the small nut from the second end of the push rod without disturbing the position of the servo piston. Grip the large hexagon of the servo piston centre piece in the vice and remove the components mounted on the centre piece by detaching a nut at the opposite end, commencing with the end stop with wick mounted thereon by the barbed wick retainer, piston plate, leather cup, ' O ' ring seal, second piston plate and locating washer ; the centre piece can now be removed from the vice and the small nut fitted to the protruding threaded end of the slave cylinder push rod, exercising care not to disturb the circumferential position of either component part.

Remove the slave cylinder body end gasket from the front of the servo cylinder by withdrawing four bolts and an abutment plate inside the servo cylinder and withdrawing the spigot, rubber cup, cup spreader and spring from inside the slave cylinder bore. Withdraw the spring, spring guide, rubber cup and slave cylinder body by withdrawing the end adaptor and ejecting the components through the threaded end of the slave cylinder bore utilizing a soft nosed drift. Remove the washer and distance piece from the servo cylinder end of the slave cylinder body by withdrawing the internal circlip.

Identify the circumferential position and remove the air valve cover and gasket from the control valve housing exercising care to control the released tension of the two diaphragm springs. Withdraw the diaphragm, gasket and spring. Remove the control valve housing and gasket from the slave cylinder body by withdrawing four bolts. The combined air valve cannot be removed from the air valve cover.

Expel the air valve piston from the slave cylinder body by closing the straight through bore at both ends and applying low air pressure to the small port in the side of the slave cylinder body. Remove the rubber seal from the bottom end of the air valve piston.

Assembling (Fig. 22)

Assembling is the reverse of the removal sequence but particular attention must be given to the following points :—

(i) That the hydraulic system component parts are liberally coated with brake fluid and the leather cup, wick and servo cylinder are liberally coated with Shell Tellus 33 oil ; it is important that the latter oil is not allowed to infiltrate into the hydraulic system or to contact any of the non-metallic component parts therein.

(ii) That the air control valve housing and gasket are secured to the side face of the slave cylinder and the air valve cover fitted according to the circumferential indentification marks align and bolts and screws tighten to 100/120 and 150 lbs./ins. respectively.

(iii) That a servo piston assembly ring is fabricated to the following dimensions :

Internal diameter ..	6.920—6.910″ (175.77—175.51 mm.)
External diameter .. (approx.)	7.050″ (179.07 mm.)
Depth..	1.000″ (25.4 mm.)

A section cut from a discarded servo cylinder is a speedy solution.

(iv) That the servo piston assembly ring is laid on a bench top and the large piston plate is positioned inside turned up edge face first, followed by the leather cup flat face first, a rubber ' O ' ring and a second piston plate flat face first the ' O ' ring being aligned to the centre drillings in the piston plates. The wick is positioned inside the leather cup followed by the metal retainer, barbs outermost and push the bent end of the retainer inward

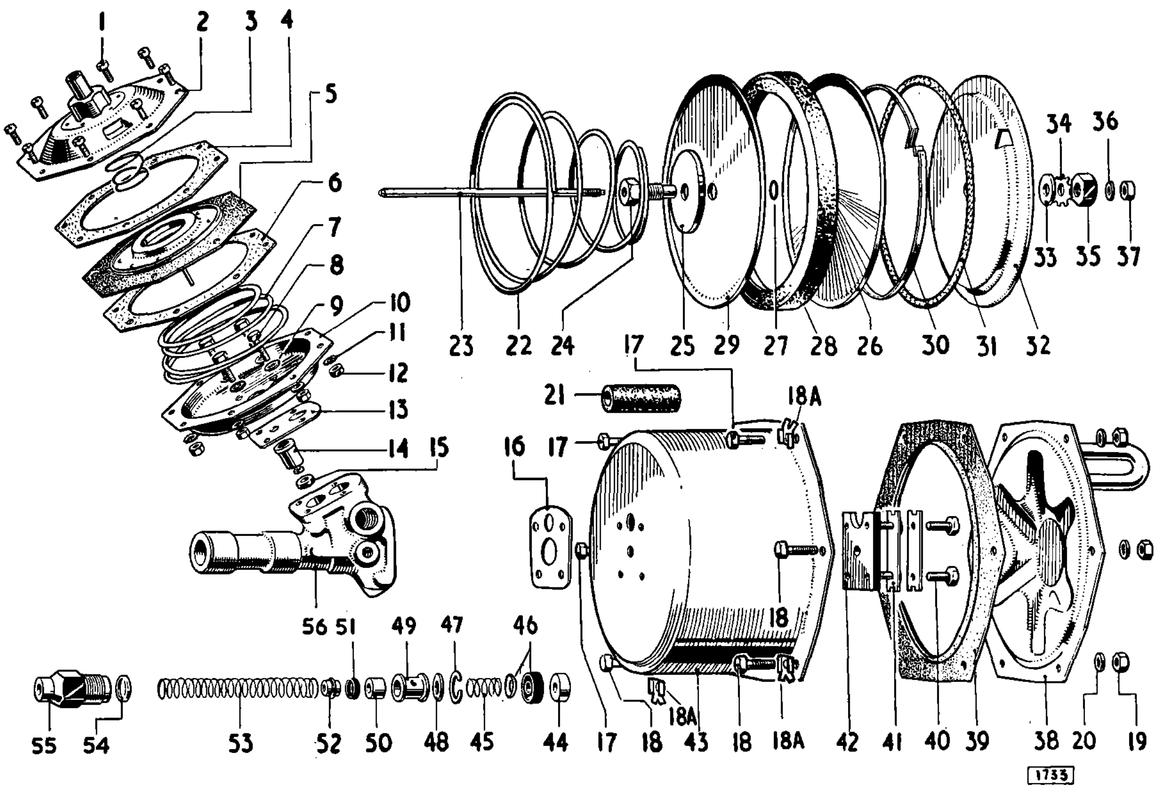

Fig. 22. Exploded view of $6\frac{7}{8}$" servo unit.

1. Valve cover screws
2. Valve and cover assembly
3. Diaphragm return spring
4. Gasket
5. Diaphragm
6. Gasket
7. Diaphragm balance spring
8. Valve housing bolts
9. Shakeproof washers
10. Valve housing
11. Shakeproof washers
12. Nuts
13. Gasket
14. Air valve piston
15. Piston seal
16. Gasket
17. Short bolt
18. Long bolt
18a. Tab washer
19. Nut
20. Shakeproof washer
21. Connecting hose
22. Servo piston return spring
23. Servo/slave cylinder push rod
24. Adjusting nut
25. Locating washer
26. Outer piston plate
27. Piston plate 'O' ring
28. Leather cup
29. Inner piston plate
30. Wick retainer
31. Wick
32. End stop
33. Washer
34. Shakeproof washer
35. Nut
36. Copper washer
37. Nut on push rod
38. Servo cylinder cover and pipe
39. Gasket
40. Bolt
41. Tab washer
42. Abutment plate
43. Servo cylinder body
44. Spigot
45. Short spring
46. Spigot cup
47. Circlip
48. Washer
49. Distance piece
50. Piston
51. Piston seal
52. Spring guide
53. Long spring
54. Copper washer
55. Adaptor
56. Slave cylinder body

and backwards to engage the fork with the tongue of the second end.

Place the piston end stop, flat face first, on top of the wick and retainer so the cutaway portion of the end stop locates the join of the wick retainer and leave the complete assembly inside the ring.

(v) That the servo cylinder push rod is fitted to the servo piston centre piece and mounted by the hexagon of the latter in a vice exercising care not to damage the highly polished face of the push rod, lift the servo piston, assembled in the ring, from the bench top and with a locating washer mounted on the threaded shank of the centre piece or the piston and stop is upward and secure with a backing washer, shakeproof washer and nut, fit a copper washer and nut to the protruding thread of the push rod.

(vi) That the inside of the servo cylinder is smeared with lubricant and the piston return spring, large end leading, inserted inside ; engage the servo piston with the small end of the spring and apply sufficient pressure to move the servo piston into the cylinder from the assembly ring, remove the latter and depress the latter several times to ensure it returns unassisted and there is no excessive friction between the leather cup and cylinder face, pour 25 c.c.'s of the specified servo cylinder lubricant into the end stop of the servo cylinder so it can soak into the wick and leather cup while exercising care to ensure the spring does not eject the piston.

(vii) That the rubber gasket is located on the inside face of the end cover with a smear of lubricant and so its shape conforms to the inside contour of the end cover, this is offered up to the servo cylinder so the circumferential identification markings align and secure temporarily with the three short bolts.

(viii) That the servo cylinder push rod and slave cylinder clearance is checked and adjusted by inserting the slave cylinder piston, hollow end first, to the bottom of the slave cylinder bore and utilizing a depth gauge measure the depth of the slave cylinder piston below the end face of the slave cylinder bore and the depth gauge moved to the centre and the depth of the push rod end face below the end face of the slave cylinder bore is measured. The difference is calculated by subtracting the slave cylinder depth dimensions from the push rod depth dimensions and this should be between 0.060"—0.070" (1.52—1.78 mm.). The clearance is adjusted by removing the servo

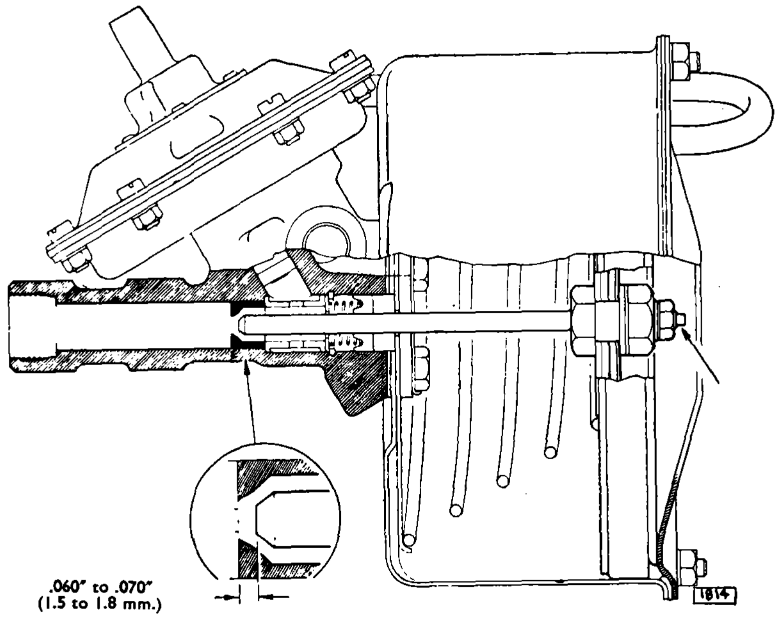

Fig. 23. When assembled there must be .060" to .070" (1.5 to 1.8 mm.) clearance between the end of the push rod and the piston. The clearance is adjusted by means of a screwdriver at the point indicated by the arrow.

cylinder end cover and while preventing the servo piston from being ejected, slacken the small nut in the centre of the stop plate and rotating the end of the push rod with a screwdriver, then tightening the nut ; one rotation of the push rod moves the push rod 0.035" (0.89 mm.) rotating the screwdriver clockwise reduces the clearance while anti-clockwise rotation increases it.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :—

(i) That rubber grommets together with the spacers inside are fitted to the three mounting studs of the vacuum servo unit and the slave cylinder support block.

(ii) That the hydraulic system is bled of air as detailed under " Bleeding the Hydraulic System ".

(iii) That the vacuum servo air cleaner is serviced.

SUPPLEMENTARY INFORMATION
TO SECTION L
"BRAKES"

covering

SELF-ADJUSTING HANDBRAKES

Commencing Chassis Numbers:

	Right-Hand Drive	Left-Hand Drive
2·4 Litre	108998	126479
3·4 Litre	156343	177360
3·8 Litre	205633	217696

SELF-ADJUSTING HANDBRAKES

DESCRIPTION

The self-adjusting handbrakes fitted to later models are attached to the rear brake caliper bodies but form an independent mechanically actuated system carrying its own friction pads. The handbrakes are self-adjusting to compensate for friction pad wear and automatically provide the necessary clearance between the brake discs and the friction pads.

OPERATION

When the handbrake lever in the car is operated, the operating lever (A, Fig. 24) is moved away from the friction pad carrier (B) and draws the friction pads (F) together. Under normal conditions when the lever is released the pawl (C) in the adjusting mechanism returns to its normal position, thus the normal running clearance between the brake disc and the friction pads is maintained.

In the event of there being increased clearance, the pawl will turn the ratchet nut (D) on the bolt thread drawing the adjuster bolt (E) inwards and bringing the friction pads closer to the brake disc until the normal running clearance is restored.

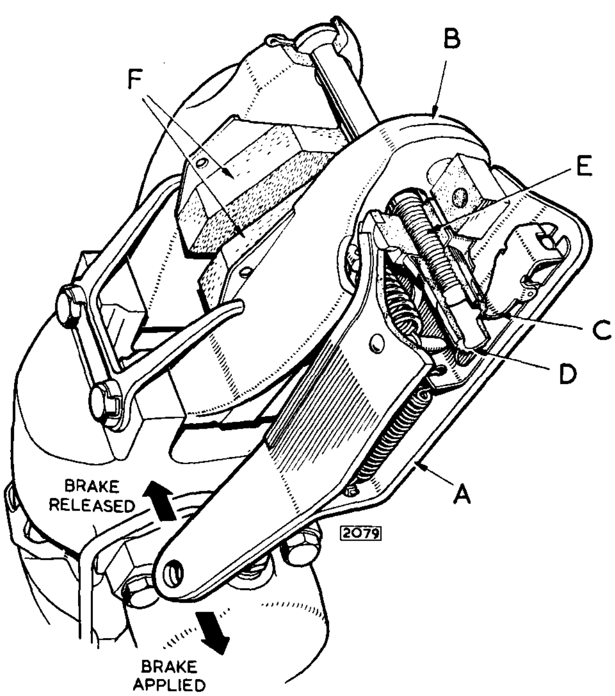

Fig. 24. Sectioned view of the adjusting mechanism.

REMOVAL

Securely chock the front roadwheel, release the handbrake, select neutral, jack up the rear of the car and remove the rear roadwheels. Detach the brake cable from the handbrake operating lever by discarding the split pin and withdrawing the clevis pin. Lift the locking tabs and remove the pivot bolts and retraction plate. Detach the friction pad carriers from the top of the caliper bridge. Repeat for the second handbrake.

DISMANTLING

Remove the cover securing bolt, discard the split pin and withdraw the pivot clevis pin. Remove the dust cover and remove the split pin from the screwdriver slot in the adjusting bolt. Unscrew the adjusting bolt from the ratchet nut and withdraw the nut and bolt. Detach the pawl return spring and withdraw the pawl over the locating dowel. Detach the operating lever return spring and remove the operating lever and lower cover plate.

ASSEMBLING

Assembly is the reverse of the dismantling procedure.

REFITTING

Refitting is the reverse of the removal procedure but the handbrake should be set as follows :—

With the split pin removed from the screwdriver slot in the adjusting bolt, screw the bolt in or out until there is a distance of $\frac{7}{16}$" (11.1 mm.) between the friction pads, that is, the thickness of the disc plus $\frac{1}{16}$" (1.5 mm.).

Refit the split pin and refit the caliper to the car.

Pull and release the operating lever at the caliper repeatedly when the ratchet will be heard to " click-over ". Repeat the operation until the ratchet will not operate which will indicate that the correct clearance is maintained between the disc and the friction pads.

Connect up the two cross cables to the operating levers and check the cable adjustment as follows :—

HANDBRAKE CABLE ADJUSTMENT

Fully release the handbrake lever in the car. Slacken the locknut at the rear end of the main cable.

Adjust the length of the main cable by screwing the threaded end of the cable into the fork end to a point just short of where the handbrake operating levers at the calipers start to move. Check the adjustment by pressing each handbrake operating lever at the same time towards the calipers ; if the top of the compensator on the rear axle tends to move appreciably the cable is too tight.

When correctly adjusted a certain amount of slackness in the cables will be apparent ; no attempt should be made to place the cables under tension, otherwise the handbrakes may bind.

Cast Iron Brake Cylinders

Commencing Chassis Numbers

	R.H. Drive	L.H. Drive
2.4 litre with disc wheels	106897	126283
2.4 litre with wire wheels	106839	126295
3.4 litre with disc wheels	154315	176964
3.4 litre with wire wheels	154321	176938
3.8 litre with disc wheels	203627	216474
3.8 litre with wire wheels	203576	216374

On cars with the above chassis numbers and onwards, cast iron brake cylinder blocks replace the malleable iron.

With this change, the self adjustment is modified. The spring washer shown in Fig. 2, page L.5, is no longer used, retraction being by means of a coil spring located in the piston.

Also, whereas the original type had a separate piston and backing plate, Fig. 14, page L.14, the new type is of integral construction with no end plate.

It is therefore necessary when removing or replacing the piston seal or dust seal, to stretch the rubber over the piston. When replacing the piston seal, lubricate the seal with the brake fluid. Take care not to damage the inside surface of the seal or the groove in the piston.

Brake Bleed Nipples

Commencing Chassis Numbers

	R.H. Drive	L.H. Drive
2.4 litre	117537	127516
3.4 litre	166443	179812
3.8 litre	232583	223561

Commencing at the above chassis numbers, the position of the brake bleed nipple is changed from the outside to the inside of each caliper. The hydraulic pipes are modified to suit.

This arrangement allows the brakes to be bled with the wheels in position if desired.

Brake Disc Shields

Commencing Chassis Numbers

	R.H. Drive	L.H. Drive
2.4 litre	118052	127636
3.4 litre	167631	179994
3.8 litre	233264	223960

Commencing at the above chassis numbers, dust shields are fitted to the inside of the brake discs to reduce the tendency for the inner brake pad to wear more quickly than the outer pad.

Handbrake Alignment

Commencing Chassis Numbers

	R.H. Drive	L.H. Drive
2.4 litre	119356	127868
3.4 litre	169632	180262
3.8 litre	234395	224207

From the above chassis numbers onwards the retraction plates fitted to the handbrake calipers are "handed".

It is ESSENTIAL that these retraction plates are fitted in the correct position.

IMPORTANT

To check for the correct hand, lay the plates on a flat surface with the prongs and locating extensions projecting upwards.

It will be seen that one of the plates has a square cut face uppermost. This retraction plate **MUST ALWAYS** be fitted to the left-hand caliper.

Fitting

Place the prongs of the retraction plates in the holes in the pad carriers.

Position the lower locating extension of the plates between the upper and lower bridge clamps and secure the clamps to the caliper with two set screws and locking tabs.

Check that the retraction plate location extension is free to move between the bridge clamps when secured and that the handbrake mechanism is operating satisfactorily.

BRAKES

Chassis Number

128156	2.4 L.H. Drive
121082	2.4 R.H. Drive
180814	3.4 L.H. Drive
171380	3.4 R.H. Drive
224654	3.8 L.H. Drive
235263	3.8 R.H. Drive

Commencing at the above chassis numbers. Girling brake master cylinders and relevant piping replace the Dunlop units previously employed.

The principle of operation, removal and refitting details are similar to those described in Section L but dismantling and assembly procedures differ and are given below.

Dismantling

Release the crimping and withdraw the metal end-cap. Remove the circlip from the groove in the top of the cylinder bore. Withdraw the push rod, retaining dished washer and dust seal. The piston and its associated non-return valve will slide from the bore of the cylinder aided by the return spring.

Lift the prong of the spring seat out of the piston recess and withdraw the plunger and spring retainer. Remove the non-return valve seal and the piston seal and discard.

Clean all parts throughly in methylated spirits or brake fluid and examine the bore of the cylinder for pitting.

Lubricate new seals with brake fluid and fit to their respective positions on the piston and non-return valve.

Re-assembling

The master cylinder is re-assembled by reversing the dismantling procedure. Ensure perfect cleanliness throughout the operation and wet all parts with fresh brake fluid.

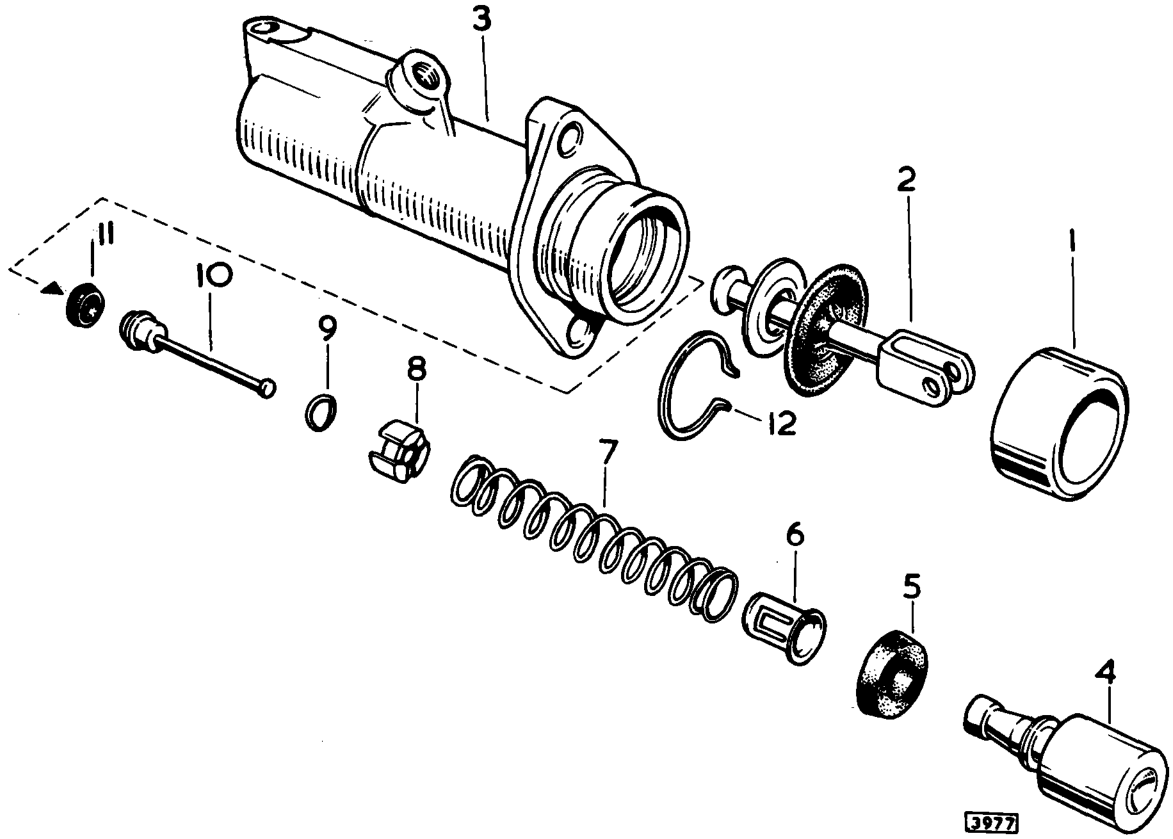

Fig. No. 25 Exploded view of Girling Brake Master Cylinder.

1. End cap.
2. Push rod assembly.
3. Body.
4. Piston.
5. Piston seal.
6. Spring seat.
7. Return spring.
8. Plunger.
9. Waved washer.
10. Valve piston.
11. Valve seal.
12. Circlip.

SECTION M

WHEELS AND TYRES

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

INDEX *(continued)*

TUBELESS TYRES

WHEELS AND TYRES

DESCRIPTION

Dunlop Gold Seal Tyres were fitted to early production 2.4 litre cars, tubeless type to the disc wheels and a tyre and tube to wire spoke wheels. Later production 2.4 litre cars are fitted with Dunlop Road Speed R.S.5 Tyres and Tubes.

Dunlop Road Speed R.S.4 Tyres and Tubes were fitted to early production 3.4 and 3.8 litre cars whether they were equipped with disc wheels or wire wheels. Later production 3.4 and 3.8 litre cars are fitted with Dunlop Road Speed R.S.5 Tyres and Tubes.

DATA

Roadwheel

Type—standard equipment	Pressed steel disc
—optional equipment	Wire spoke
Fixing—press steel disc	Five studs and nuts
—wire spoke	Centre lock, knock on hub cap
Rim section—disc (early cars)	$4\frac{1}{2}$ J
—disc (later cars)	5 J
—wire spoke	5 K
Rim diameter—all types	15″ (381 mm.)

Tyres

Make—all types	Dunlop
Type—(early 2.4 litre cars)	Gold Seal
—(later 2.4 litre cars)	Road Speed R.S.5
—(early 3.4 and 3.8 litre cars)	Road Speed R.S.4
—(later 3.4 and 3.8 litre cars)	Road Speed R.S.5
Size	6.40 × 15 (162.1 mm. — 381 mm.)

INFLATION PRESSURES

PRESSURES SHOULD BE CHECKED WHEN THE TYRES ARE **COLD**, SUCH AS STANDING OVERNIGHT, AND **NOT** WHEN THEY HAVE ATTAINED THEIR NORMAL RUNNING TEMPERATURES.

On all the models it is advisable to increase the REAR tyre pressure by 4 lbs. per sq. in. (.28 kg./cm.^{2}) when undertaking a long journey with a full load of passengers and luggage.

2.4 LITRE MODEL

DUNLOP GOLD SEAL C.41 (TUBELESS) TYRES

	Front	Rear
For conditions where maximum performance with sustained speeds is being used, or for touring conditions where the car is fully laden :	33 lb/in^2 (2,3 kg/cm^2)	33 lb/in^2 (2,3 kg/cm^2)
For normal motoring with maximum speed up to 90 m.p.h. (145 k.p.h.)	28 lb/in^2 (2,0 kg/cm^2)	28 lb/in^2 (2,0 kg/cm^2)

For two-up normal motoring to give maximum comfort it is permissible and may be found desirable to reduce the rear tyre pressures by 3 lb/in (0,2 kg/cm).

2.4, 3.4 and 3.8 litre Mark 2

DUNLOP RS5 TYRES

	Front	Rear
For conditions where maximum performance with sustained speeds is being used, or for touring conditions where the car is fully laden :	33 lb/in^2 (2,3 kg/cm^2)	33 lb/in^2 (2,3 kg/cm^2)
For normal motoring with maximum speed up to 110 m.p.h. (176 k.p.h.)	28 lb/in^2 (2,0 kg/cm^2)	28 lb/in^2 (2,0 kg/cm^2)

For two-up normal motoring to give maximum comfort it is permissible and may be found desirable to reduce the rear tyre pressures by 3 lb/in^2 (0,2 kg/cm^2).

DUNLOP SP 41 TYRES (OPTIONAL)

	Front	Rear
For conditions where maximum performance with sustained speeds is being used, or for touring conditions where the car is fully laden :	36 lb/in^2 (2,5 kg/cm^2)	36 lb/in^2 (2,5 kg/cm^2)
For normal motoring with maximum speed up to 100 m.p.h. (160 k.p.h.)	30 lb/in^2 (2,1 kg/cm^2)	30 lb/in^2 (2,1 kg/cm^2)

For two-up normal motoring to give maximum comfort it is permissible and may be found desirable to reduce the rear tyre pressures by 3 lb/in^2 (0,2 kg/cm^2).

TYRES—GENERAL INFORMATION

CONSTRUCTION OF THE TYRE

One of the principal functions of the tyres fitted to a car is to eliminate high frequency vibrations. They do this by virtue of the fact that the unsprung mass of each tyre—the part of the tyre in contact with the ground—is very small.

Tyres must be flexible and responsive. They must also be strong and tough to contain the air pressure, resist damage, give long mileage, transmit driving and braking forces, and at the same time provide road grip, stability and good steering properties.

Strength and resistance to wear are achieved by building the casing from several plies of cord fabric, secured at the rim position by wire bead cores, and adding a tough rubber tread. (Fig. 1).

Part of the work done in deflecting the tyres on a moving car is converted into heat within the tyres. Rubber and fabric are poor conductors and internal heat is not easily dissipated. Excessive temperatures weakens the tyre structure and reduces the resistance of the tread to abrasion by the road surface.

Heat generation, comfort, stability, power consumption, rate of tread wear, steering properties and other factors affecting the performance of the tyres and car are associated with the degree of tyre deflection. All tyres are designed to run at predetermined deflections, depending upon their size and purpose.

Load and Pressure Schedules are published by all tyre makers and are based on the correct relationship between tyre deflection, tyre size, load carried and inflation pressure. By following the recommendations the owner will obtain the best results both from the tyres and the car.

INFLATION PRESSURES

Tyres lose pressure, even when in sound condition, due to a chemical diffusion of the compressed air through the tube walls. The rate of loss in a sound tyre is usually between 1 lb. and 3 lb. per week, which may average 10% of the total initial pressure.

For this reason, and with the additional purpose of detecting slow punctures, **pressures should be checked with a tyre gauge applied to the valve not less than once per week.** (See under " Data " for correct pressures.)

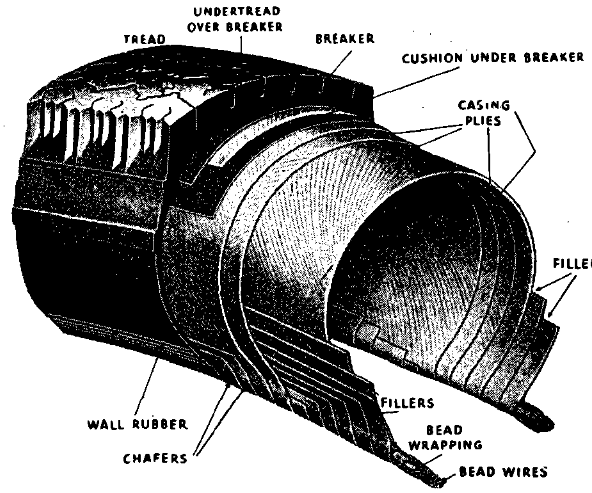

Fig. 1. Diagramatic illustration of the principle of tyre construction.

Any unusual pressure loss should be investigated. After making sure that the valve is not leaking the tube should be removed for a water test.

Do not overinflate, and do not reduce pressures which have increased owing to increased temperature. (See Section " FACTORS AFFECTING TYRE LIFE AND PERFORMANCE ".)

VALVE CORES AND CAPS

Valve cores are inexpensive and it is a wise precaution to renew them periodically.

Valve caps should always be fitted and renewed when the rubber seatings have become damaged after constant use.

TYRE EXAMINATION

Tyres on cars submitted for servicing should be examined for :

- Inflation pressures
- Degree and regularity of tread wear
- Misalignment
- Cuts and penetrations
- Small objects embedded in the treads, such as flints and nails
- Impact bruises
- Kerb damage on walls and shoulders
- Oil and grease
- Contact with the car

Oil and grease should be removed by using petrol sparingly. Paraffin is not sufficiently volatile and is not recommended.

If oil or grease on the tyres results from over lubrication or defective oil seals suitable correction should be made.

REPAIR OF INJURIES

Minor injuries confined to the tread rubber, such as from small pieces of glass or road dressing material, require no attention other than the removal of the objects. Cold filling compound or "stopping" is unnecessary in such cases.

More severe tread cuts and wall rubber damage, particularly if they penetrate to the outer ply of the fabric casing, require vulcanised repairs. The Dunlop Spot Vulcanising Unit is sold for this purpose and it is also suitable for all types of tube repairs.

Injuries which extend into or through the casing, except clean nail holes, seriously weaken the tyre. Satisfactory repair necessitates new fabric being built in and vulcanised. This requires expensive plant and should be undertaken by a tyre repair specialist or by the tyre maker.

Loose gaiters and "stick-in" fabric repair patches are not satisfactory substitutes for vulcanised repairs and should be used only as a temporary "get-you-home" measure if the tyre has any appreciable tread remaining. They can often be used successfully in tyres which are nearly worn out and which are not worth the cost of vulcanised repairs.

Clean nail holes do not necessitate cover repairs. If a nail has penetrated the cover the hole should be sealed by a tube patch attached to the inside of the casing. This will protect the tube from possible chafing at that point.

If nail holes are not clean, and particularly if frayed or fractured cords are visible inside the tyre, expert advice should be sought.

FACTORS AFFECTING TYRE LIFE AND PERFORMANCE

Inflation Pressures

Other things being equal there is an average loss of 13% tread mileage for every 10% reduction in inflation pressure below the recommended figure.

The tyre is designed so that there is minimum pattern shuffle on the road surface and a suitable distribution of load over the tyre's contact area when deflection is correct.

Moderate underinflation causes an increased rate of tread wear although the tyre's appearance may remain normal.

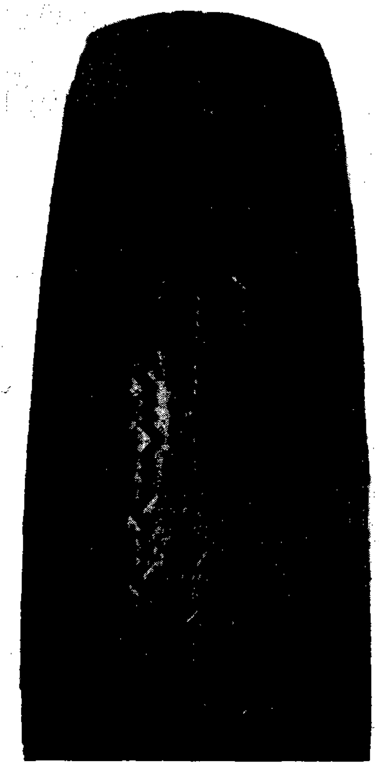

Fig. 2. Excessive tyre distortion from persistent underinflation causes rapid wear on the shoulders and leaves the centre standing proud.

Severe and persistent underinflation produces unmistakable evidence on the tread (Fig. 2). It also causes structural failure due to excessive friction and temperature within the casing. (Figs. 3 and 4).

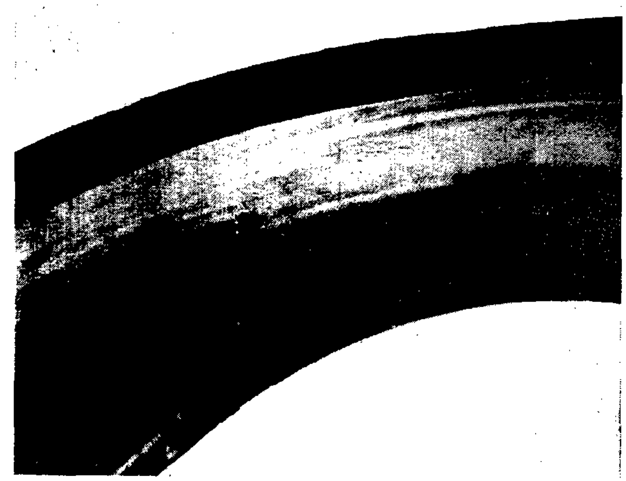

Fig. 3. The case is breaking up due to over-flexing and heat generation.

Fig. 4. Running deflated has destroyed this cover.

Pressures which are higher than those recommended for the car reduce comfort. They may also reduce tread life due to a concentration of the load and wear on a smaller area of tread, aggravated by increased wheel bounce on uneven road surfaces. Excessive pressures overstrain the casing cords, in addition to causing rapid wear, and the tyres are more susceptible to impact fractures and cuts.

Effect of Temperature

Air expands with heating and tyre pressures increase as the tyres warm up. Pressures increase more in hot weather than in cold weather and as the result of high speed. These factors are taken into account when designing the tyre and in preparing Load and Pressure Schedules.

Pressures in warm tyres should not be reduced to standard pressures for cold tyres. " Bleeding " the tyres increases their deflections and causes their temperatures to climb still higher. The tyres will also be underinflated when they have cooled.

Speed

High speed is expensive and the rate of tread wear may be twice as fast at 50 m.p.h. (80 k.p.h.) as at 30 m.p.h. (48 k.p.h.)

High speed involves :

1. Increased tyre temperature due to more deflections per minute and a faster rate of deflection and recovery. The resistance of the tread to abrasion decreases with increase in temperature.
2. Fierce acceleration and braking.
3. More tyre distortion and slip when negotiating bends and corners.
4. More " thrash " and " scuffing " from road surface irregularities.

Braking

" Driving on the brakes " increases rate of tyre wear, apart from being generally undesirable. It is not necessary for wheels to be locked for an abnormal amount of tread rubber to be worn away.

Climatic Conditions

The rate of tread wear during a reasonably dry and warm summer can be twice as great as during an average winter.

Water is a rubber lubricant and tread abrasion is much less on wet roads than on dry roads. Also the resistance of the tread to abrasion decreases with increase in temperature. Increased abrasion on dry roads, plus increased temperatures of tyres and roads cause faster tyre wear during summer periods. For the same reason tyre wear is faster during dry years with comparatively little rainfall than during wet years.

When a tyre is new its thickness and pattern depth are at their greatest. It follows that heat generation and pattern distortion due to flexing, cornering, driving and braking are greater than when the tyres are part worn.

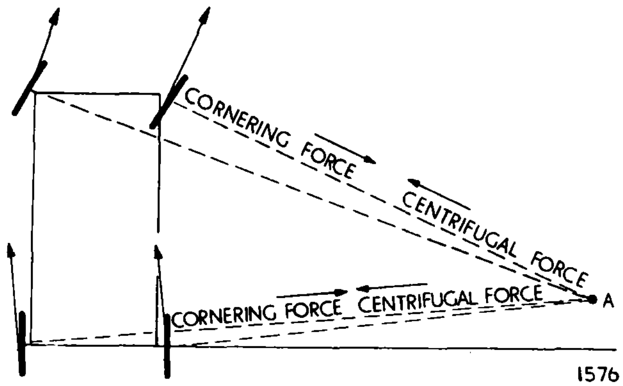

Fig. 5. Slip when cornering causes increased tyre wear.

Road Surface

The extent to which road surfaces affect tyre mileage is not always realised.

Present day roads generally have a better non skid surface than formerly. This factor, combined with improved car performance, has tended to cause faster tyre wear, although developments in tread compounds and patterns have done much to offset the full effects.

Road surfaces vary widely between one part of the country and another, often due to surfacing with local materials. In some areas the surface dressing is coarser or of larger " mesh " than in others. The material may be comparatively harmless gravel or more abrasive crushed granite or knife edged flint. Examples of surfaces producing very slow tyre wear are smooth stone setts and wood blocks but their non-skid properties are poor.

Bends and corners are severe on tyres because a car can be steered only by misaligning its wheels relative to the direction of the car. This condition applies to the rear tyres as well as to the front tyres. The resulting tyre slip and distortion increase the rate of wear according to speed, load, road camber and other factors. (Fig. 5.)

Road camber is a serious factor in tyre wear and the subject is discussed on page 11.

An analysis of tyre performance **must** include road conditions.

Impact Fractures

In order to provide adequate strength, resistance to wear, stability, road grip and other necessary qualities, a tyre has a certain thickness and stiffness. Excessive and sudden local distortion such as might result from striking a kerb, a large stone or brick, an upstanding manhole cover, or a deep pothole may fracture the casing cords. (Figs. 6 and 7.)

Fig. 6. Severe impact has fractured the casing.

Impact fractures often puzzle the car owner because the tyre and road spring may have absorbed the impact without his being aware of anything unusual ; only one or two casing cords may be fractured by the blow and the weakened tyre fails some time later ; there is usually no clear evidence on the outside of the tyre unless the object has been sufficiently sharp to cut it.

This damage is not associated solely with speed and care should be exercised at all times, particularly when drawing up to a kerb or parking against one.

" Spotty " Wear

Fig. 8 shows a type of irregular wear which sometimes develops on front tyres and particularly on near front tyres. The causes are difficult to diagnose although evidence of camber wear, misalignment, underinflation or braking troubles may be present.

Front tyres are at a disadvantage due to their fore and aft slip and distortion being in one direction.

Fig. 7. A double fracture caused by the tyre being crushed between the rim and an obstacle, such as the edge of a kerb.

Front tyres are connected to the car through swivelling stub axles and jointed steering linkage and they are subjected to complicated movement resulting from steering, spring deflection, braking and camber. Load transfer during braking causes increased loading and pattern displacement on front tyres, and adds to the severity of front tyre operation.

Unbalance of the rotating assembly may also contribute to a special form of irregular wear with one half of the tyre's circumference more worn than the other half. Unbalance alone does not cause the type of " spotty " wear illustrated but the unbalance usually becomes progressively worse as the irregular or unequal wear develops.

The nature of " spotty-wear "—the pattern being much worn and little worn at irregular spacings round the circumference—indicates an alternating " slip-grip " phenomenon but it is seldom possible to associate its origin and development with any single cause.

It is preferable to check all points which may be contributory factors. The front tyre and wheel assemblies may then be interchanged, which will also reverse their direction of rotation.

Points for checking are :

(a) Inflation pressures and the consistency with which the pressures are maintained.

(b) Sticking caliper pistons.

(c) Wheel alignment.

(d) Camber and similarity of camber of the front wheels.

(e) Play in hub bearings, suspension bearings and steering joints.

(f) Wheel concentricity at the tyre bead seats. S.M.M. & T. tolerances provide for a radial throw out exceeding $\frac{3}{32}''$ (2.38 mm.), but this may be affected by impact or other damage.

(g) Balance of the wheel and tyre assemblies.

(h) Condition of road springs and shock absorbers.

Fig. 8. Irregular " spotty " wear, to which a variety of causes may contribute.

Corrections which may follow a check of these points will not always effect a complete cure and it may be necessary to continue to interchange wheel positions and reverse directions of rotation at suitable intervals.

Irregular wear may be inherent in the local road conditions such as from a combination of steep camber, abrasive surfaces, and frequent hills and bends. Driving methods may also be involved. Irregular wear is likely to be more prevalent in summer than in winter, particularly on new or little worn tyres.

WHEEL ALIGNMENT AND ITS ASSOCIATION WITH ROAD CAMBER

It is very important that correct wheel alignment should be maintained. Misalignment causes a tyre tread to be scrubbed off laterally because the natural direction of the wheel differs from that of the car.

An upstanding sharp " fin " on the edge of each pattern rib is a sure sign of misalignment and it is possible to determine from the position of the " fins " whether the wheels are toed in or toed out. (Fig. 9.)

Fig. 9. Fins or feathers caused by severe misalignment.

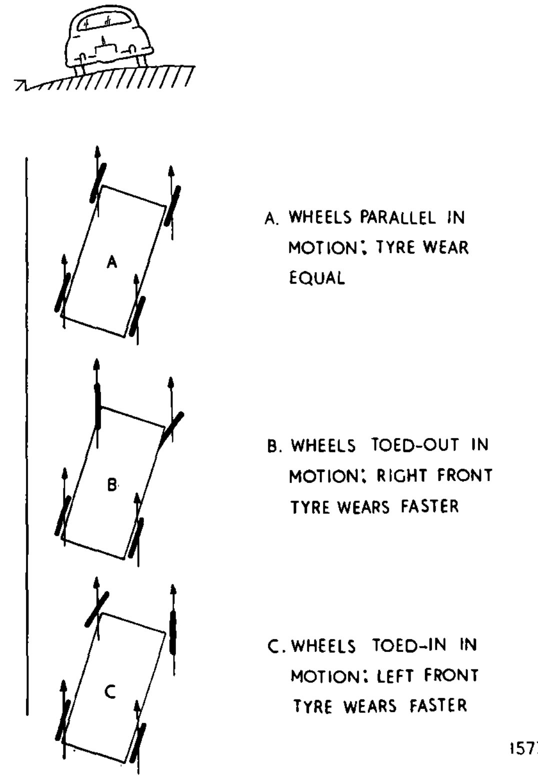

Fig. 10. Exaggerated diagram of the way in which road camber affects a car's progress.

" Fins " on the inside edges of the pattern ribs—nearest to the car—and particularly on the near side tyre indicate toe in. " Fins " on the outside edges, particularly on the offside tyre, indicate toe out.

With minor misalignment the evidence is less noticeable and sharp pattern edges may be caused by road camber even when wheel alignment is correct. In such cases it is better to make sure by checking with an alignment gauge.

Road camber affects the direction of the car by imposing a side thrust and if left to follow its natural course the car will drift towards the near side. This is instinctively corrected by steering towards the road centre.

As a result the car runs crab-wise, diagrammatically illustrated in an exaggerated form in Fig. 10. The diagram shows why near side tyres are very sensitive to too much toe in and offside tyres to toe out. It also shows why sharp " fins " appear on one tyre but not on the other and why the direction of misalignment can be determined by noting the position of the " fins ". Severe misalignment produces clear evidence on both tyres.

The front wheels on a moving car should be parallel. Tyre wear can be affected noticeably by quite small variations from this condition. It will be noted from the diagram that even with parallel wheels the car is still out of line with its direction of movement, but there is less tendency for the wear to be concentrated on any one tyre.

The near front tyre sometimes persists in wearing faster and more unevenly than the other tyres even when the mechanical condition of the car and tyre maintainance are satisfactory. The more severe the average road camber the more marked will this tendency be.

Precautions When Measuring Wheel Alignment

1. The car should have come to rest from a forward movement. This ensures as far as possible that the wheels are in their natural running positions.
2. It is preferable for alignment to be checked with the car laden.
3. With conventional base-bar tyre alignment gauges measurements in front of and behind the wheel centres should be taken at the same points on the tyres or rim flanges. This is achieved by marking the tyres where the first reading is taken and moving the car forwards approximately half a road wheel revolution before taking the second reading at the same points. With the Dunlop Optical Gauge two or three readings should be taken with the car moved forwards to different positions—180° road wheel turn for two readings and 120° for three readings. An average figure should then be calculated.

   Wheels and tyres vary laterally within their manufacturing tolerances, or as the result of service, and alignment figures obtained without moving the car are unreliable.

CAMBER, CASTOR ANGLES

These angles normally require no attention unless they have been disturbed by a severe impact or abnormal wear of front end bearings. It is always advisable to check them if steering irregularities develop.

Wheel camber, usually combined with road camber, causes a wheel to try to turn in the direction of lean, due to one side of the tread attempting to make more revolutions per mile than the other side. The resulting increased tread shuffle on the road and the off centre tyre loading tend to cause rapid and one sided wear. If wheel camber is excessive for any reason the rapid and one sided tyre wear will be correspondingly greater. Unequal cambers introduce unbalanced forces which try to steer the car one way or the other. This must be countered by steering in the opposite direction which results in still faster tread wear.

When tyre wear associated with camber results from road conditions and not from car condition little can be done except to interchange or reverse the tyres. This will prevent one sided wear, irregular wear and fast wear from developing to a maximum degree on any one tyre, usually the near front tyre.

The castor angle has no direct bearing on tyre wear but its measurement is often useful for providing a general indication of the condition of the front end geometry and suspension.

TYRE AND WHEEL BALANCE

Static Balance

In the interests of smooth riding, precise steering and the avoidance of high speed " tramp " or " wheel hop " all Dunlop tyres are balance checked to predetermined limits.

To ensure the best degree of tyre balance the covers are marked with white spots on one bead, and these indicate the lightest part of the cover. Tubes are marked on the base with black spots at the heaviest point. By fitting the tyre so that the marks on the cover bead exactly coincide with the marks on the tube, a high degree of tyre balance is achieved. (Fig. 11.) When

Fig. 11. Correct fitting relationship of Dunlop covers and tubes.

using tubes which do not have the coloured spots it is usually advantageous to fit the covers so that the white spots are at the valve position.

Some tyres are slightly outside standard balance limits and are corrected before issue by attaching special patches to the inside of the covers at the crown. These patches contain no fabric, they do not affect the local stiffness of the tyre and should not be mistaken for repair patches. They are embossed " Balance Adjustment Rubber ".

The original degree of balance is not necessarily maintained and it may be affected by uneven tread wear, by cover and tube repairs, by tyre removal and refitting or by wheel damage and eccentricity. The car may also become more sensitive to unbalance due to normal wear of moving parts.

If roughness or high speed steering troubles develop, and mechanical investigation fails to disclose a possible cause, wheel and tyre balance should be suspected.

A Tyre Balancing Machine is marketed by the Dunlop Company to enable Service Stations to deal with such cases.

If balancing equipment is used which dynamically balances the road wheels on the car, the following precaution should be observed.

In the case of the rear wheels always jack **both** wheels off the ground otherwise damage may be caused to the differential.

This is doubly important in the case of cars fitted with a Thornton " Powr-Lok " differential as in addition to possible damage to the differential, the car may drive itself off the jack or stand.

Dynamic Balance

Static unbalance can be measured when the tyre and wheel assembly is stationary. There is another form known as dynamic unbalance which can be detected only when the assembly is revolving.

There may be no heavy spot—that is, there may be no natural tendency for the assembly to rotate about its centre due to gravity—but the weight may be unevenly distributed each side of the tyre centre line. (Fig. 12.) Laterally eccentric wheels give the same effect. During rotation the offset weight distribution sets up a rotating couple which tends to steer the wheel to right and left alternately.

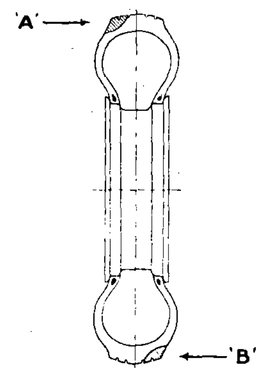

Fig. 12. Dynamic or couple unbalance.

Dynamic unbalance of tyre and wheel assemblies can be measured on the Dunlop Tyre Balancing Machine (Fig. 13) and suitable corrections made when cars show sensitivity to this form of unbalance. Where it is clear that a damaged wheel is the primary cause of severe unbalance it is advisable for the wheel to be replaced.

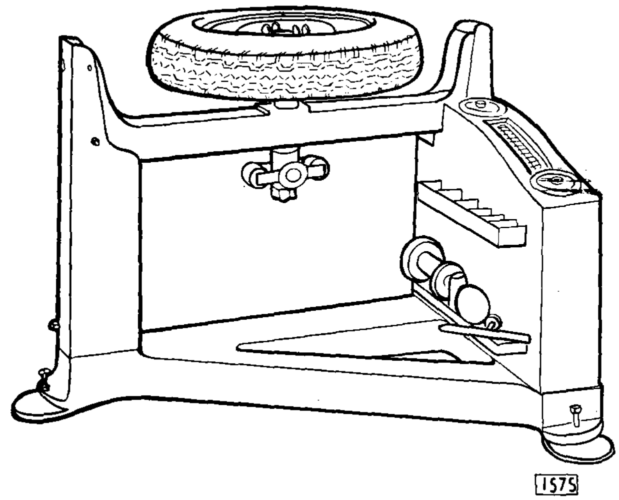

Fig. 13. The Dunlop tyre balancing machine.

TYRE REPLACEMENT AND WHEEL INTERCHANGING

When replacement of the rear tyres becomes necessary, fit new tyres to the existing rear wheels and, after balacing, fit these wheels to the front positions on the car, fitting the existing front wheel and tyre assemblies (which should have useful tread life left) to the rear wheel positions on the car.

If at the time this operation is carried out the tyre of the spare wheel is in new condition, it can be fitted to one of the front wheel positions in preference to replacing one of the original rear tyres, which wheel and tyre then becomes the spare.

Note : Due to the change in the steering characteristics which can be introduced by fitting to the front wheel positions wheels and tyres which have been used on the rear wheel positions, interchanging of part worn tyres from rear to front wheel positions is not recommended.

TUBELESS TYRES

(Fitted to early 2.4 litre cars)

In the tubeless tyre the separate inner tube is replaced by a rubber liner moulded to the inside of the casir ,. The air chamber is completed by the rim itself.

This tyre has a slow rate of air loss, more resistance to the damaging effects of underinflation and impact, and it prevents road delays following the entry of nails because the special construction prevents the air from escaping round the nail.

FITTING AND INFLATION

Rim preparation:

1. Remove loose or excessive mud from the wheel, taking care not to damage the paint.
2. Hammer out any dents in the rim flanges.
3. Clean the rim bead seats and flanges thoroughly. Use emery cloth, steel wool, a wire brush or a file, depending on the amount of dirt, rust, rubber and surface irregularities to be removed. (Fig. 15.) Smooth paint need not be removed.
4. File or buff away any high spots at the welded join. (Fig. 14.)
5. Wipe clean with a moist rag.

Valve fitting:

The snap-in rubber valve, Fig. 16, is used by car

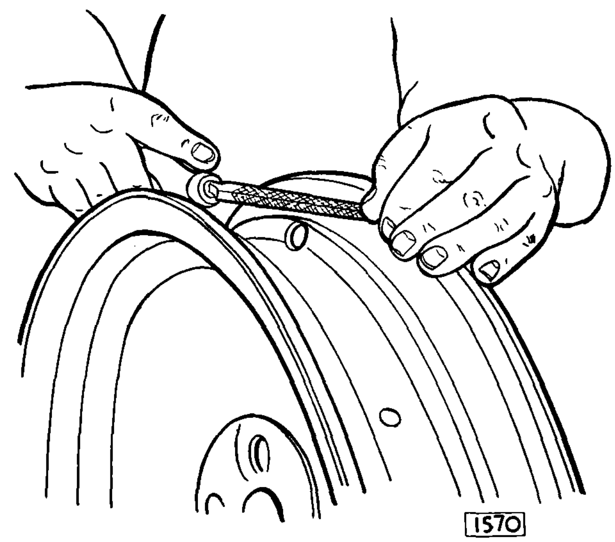

Fig. 14. Removing high spots from weld joint.

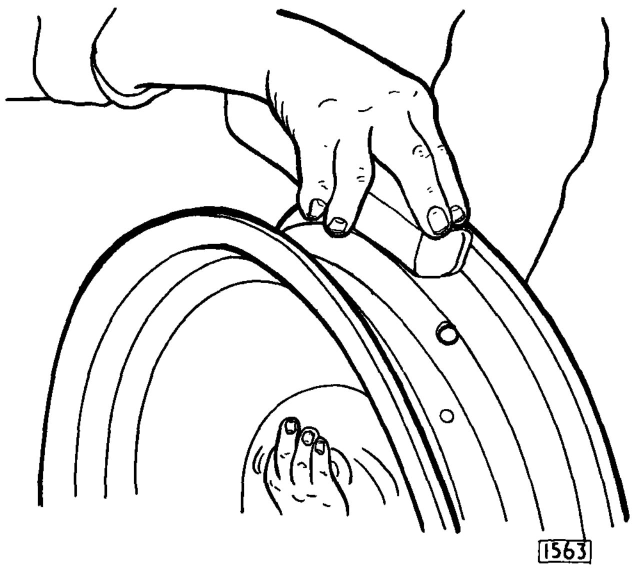

Fig. 15. Removing irregularities from rim.

makers for original equipment. This valve should never be refitted once it has been removed and it should be renewed every time a new tyre is fitted. The old valve can be cut out or pulled out.

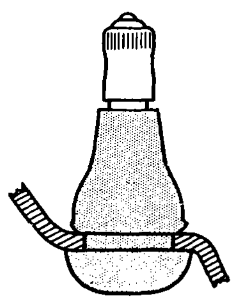

Fig. 16. Section through snap-in rubber valve.

A new snap-in rubber valve should be fitted by lubricating with soap solution and pulling through the rim hole from the inside until the flange on the rubber base is in full contact with the rim. If the valve is pulled too far, the base will be damaged or come right through the hole and another new valve must be fitted.

For fitting snap-in valves Schrader mounting tools No. 505 or 553 are available. If the valve is pulled through by pliers or an unsuitable tool, the threads or cap may be damaged.

Tyre fitting:

The tyre beads and their rubber surfaces must not be damaged during fitting. Do not use a hammer or mallet.

1. Wipe beads clean with a damp cloth.
2. Lubricate tyre beads, rim seats and fitting levers with Dunlop Tyre Bead Lubricant Code TBL/1 or a thin vegetable oil soap solution.
3. Fit tyre in a normal way with narrow levers in good condition and free from sharp edges, such as the Dunlop TL/12 spoon lever. Take small bites so as not to strain or damage the beads. Take particular care not to tear the rubber bead toes when they are lifted over the rim flanges. Fit the second bead so that the part of the bead nearest the valve goes over the rim flange last.

Note : The coloured balance spot near the tyre bead should be at the valve position.

Inflation:

1. Remove valve core.
2. Connect air line and with the valve core removed inflate with the wheel and tyre upright. If the first rush of air does not seal the beads, bounce the tread of the tyre at several points round its circumference with the air line attached. (Fig. 17.)

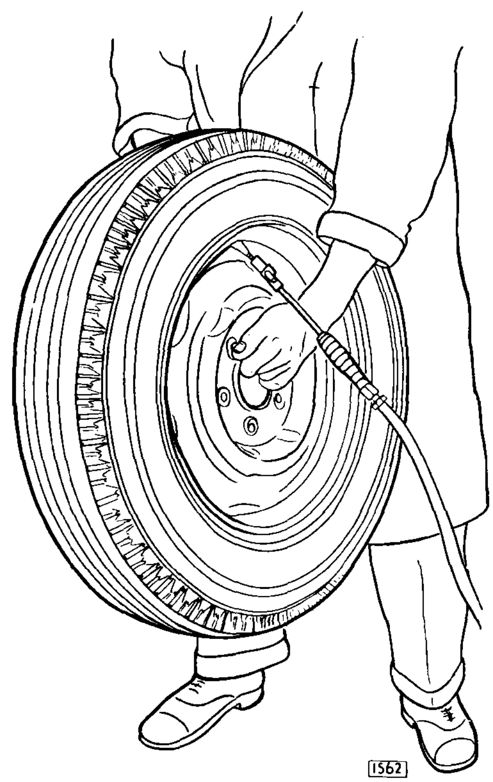

Fig. 17. Inflating and bouncing wheel to seal beads.

This will help to snap the beads on to the tapered rim seats. Continue to inflate until both beads obtain a hold on the rim seats.

3. Remove the air line and fit the valve core. Then inflate to 50 lbs. per sq. in. (3.44 kg/cm.²). Do not inflate car tyres above 50 lbs. per sq. in. (3.44 kg/cm.²). If a higher pressure is required to force the beads home against the rim flanges the tyre is not centralised on the rim. Deflate and centralise the tyre before re-inflating.

Note : If air continues to escape under the beads after bouncing and the tyre cannot be inflated, use one of the supplementary methods described on pages 17 and 18.

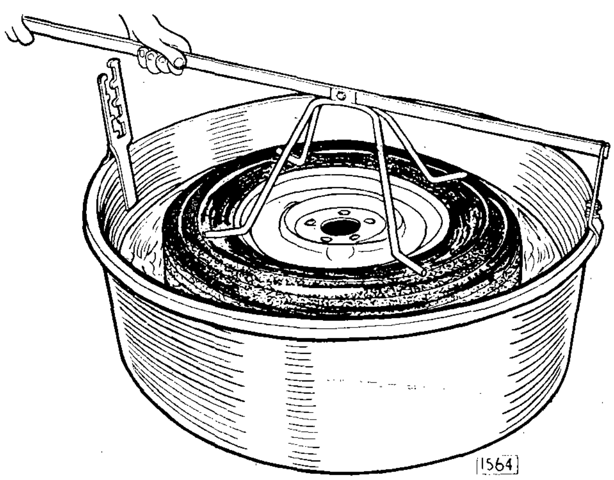

Fig. 18. Using Dunlop tank and submerging tool.

Testing for leaks:

A few minutes after inflation, immerse the tyre and wheel in a water tank and check for leaks.

A Dunlop Water Tank and Submerging tool are available for this purpose—WT/1 and ST/2. (Fig. 18.) If a water tank without submerging tool is being used, proceed as follows :

1. Place assembly in tank with valve uppermost. Submerge valve and check.
2. Release and allow assembly to float, with the channel between the rim flange and the tyres filled with water. Check carefully for air bubbles above the rim flange.
3. Turn wheel assembly over and submerge wheel rivets if they are not already under water. Check for leaks at rivets.
4. Submerge assembly to fill channel between flange and tyre and then allow to float.
   Repeat flange check as at 2.

If the Dunlop tank and submerging tool are used, the assembly can be held submerged on the bottom of the tank by locking the handle in one of the slots in the side bracket. Check for leaks at valve, rivets and each flange in turn.

To seal leaks:

1. Leak at top of rim flange.
   Mark on tyre and rim the position of leak and deflate tyre. The leak may be caused by dirt, rust, a high weld or chipped paint. By holding the bead away from the rim seat, the cause of the leak can often be detected and removed without removing the tyre. Make sure the rim is clean after treatment.
2. Leak at wheel rivet.
   Mark position of leak on rim. Deflate and remove tyre. The leak should be sealed by peening over the rivet head with a ball peen hammer, backed up by another hammer or a solid resistance such as an anvil. (Fig. 19.)

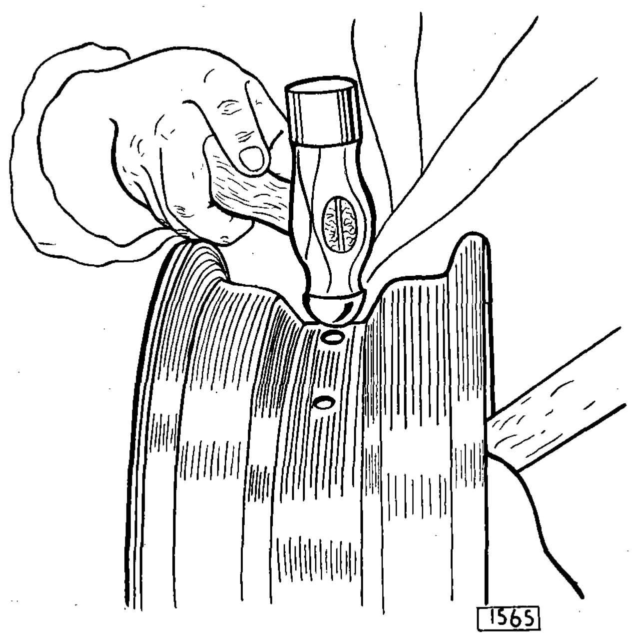

Fig. 19. Peening leaking rivets.

3. Leak at base of clamp-in valve.
   If the valve has been fitted correctly and the valve hole is in good condition, the leak can be stopped by tightening the nut.

Final inflation pressures:

Tubeless tyres require the same inflation pressures as normal covers and tubes. After testing at 50 lbs. per sq. in. (3.44 kg/cm.²) make sure that the inflation pressure is adjusted to the correct running figure.

INFLATION AFTER FITTING

Employing a tourniquet:

The Dunlop Tubeless Tyre Tourniquet, Part No. TT/1, is very suitable for assisting the inflation of Tubeless tyres. Its purpose is to contract the centre of the tread so that the beads are forced outwards against the rim seats and so provide a partial seal for inflation.

1. With the tool in the open position, buckle the strap centrally round the tread of the deflated tyre and wheel assembly. Pull strap through buckle as tightly as possible. Strap must be threaded between buckle and teeth in clip, and not between clip and end of buckle.
2. Thread the loose end of the strap through gap between rivet and roller on the link mechanism and compress tread by pulling handle through 180° (Fig. 20).

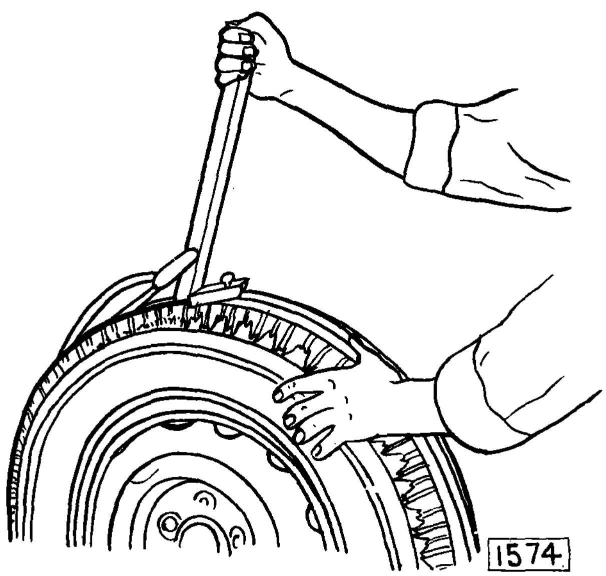

Fig. 20. Tightening tourniquet to seal beads.

3. With valve core removed, attach the air line and inflate until the beads are sealed against the flanges. If they fail to seal at the first attempt, move the handle back and re-tighten the strap. When the beads are home, disconnect the air supply and fit the valve core. Then remove the tourniquet before final inflation.
4. To remove the tourniquet, move the handle back and press the thumb on the end of the buckle—pushing the slider bar on the buckle inwards and upwards.
5. Inflate to 50 lbs. per sq. in. (3.44 kg/cm.^{2}) and test.

Note : When an air line is not available, the tourniquet enables Tubeless tyres to be inflated with an efficient foot or hand pump. In necessary cases, a tourniquet may be improvised from a piece of rope and a twisting bar.

Without a tourniquet:

This method is usually effective if other methods fail.

1. Fit tyre to rim dry, or if lubricated wipe tyre beads and rim seats dry afterwards.
2. Lean tyre and wheel against a wall at an angle as shown in Fig. 21. (See note below.)

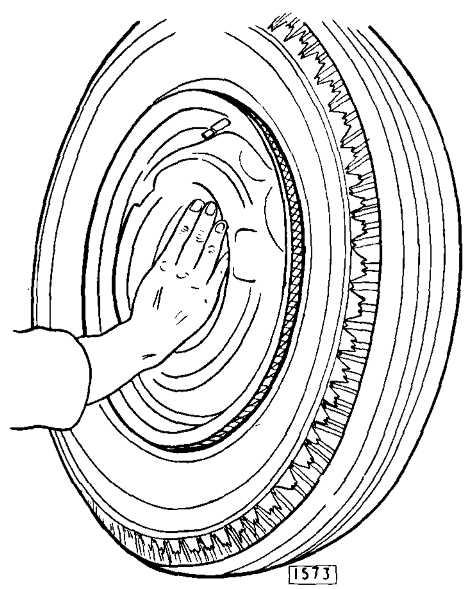

Fig. 21. Method of sealing bead without tourniquet.

3. Press wheel centre so that nearest bead obtains a hold on the rim seat. (Fig. 21.)
4. Reverse assembly, taking care not to dislodge first bead, and lean at a greater angle. (Fig. 22.)
5. With valve core removed attach air line. Whilst inflating, press gently against wheel centre to seal second bead. (Fig. 22.) Alternating hand pressure rather than continuous pressure may be found helpful. Continue to inflate until beads obtain a hold on the rim seats.
6. At this stage and before beads have gone home against the rim flanges allow lubricant to penetrate between tyre head and rim flange by brush or similar means.
7. Remove air line and fit valve core. Inflate to 50 lbs. per sq. in. (3.44 kg/cm.^{2}) and test.

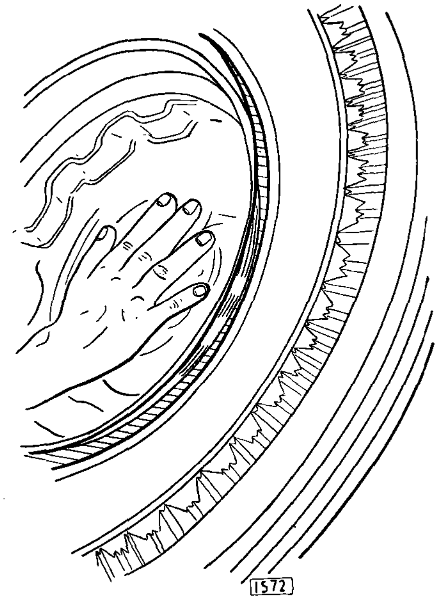

Fig. 22. Seating the reverse bead.

Do not inflate car tyres above 50 lbs. per sq. in. (3.44 kg/cm.²). If a higher pressure is required to force the beads home against the rim flanges the tyre is not centralised on the rim. Deflate and centralise the tyre before re-inflating.

Note : Some rims have a wider seat on one side than on the other. When fitting to a rim with equal seats the first part of the operation (Fig. 21) should be carried out with the valve at the front. On other rims, the first operation should be carried out with the valve towards the wall and the wider rim seat to the front.

REMOVAL

Remove in exactly the same way as covers for use with tubes. Take particular care not to damage the bead surfaces when breaking the " stick " between the beads and rims and when lifting the beads over the rim flanges. Before lifting the beads over the rim flanges, apply lubricant (see page 15) to both tyre beads. When lifting the second bead over the flange insert tyre lever between bead and rim for the depth of the flange only (Fig. 23). These precautions will facilitate removal and avoid kinked beads. Damaged beads will cause air leaks and may also cause premature tyre failures.

Tyre levers and bead breaking tools must be of suitable type, have smooth contact faces in good condition and be used properly.

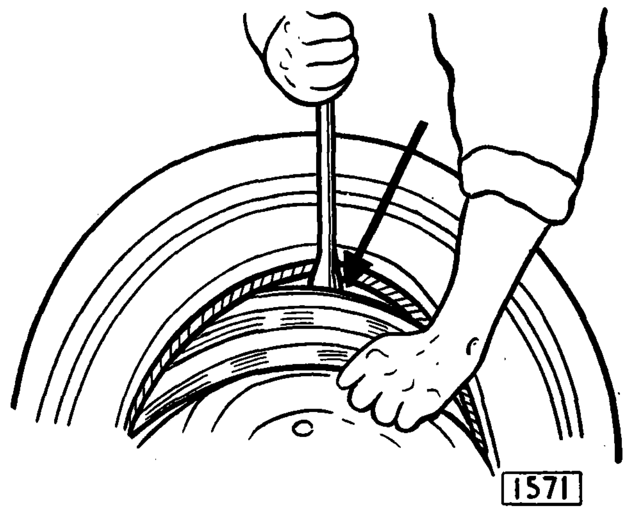

Fig. 23. Insert tyre lever for depth of flange only.

Levers should be kept moistened with the lubricant during use.

REPAIR OF SMALL PENETRATIONS

Dunlop " Reddiplug " method:

Normally, a tubeless tyre will not leak when the tread is penetrated by a nail or other normal puncturing object, provided that it is left in the tyre.

These objects should be withdrawn every 2,000 to 3,000 miles (3,200 km.—4,800 km.) at a time when loss of air will cause least inconvenience. If they are left in the tyre indefinitely, the original injuries may extend and cause a road delay, and possibly more serious tyre damage.

For a simple penetration through the tread, e.g. a nail, the Dunlop "Reddiplug" method is recommended as a temporary repair only.

A Vulcanised repair should be carried out as soon as possible.

It does not require the tyre to be removed from the rim nor to be completely deflated. This method should not be used for sidewall penetrations.

The following instructions are included with each kit.

1. Extract the penetrating object and determine the direction of penetration by inserting the small wire probe through the hole and leave in position (Fig. 24). If the tyre is leaking and the puncturing object cannot be located by sight, it is necessary to immerse the inflated tyre in water.
2. Dip the needle into the flask of solution and after removing the probe insert the needle through the hole in the direction indicated by the probe.

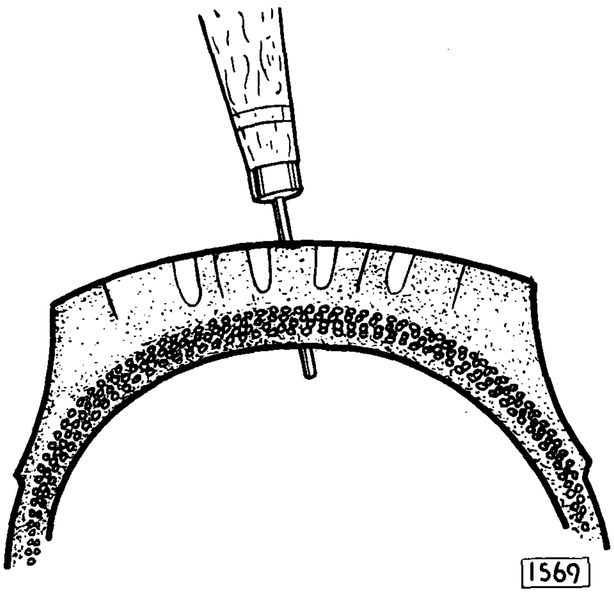

Fig. 24. Determining direction of penetration with probe.

When the needle eye is through the hole, work it up and down several times and then pull it out. Again dip the needle into the solution and repeat the process until the hole is well lubricated.

3. Select a suitable plug according to the size of the puncturing object and stretch and roll it into the eye of the needle leaving about $\frac{1}{4}''$ (6.35 mm.) of plug on one side of the needle. (Fig. 25.)

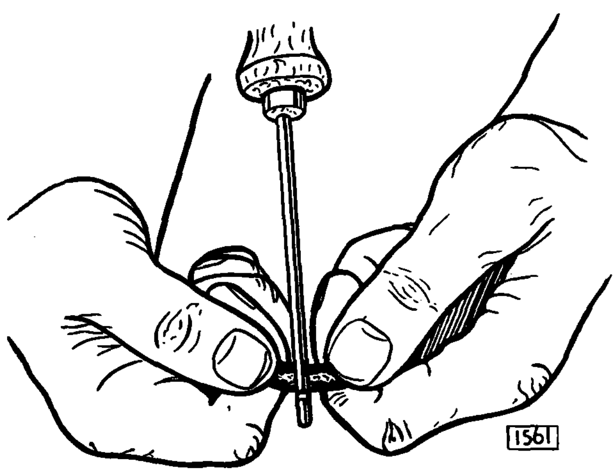

Fig. 25. Threading rubber plug into special needle.

4. After dipping plug into the solution, insert point of needle into hole and push through tyre until a sudden release in pressure is felt indicating that the double thickness is completely through the hole.

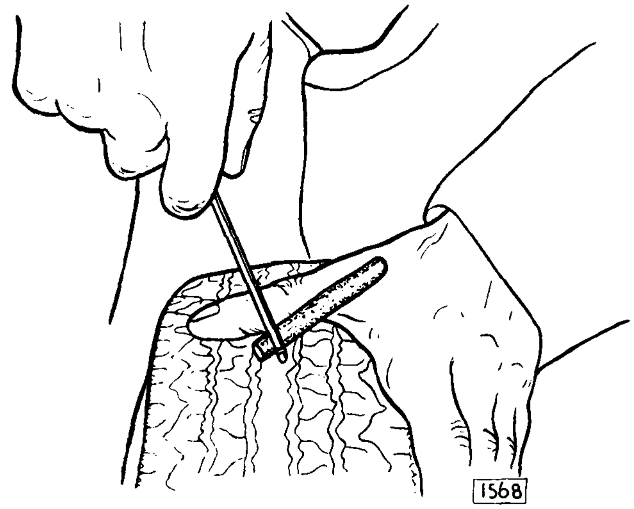

Fig. 26. Forcing plug into puncture.

Stop pushing as soon as this release in pressure is felt. (Figs. 26 and 27.) Do not rotate the needle during this operation.

Note : The plug must follow the direction of original penetration to seal the hole.

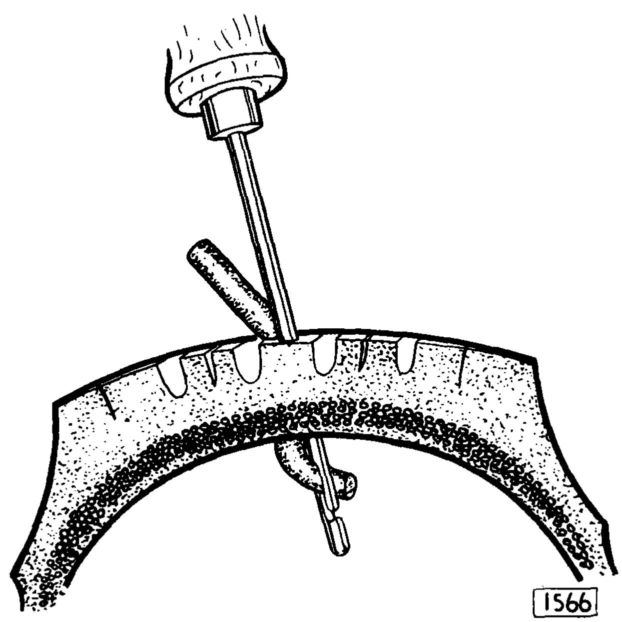

Fig. 27. Release needle by further downward movement then withdraw.

5. Withdraw the needle and cut off surplus plug about $\frac{1}{8}''$ (3.17 mm.) from surface of tread (Fig. 28.) Tyre can be inflated and used immediately.

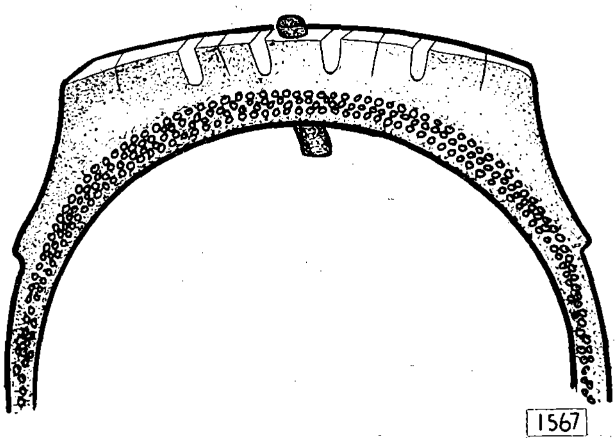

Fig. 28. Section showing repair completed.

Repairs outside scope of "Reddiplug" method

To repair all small penetrations through the side-walls, and tread penetrations which are larger than caused by nails or other small penetrating objects and do not exceed $\frac{1}{4}''$ (6.35 mm.) diameter, remove the tyre and :

1. Roughen the rubber liner for about 1″ (25.39 mm.) around the injury.
2. Clean and solution around the injury. Using the Dunlop "Reddiplug" needle as a prodder press uncured cushion compound into the hole. Trim off surplus compound on the inside.
3. Apply one coat of vulcanising solution to the roughened liner and allow to dry. Then fit a patch of $\frac{1}{16}''$ (1.58 mm.) uncured cushion compound.
4. Vulcanise.

Note : As a temporary "get-you-home" measure, in the absence of vulcanising equipment, fit a patch such as Dunlop "Vulcafix" patch on the inside of the casing. A vulcanised repair should be effected as soon as possible.

MAJOR REPAIRS

For larger injuries the acceptance limits are the same as for outer covers and the same processes should be followed, with these additions :

1. After the reinforcing patch has been fitted, solution its exposed surface and allow to dry. Apply and roll down $\frac{1}{16}''$ (1.58 mm.) uncured cushion compound over the patch and the prepared area around it to replace the original inner liner.
2. After filling the cut out external cavity, cure in a normal manner but increase the curing time to allow for the thickness of the new liner over the patch.
3. During cure protect the beads from possible damage by the bead plates with strips of cured rubber.

BEAD REPAIRS

Superficial rubber damage to the beads should be repaired in the following way if vulcanising is not possible.

1. Buff the damage carefully and solution with one coat.
2. Fill with tread repair compound so that it stands proud.
3. Trim until nearly flush with a sharp wet knife and then smooth down accurately to the original profile with emery cloth kept wet with naphtha.
4. Allow to stand for at least 12 hours and then dust with chalk. Avoid damage when refitting the tyre because the repair is not vulcanised.

RETREADING

Acceptance limits and processes are the same as for tubed cover. Use tread repair compound for bead rubber repairs if bead to bead moulds are used. If a repair patch is being cured with the retread add 10% to the time to allow the replaced section of inner liner.

IMPORTANT

During repair or retreading the whole of the inner liner and bead surfaces should be examined for damage, however small, which may cause pressure loss or air seepage into the casing.

After repair or retread always test the inflated tyre in a water tank.

SUPPLEMENTARY INFORMATION TO SECTION M "WHEELS AND TYRES"

covering

RADIAL PLY (SP41) TYRES. SERVICE PROCEDURE.

Radial ply tyres may be fitted as an optional extra to all models of the Mark 2 and the following notes are provided to assist in dealing with problems which may occasionally arise.

The features of radial ply tyres can introduce a different "feel" to driving. Cars must therefore be taken to establish that the problem is a condition which ought not to be there and not something which is inherent in radial ply tyre operation. For instance, whereas S.P. tyres offer considerable advantage in road noise supression and ride comfort at open road speeds, some increase in harshness is inevitable at town speeds as is some increase in steering effort whilst parking.

1. Lurch

This is a rolling kind of progress where the front or back or both ends of the car appear to lurch from one side to the other sometimes accompanied by a slight up and down movement. These low frequency lateral and vertical oscillations may occur at speeds between 10 m.p.h. and 30 m.p.h. (16 and 48 k.p.h.).

To some extent, this is inherent in the very flexible casing construction of the radial ply tyre. More severe cases may be associated with poor suspension damping, possibly due to weakened or faulty shock absorbers; or with severe lateral or radial run-out of the tyre/wheel assemblies. These assemblies should be checked for truth, beginning at the end of the car which appears to be most affected.

2. Heavy Steering at Low Speeds

This condition, particularly at parking speeds, must be accepted. If it appears to be abnormal, points to check are tyre pressures; castor angles; excessive friction in ball joints and steering box.

3. Surge

This is a fore and aft hesitancy causing uneven progress. It is related to engine speed and, if present, will occur at town speeds, mainly in the intermediate gears.

Again, this is partly inherent in radial ply construction because the lower torsional rigidity of the casing permits some degree of wind-up between the tread and the rim. If the condition is not aggravated by other factors, it can sometimes be an advantage in providing a more gradual getaway on very slippery surfaces such as ice.

Surge may be more noticeable as the result of a torque disturbing factor such as misfiring, unsuitable carburation, momentary fuel starvation or excessive flexibility in the engine mountings. Similarly it may be aggravated by excessive run-out of the tyre/wheel assemblies but in this case, other forms of vibration would also be present.

4. Steering Niggle

This normally refers to torsional oscillation of the steering wheel at speeds up to 50 m.p.h. (80 k.p.h.) similar to that caused by dynamic unbalance.

Rebalance the tyre/wheel assemblies statically and dynamically and check for excessive play in wheel bearings, ball joints, steering box and bracket connections.

5. Pull

Check camber and castor angles. If steering angles are correct, fit cross ply tyres **for test purposes only.** If pulling does not occur with cross ply tyres, refit each SP tyre in turn to the near front wheel with a cross ply tyre on the off side. Re-test on a flat road. If one SP tyre is the offender, it may have to be replaced but, if both are similarly affected, it should be possible to cancel this by reversing one tyre on its rim.

It will be clear that pull to the near side will be increased by road camber and pull to the off side reduced or cancelled by it. This can often be used to make an unacceptable condition acceptable by reversing or interchanging tyres without the need to replace.

6. High Speed Vibrations

These are vibrations which occur through the car at speeds of around 80 m.p.h. (130 k.p.h.) and are similar to vibrations caused by an out of balance condition of cross ply tyres.

These vibrations may result from the propeller shaft being out of balance or play in its joints. Excessive run-out of brake discs, untrue wheels, fatigued engine mountings and general engine vibration may also be factors other than the tyres themselves.

Check all tyre/wheel assemblies for static and dynamic balance. Check for lateral and radial run-out and concentricity of the tyre fitting line. An assembly run-out which exceeds .060″ (1.5 mm.) **MAY** be suspect.

Should the run-out exceed .60″ (1.5 mm.) remove the tyre from the wheel; check the wheel separately at both bead seats for wobble or lift; refit the tyre to give minimum run-out (by rotating the tyre relative to the wheel in 90° steps). Road test the car and, if the condition is still unacceptable, check the spare wheel as above and use in place of the worst wheel which may become the spare.

If the measurements of the wheel exceed S.M.M. & T. tolerance, a new wheel should be fitted.

If the wheel is well within tolerance and an assembly run-out of or below .60″ (1.5 mm.) cannot be achieved, the tyre may be exchanged at an appropriate allowance.

SECTION N

BODY & EXHAUST SYSTEM

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

BODY

INDEX (*continued*)

INDEX *(continued)*

INDEX *(continued)*

EXHAUST SYSTEM

BODY AND EXHAUST SYSTEM

BODY

SIDE FACIA PANEL

Removal

Disconnect the positive lead on the battery.

Unscrew the two chrome bezels securing the speedometer trip and the time clock remote control cables to the dash casing.

If a radio is fitted remove the screw securing the aerial remote control winding handle to the square drive.

Remove the lever, nut and chrome washer.

Remove the three chrome drive screws securing the dash casing.

Unscrew the two nuts securing the tie plate to the bottom of the side facia panel under the steering column.

Remove the two screws and washers securing the top half of the flasher switch cover to the steering column.

Withdraw the bulb holders for the flashing indicators.

Withdraw the bulb holders for the automatic transmission or overdrive if fitted.

Remove the two bolts securing the steering column to the body and allow the steering column to rest on the driver's seat cushion.

Disconnect the indicator warning light cables at the snap connectors.

Withdraw the indicator light cables through the bracket which is secured to the rear of the facia panel.

Disconnect the speedometer drive cable from the rear of the speedometer.

Withdraw the headlamp, ignition and fuel warning light bulb holders from the rear of the speedometer.

Disconnect the two " Lucar " connectors from the rear of the revolution counter.

Disconnect the electrical connection at the snap connector for the time clock, which is recessed into the back of the revolution counter.

Withdraw the two instrument illumination bulb holders from the rear of the speedometer.

Withdraw the two instrument illumination bulb holders from the rear of the revolution counter.

Disconnect the brake fluid indicator warning light at the snap connector.

On 2.4 litre models slacken the pinch bolts securing the mixture control wire and outer conduit casing at the rear of the side facia panel.

Disconnect the mixture control warning light cable at the snap connector.

Remove the two nuts, plain and serrated washers securing the wooden strip along the front of the newspaper tray.

Remove the two thumb screws securing the instrument panel to the body and allow the panel to rest in the horizontal position.

Unscrew the two nuts and slide the screen rail off the two mounting brackets.

Remove the two screws and serrated washers at the side of the instrument panel, securing the side of the side facia panel.

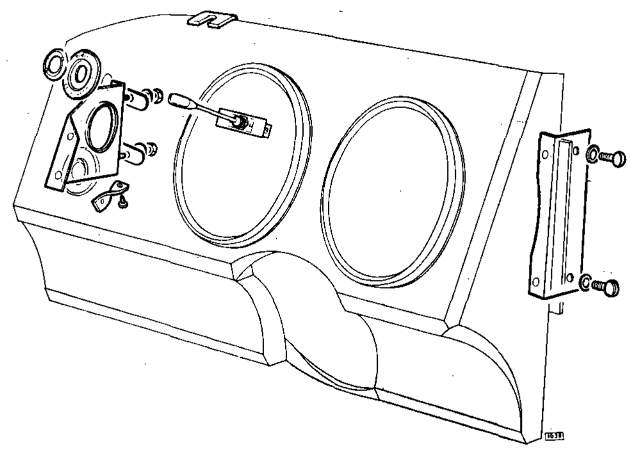

Fig. 1. Removal of side facia panel.

Remove the two nuts and washers at the rear of the side facia panel securing the panel to the body nearest the door.

Remove the drive screw at the rear of the side facia panel securing the steady bracket to the body.

Withdraw the side facia panel.

Refitting

Refitting is the reverse of the removal procedure.

When refitting the carburetter mixture control wire place the mixture control lever on the side facia panel in the COLD position and place the levers on the carburetters towards the rear of the engine. Tighten the nuts securing the mixture control wire and the conduit casing to the rear of the mixture control.

GLOVEBOX

Removal

Remove the two thumb screws securing the instrument panel to the body and allow the panel to rest in the horizontal position.

Unscrew the two nuts and slide the screen rail off the mounting brackets.

Remove the four screws securing the dash casing under the glovebox.

Remove the two screws and serrated washers at the side of the instrument panel securing the side of the glovebox to the body.

Remove the detachable side panel of the glovebox, adjacent to the light switch ; the panel is retained in position by means of an adhesive.

On early cars this panel is non-detachable.

Remove the two nuts and washers at the rear of the glovebox securing the glovebox to the body nearest the door.

Remove the drive screw at the rear of the glovebox securing the steady bracket to the body.

Remove the two nuts, plain and serrated washers securing the wooden finishing strip along the front of the newspaper tray.

Disconnect the two electrical cables from the glovebox illumination light at the snap connector.

Withdraw the glovebox.

Refitting

Refitting is the reverse of the removal procedure.

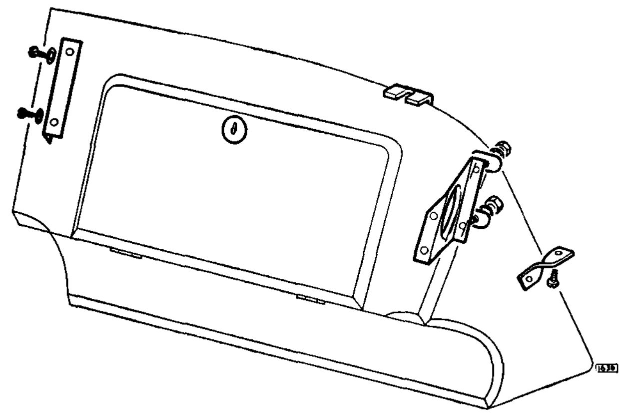

Fig. 2. Removal of glovebox

SCREEN RAIL

Removal

Release the two nuts, serrated and plain washers securing the screen rail to the body (see Fig. 3).

Disconnect the two cables attached to the Map Light.

Lift off the screen rail.

Refitting

Refitting is the reverse of the removal procedure.

BONNET

Removal

To open the bonnet pull the control knob situated under the facia panel on the right hand side. This will release the bonnet which will still be retained by the safety catch.

Insert the fingers under the nose of the bonnet and

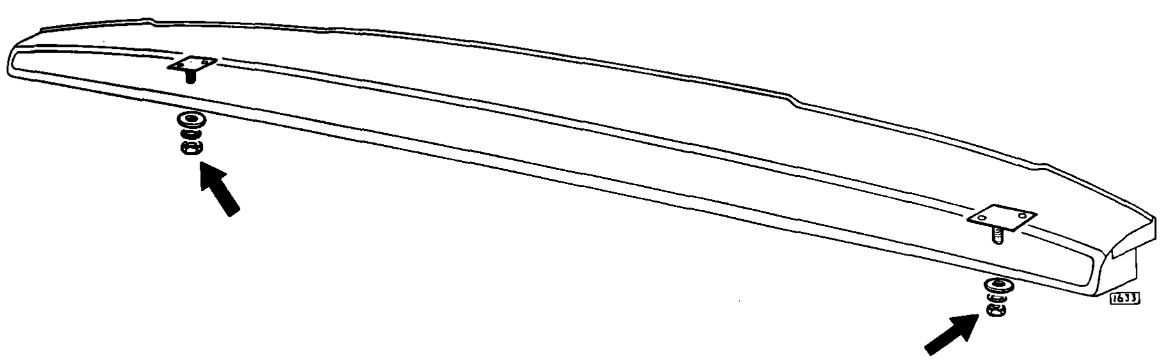

Fig. 3. Removal of screen rail.

lift the safety catch upwards when the bonnet may be raised.

The bonnet is automatically retained in the fully open position by the action of the hinge springs.

Mark the positions of the hinge brackets on the bonnet to facilitate refitting.

Remove the four setscrews and washers securing the bonnet to each hinge and lift off the bonnet.

Refitting

Position hinges on marks made before removal. Refitting is the reverse of the removal procedure.

BONNET LOCK

Removal

To remove the bonnet catch slacken the locknut at the top of the peg. Insert a screwdriver into the slot in the peg and unscrew the peg complete with locknut, two washers and spring.

Remove the two setscrews securing the closing plate which joins the front wings under the radiator grille opening. Withdraw the plate.

Remove the setscrew, plain and serrated washers and cup securing the badge boss to the body.

Remove the setscrew, plain and serrated washers and cup securing the top of the radiator grille. Unscrew the four nuts, plain and serrated washers and remove the small angle brackets securing the radiator grille to the body. Remove the radiator grille.

Slacken the nut securing the bonnet release cable and withdraw the cable from the release lever.

Remove the two setscrews securing the striker plate,

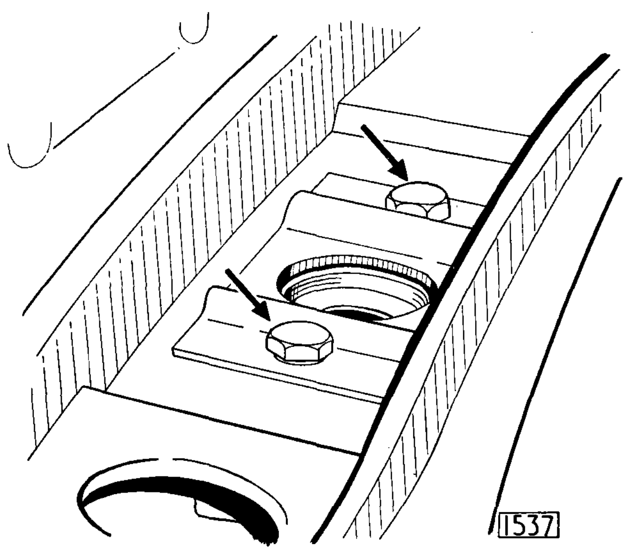

Fig. 4. Showing the two setscrews which secure the bonnet catch striker plate.

catch plate and base plate to the body.

Remove the striker, catch and base plates, spacers and spring.

Remove the three drive screws securing the dash casing. Unscrew the locknut securing the bonnet release cable abutment to the bonnet lock reinforcement panel.

Withdraw the release cable.

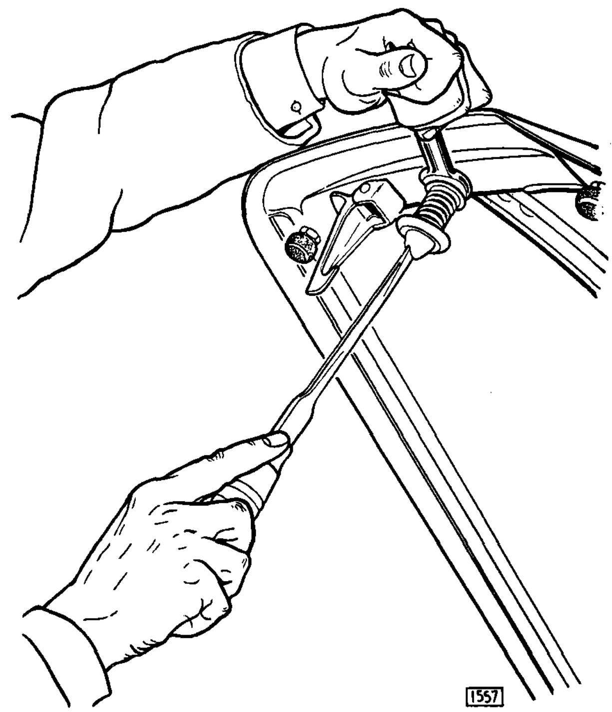

Fig. 5. Adjusting the bonnet lock peg.

Adjustment of the Bonnet Lock

Slacken the locknut on the striker peg and rotate the peg with a screwdriver, until there is approximately $\frac{1}{16}$" (1.5 mm.) movement between the catch plate and the peg. This is to ensure that the catch plate will fully engage with the peg.

Tighten the locknut on the striker peg.

Refitting

Refitting is the reverse of the removal procedure.

CHROME STRIPS ON BONNET

Removal

The chrome strips along the sides of the bonnet are secured with clips. Straighten the prongs of the clips and withdraw the chrome strip.

To remove the chrome strips in the centre of the bonnet, insert a screwdriver between the strip and the top of the bonnet and prise off the strip taking care not to damage the paintwork.

Refitting

When refitting the chrome strip to the centre of the bonnet renew the clips.

Refitting is the reverse of the removal procedure.

RADIATOR GRILLE

Removal

Remove the two setscrews securing the closing plate between the front wings under the radiator grille opening and remove the plate.

Remove the setscrew, plain and serrated washers and cup securing the top of the radiator grille to the body.

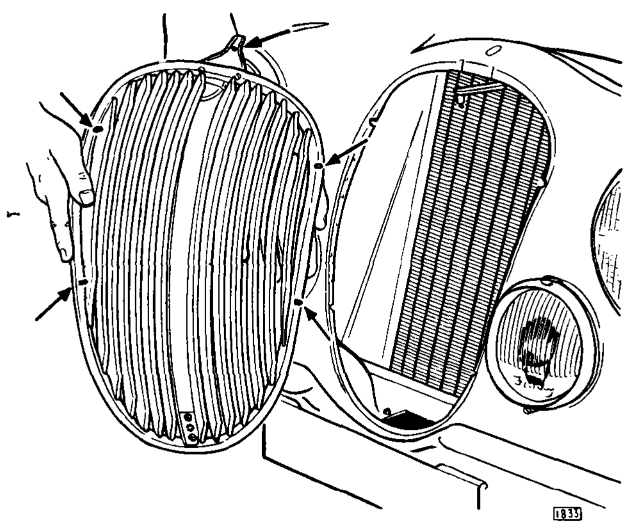

Fig. 6. Showing the mounting points for the radiator grille.

Unscrew the four nuts, plain and serrated washers and remove the small angle brackets securing the grille to the body.

Dismantling

Remove the two bolts and serrated washers securing the chrome centre strip to the bottom of the radiator grille (Fig. 7).

Remove the two screws securing the chrome centre strip to the top of the radiator grille.

Remove the chrome strip.

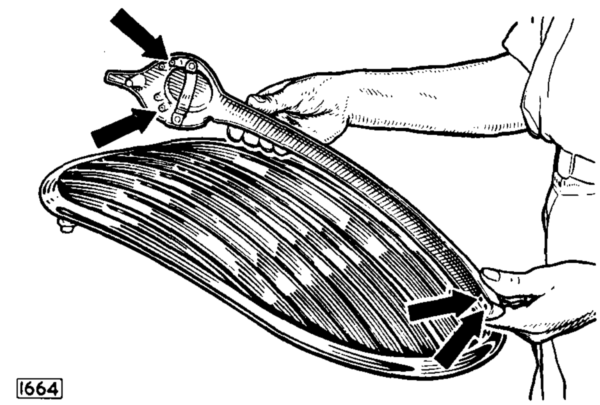

Fig. 7. Removal of the centre chrome strip on the radiator grille.

Re-assembling

Re-assembling is the reverse of the dismantling procedure.

Refitting

Refitting is the reverse of the removal procedure.

MASCOT

Removal

Raise the bonnet and remove the two setscrews, plain and serrated washers securing the mascot to the bonnet.

Refitting

Refitting is the reverse of the removal procedure.

LUGGAGE COMPARTMENT LID AND HINGES

Removal

Open the luggage compartment lid and disconnect the electrical connections in the reverse lamp.

Remove the setscrew securing the earth wire to the luggage compartment lid.

Withdraw the harness from the luggage compartment lid. Remove the two metal straps securing the reverse lamp cable to the right hand hinge. Mark the positions of the hinges on the luggage compartment lid.

Remove the eight setscrews, plain and serrated washers and remove the luggage compartment lid.

Mark the positions of the hinges on the body and remove the eight setscrews, plain and serrated washers securing the hinges to the body.

Remove the luggage compartment lid hinges.

Refitting

Refitting is the reverse of the removal procedure.

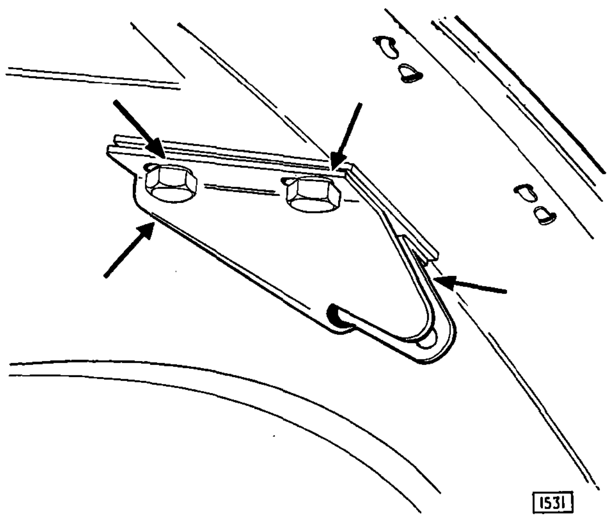

Fig. 8. *Showing the screws for adjustment of the boot lid striker.*

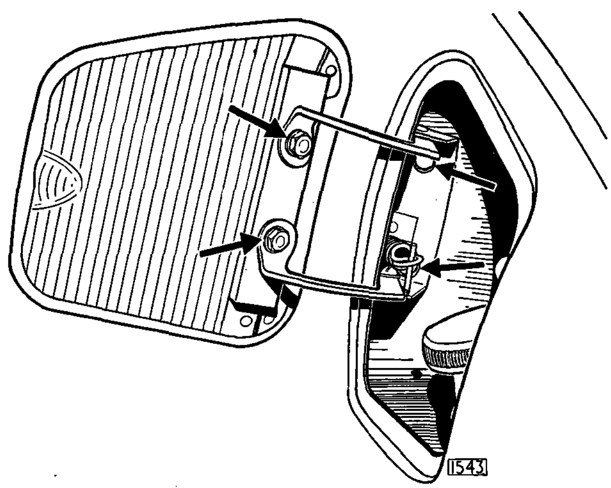

Fig. 9. *Removal of fuel filler lid.*

Boot Lock Adjustment

Slacken the four setscrews securing the boot lid lock striker to the boot lid (see Fig. 8). Move the striker in the elongated holes until the lock operates correctly and does not rattle. Tighten the retaining setscrews.

PETROL FILLER LID

Removal

Remove the return spring. Unscrew the two setscrews and washers securing the lid and hinge to the inner wall of the petrol filler cap compartment.

Remove the two setscrews and washers securing the lid to the hinge.

Refitting

Refitting is the reverse of the removal procedure. When refitting the lid retain it by screwing the setscrews finger tight in the elongated holes, then align the lid to fit into the recess of the body panel. Tighten the setscrews securely.

FRONT BUMPER

Removal

Remove the two chrome bolts, nuts, plain and spring washers securing the front bumper to the side angle brackets.

Remove the two nuts, plain and serrated washers securing the bumper to the inner brackets.

Slacken the nut securing one of the angle brackets to the outer bracket. Turn the angle bracket through 90°. This will allow the bumper to be withdrawn.

Refitting

Refitting is the reverse of the removal procedure.

FRONT BUMPER OVER-RIDERS

Removal

Remove the two nuts, plain and serrated washers securing the over-riders to the front bumper.

Remove the over-riders and beading.

Refitting

When refitting the over-riders replace the beading between the over-riders and the bumper.

Refitting is the reverse of the removal procedure.

REAR BUMPER

Removal

Remove the four setscrews, plain and serrated washers securing the bumper to the two side mounting brackets.

Remove the two large setscrews, plain and serrated washers securing the bumper to the two rear bumper mounting rubbers. Remove the rear bumper.

Remove the nuts and shakeproof washers securing the rear bumper mounting rubbers to the wings and reinforcement panels.

Detach the sealing rubber from the rear bumper.

Refitting

When refitting the rear bumper sealing rubber press the rubber over the rear bumper and tap on the sixteen spring clips. When refitting the side of the bumper ensure that the larger side of the bracket is towards the top.

Refitting is the reverse of the removal procedure.

REAR BUMPER OVER-RIDERS

Removal

Remove the two nuts, plain and serrated washers securing the over-riders to the rear bumper.

Remove the over-riders and beading.

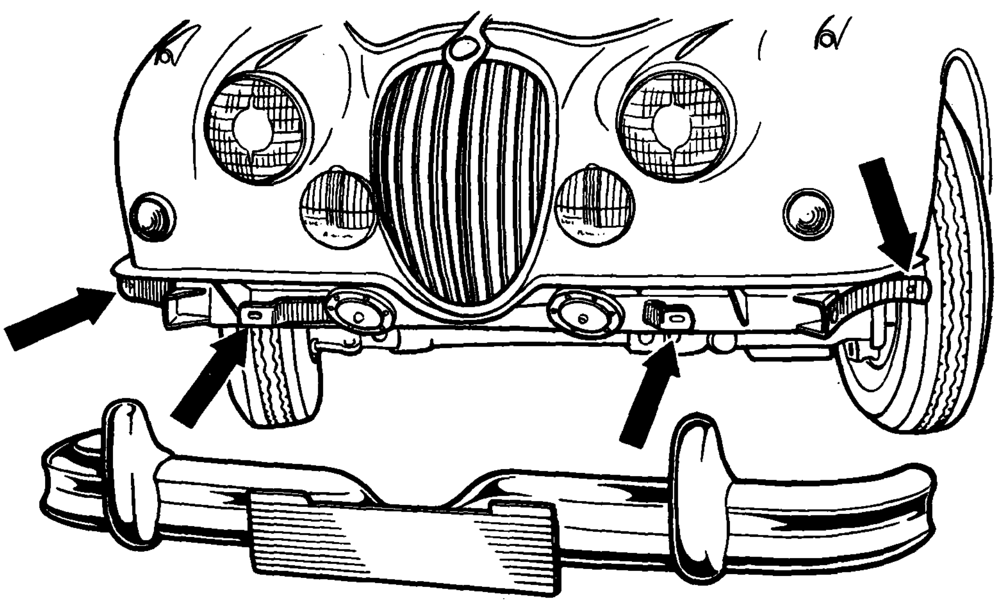

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Fig. 10. Showing the mounting points for the front bumper.

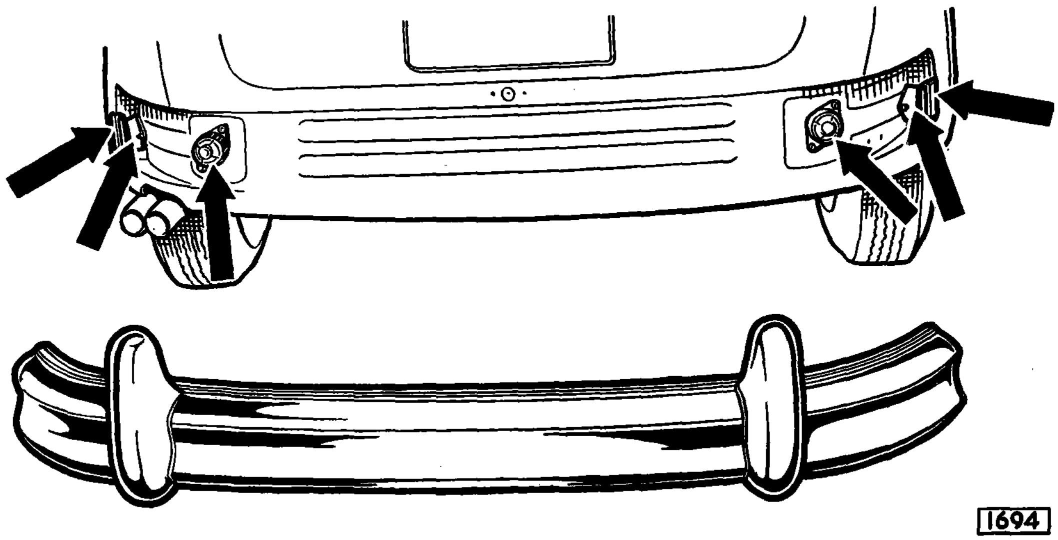


Fig. 11. Showing the mounting points for the rear bumper.

Refitting

When refitting the over-riders replace the beading between the over-riders and the bumper.

Refitting is the reverse of the removal procedure.

WINDSCREEN

Removal

Prise off the two chrome finisher pieces securing the ends of the chrome finisher which encircles the windscreen.

Prise off the chrome finisher from the windscreen rubber. Extract one end of the rubber insert and withdraw completely.

Run a suitable thin bladed tool around the windscreen to break the seal between the rubber and the windscreen aperture flange.

Strike the glass with the flat of the hand from inside the car, starting in one corner and working towards the bottom.

Repeat this process around the complete windscreen.

Withdraw the windscreen.

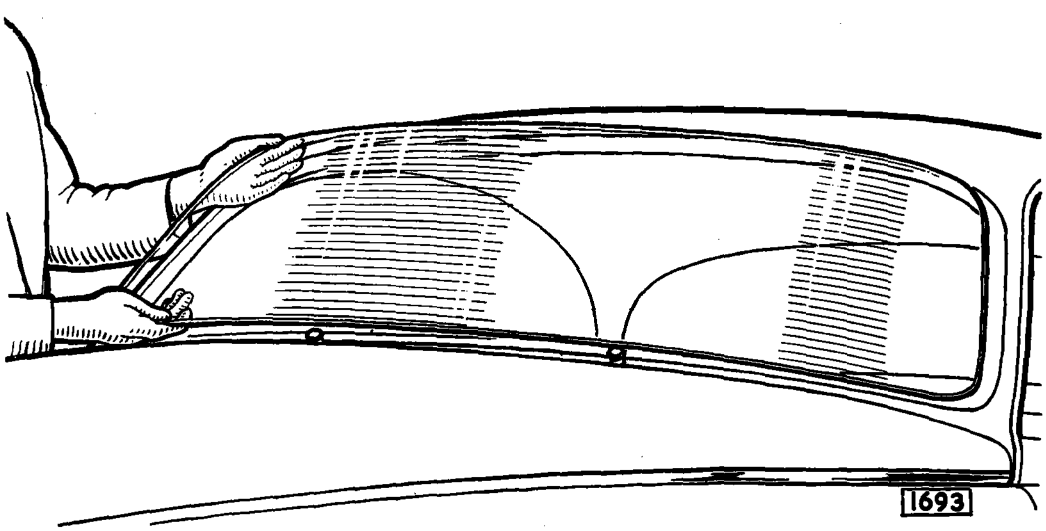


Fig. 12. Removal of the windscreen.

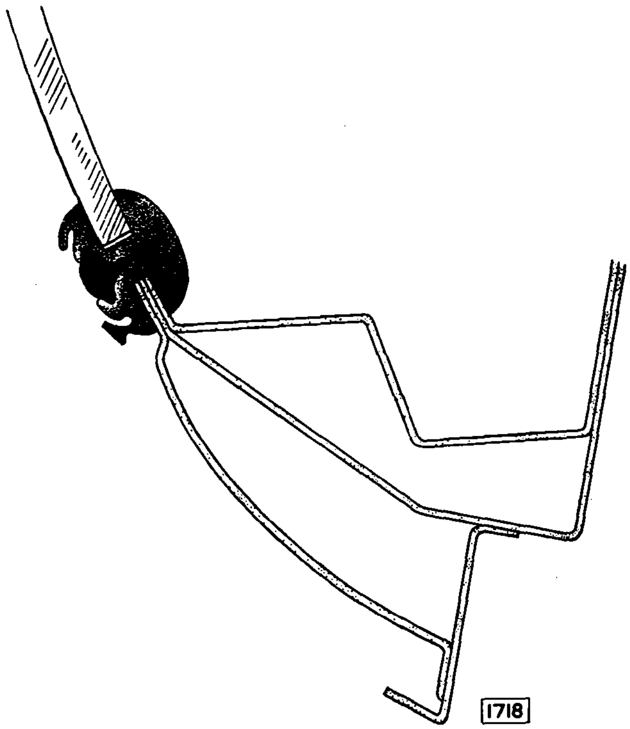


Fig. 13. Section through windscreen glass and sealing rubber.

Refitting

Remove the old sealer from the windscreen flange. Examine the windscreen rubber for cuts. If the windscreen was of the toughened glass type it is recommended that the windscreen rubber should be replaced. This is because small particles may have been impregnated in the rubber and could break the screen again. If, however, the windscreen was not broken by a projectile the windscreen aperture flange should be examined for a bump in the metal. If this is found the bump should be filed away otherwise the glass may break again.

The rubber should be attached to the windscreen aperture with the flat side of the rubber towards the rear and the joint in the rubber preferably at the bottom.

Using the special tool (A Fig. 15) insert the screen into the rubber along the bottom edge first (Fig. 14). It is important that the glass should be fitted equally. DO NOT fit one end and then try to fit the other. Using the special tool (B Fig. 15) insert the rubber sealing strip with the rounded wide edge to the outside.

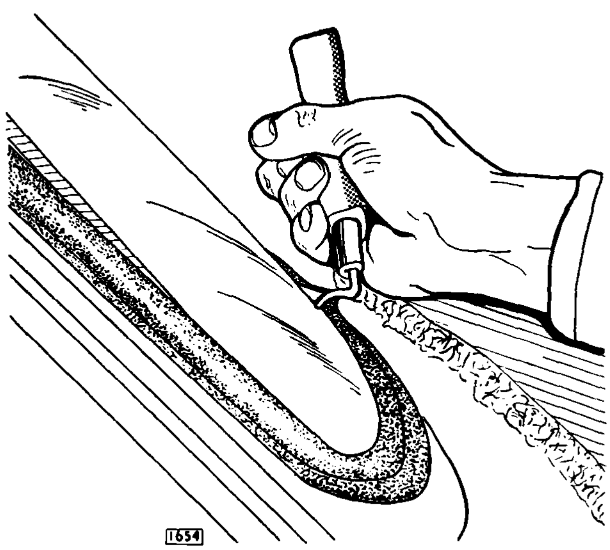


Fig. 14. Using the special tool ('A', Fig. 15) for lifting the windscreen rubber over the glass.

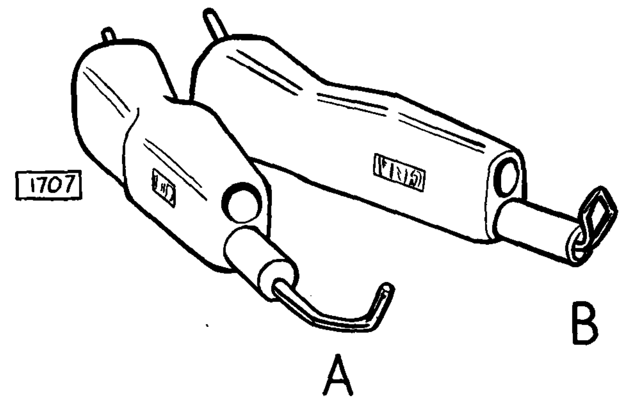


Fig. 15. The two special tools used when refitting a windscreen.

Using a pressure gun filled with a sealing compound, and fitted with a copper nozzle (so that the glass will not be scratched) apply the nozzle of the gun between the metal body flange and the rubber and fill with sealing compound. Repeat the operation between the glass and the rubber. Remove excess sealing compound with a rag soaked in white spirit. DO NOT USE THINNERS as this will damage the paintwork.

Fit the chrome strip on top of the windscreen rubber and bend to suit contour if necessary. Coat the inside of the chrome strip with a layer of Bostik 1251 and allow to become tacky. Place the chrome strip on the rubber over the rubber sealing strip and with a hook (A, Fig. 15) lip the rubber of the chrome finisher. Fit the two centre chrome clips and lip the rubber over the edges of the clips.

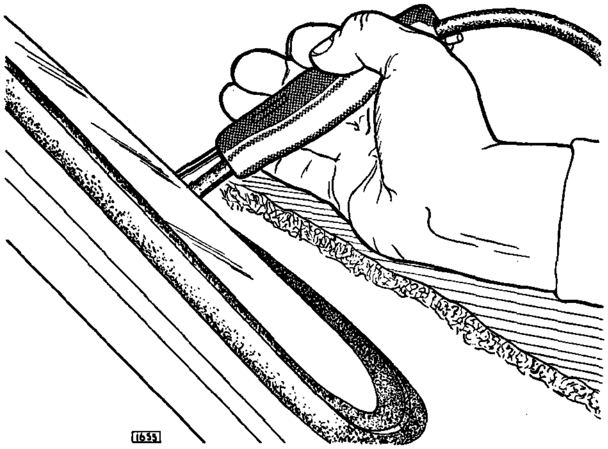


Fig. 16. Using the special tool ('B', Fig. 15) for inserting the rubber sealing strip in the windscreen sealing rubber.

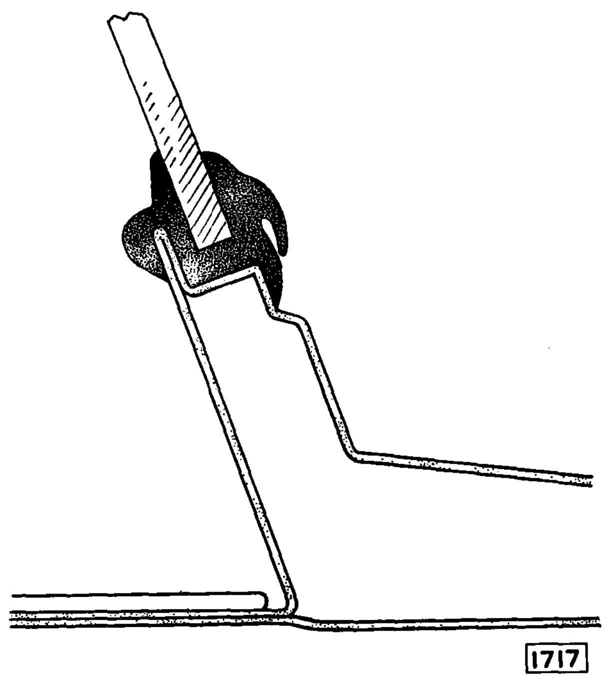


Fig. 17. Section through rear light glass and sealing rubber.

REAR GLASS

Removal

Remove the chrome finishing strip from the outside of the rubber.

Insert a screwdriver between the rubber and the rear screen aperture and draw the screwdriver completely around the rubber moulding to break the seal.

Using the flat of the hand exert sudden pressure from inside the car on to the rear screen.

Refitting

Remove the old sealer from the windscreen flange. If the same window rubber is to be used all small particles of glass should be removed and the rubber thoroughly cleaned. If the glass was not broken by a projectile the window aperture flange should be examined for a bump in the metal. If this is found, it should be filed away otherwise the glass may break again.

The rear screen rubber should be attached to the rear screen. Thread some strong cord (blind cord) twice around the aperture groove into which the flange of the rear screen aperture is fitted, leaving the two loose ends at the inside top of the screen.

From the outside edge of the car offer up the glass to the screen aperture.

Insert one end of the glass and lip the rubber over the aperture flange from inside the car.

Travel round the glass exerting sudden pressure to the outside of the glass at the same time lipping the rubber over the metal aperture inside the car. If, however, the cord is pulled directly against the rubber tearing of the rubber may result.

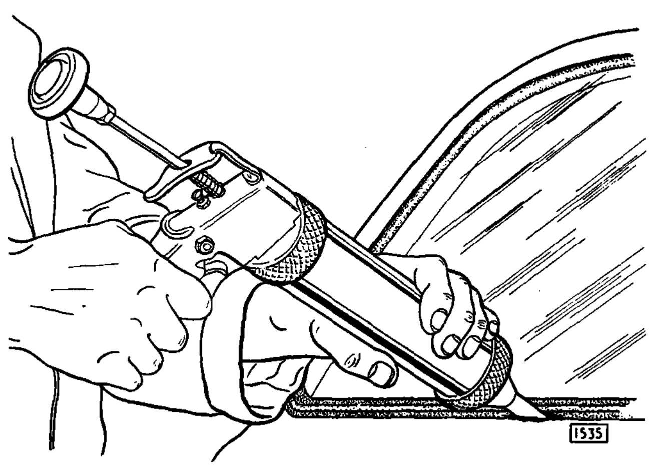


Fig. 18. Using a gun to inject sealing compound between the rubber and the windscreen aperture.

The sudden pressure exerted on the screen from the outside of the car has the effect of seating the glass and rubber on the flange.

Using a pressure gun filled with a sealing compound and fitted with a copper nozzle (so that the glass will not be scratched) apply the gun to the metal flange by pushing the nozzle of the gun between the rubber and the flange and filling with sealing compound.

Repeat the process between the glass and the rubber.

Remove the excess sealing compound with a rag soaked in white spirit. DO NOT USE THINNERS as this will damage the paintwork. Fit the chrome strip on top of the rubber and bend to suit contour if necessary. Coat the inside of the chrome strip with a layer of Bostik 1251 and allow to become tacky. Place the chrome strip on to the rubber and with a hook lip the rubber over the edge of the strip all the way round. The centre chrome clips may now be fitted.

Note : On cars fitted with the optional heated back-light it will be necessary to disconnect the cables in the boot prior to removal of the glass.

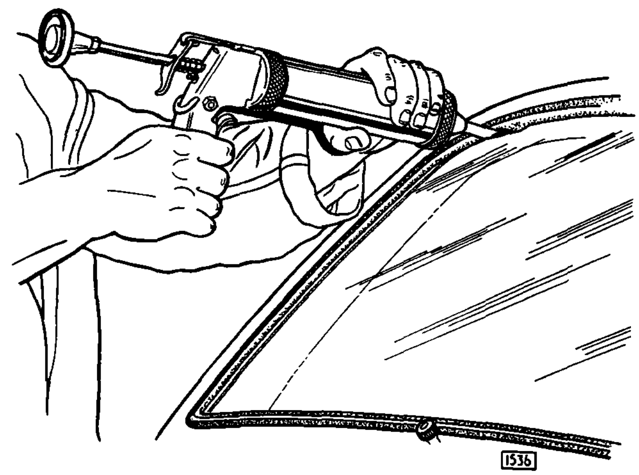


Fig. 19. Using a gun to inject sealing compound between the surround rubber and the glass.

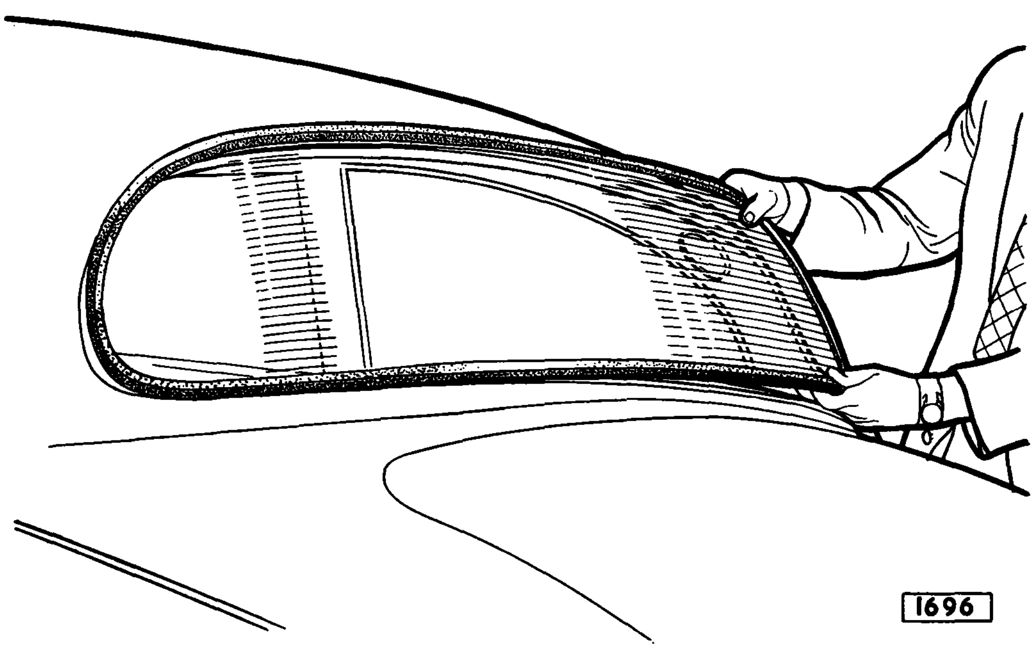


Fig. 20. Removal of the rear glass.

FRONT DOORS AND HINGES

Removal

Remove the split pin and clevis pin on the door check strap bracket situated on the door hinge pillar.

Mark the positions of the hinges on the door.

Remove the six bolts securing the hinges to the door side and remove the door.

Remove the scuttle side casing by unscrewing the three drive screws. Remove the two screws securing the aperture cover plate. Unscrew the door courtesy light switch from the bottom hinge recess. Pull out the electrical connection at the rear of the switch.

To remove the hinges unscrew the four cross headed screws and two bolts inside the hinge recess.

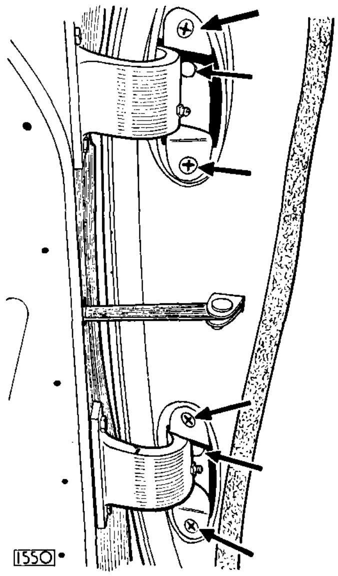


Fig. 21. Showing the screws which secure the front door hinges.

Refitting

Refitting is the reverse of the removal procedure.

REAR DOORS AND HINGES

Removal

Remove the split pin and clevis pin on the door check strap bracket on the door hinge pillar. Remove the door trim casing as described on page N.17.

Mark the positions of the hinges on the door.

Remove the three bolts securing the bottom hinge to the rear door and remove the four cross headed screws securing the top hinge to the door.

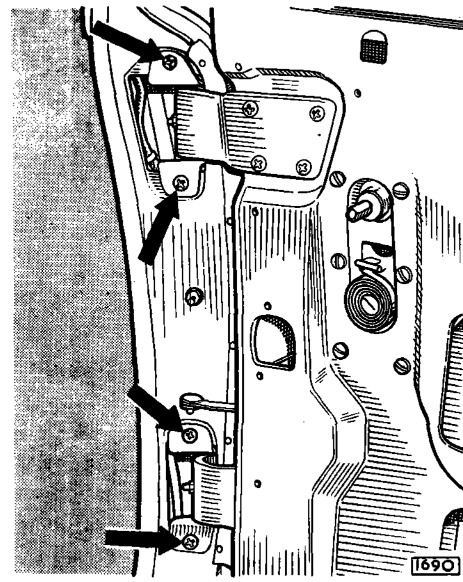


Fig. 22. Showing the screws which secure the rear door hinges.

Remove the rear door.

Remove the four cross headed screws securing the hinges to the rear door side of the centre pillar.

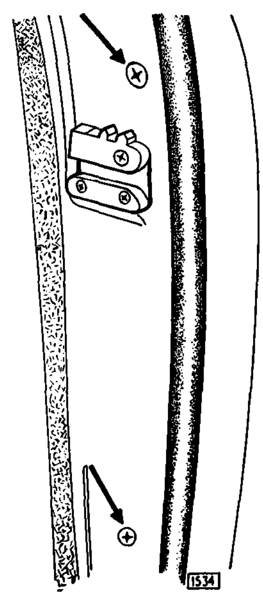


Fig. 23. Showing the two screws which secure the rear door hinge at the front of the centre pillar.

Remove the two cross headed screws from the front door side of the centre pillar.

Withdraw the hinges.

Refitting

Refitting is the reverse of the removal procedure.

FRONT AND REAR DOOR TRIM CASINGS

Removal

Remove the four chrome screws and washers securing the wood capping to the waist rail.

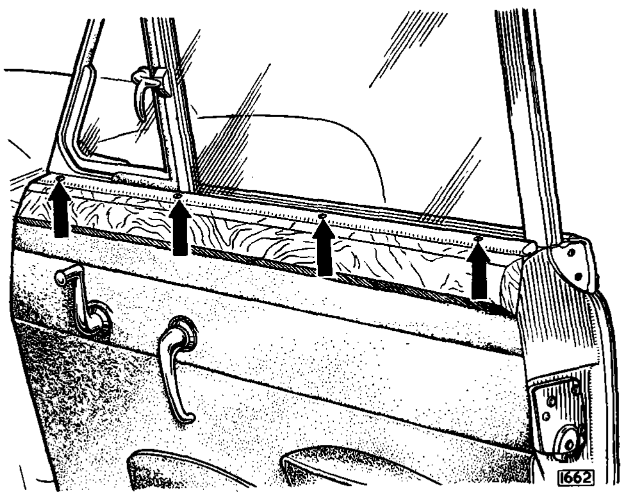


Fig. 24. Showing the four screws which secure the wood capping to the waist rail.

Prise up the three tacks securing the felt to the waist rail.

Remove the three screws securing the waist rail

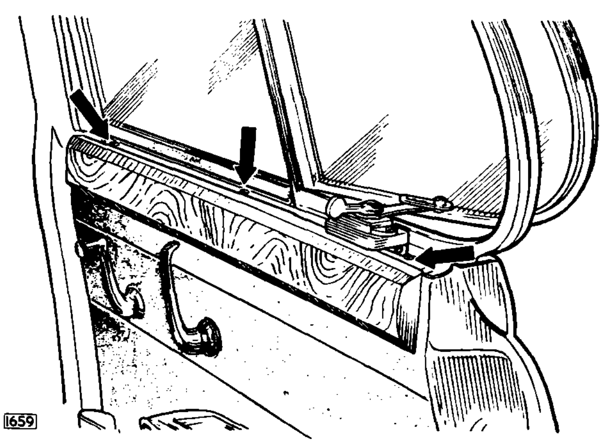


Fig. 25. Showing the three screws which secure the waist rail to the door frame.

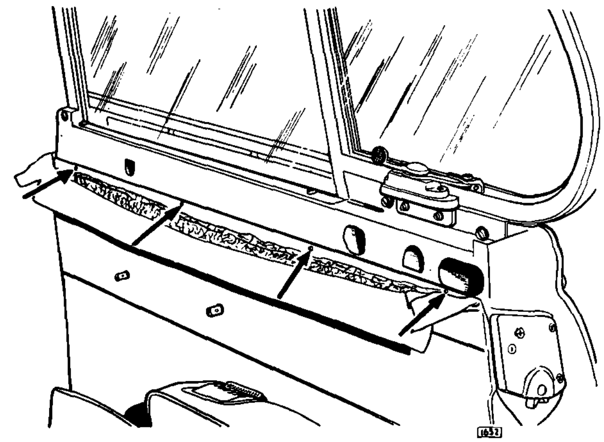


Fig. 26. Showing the screw which secures the top of the door trim casing.

to the door frame and remove the waist rail.

The covering for the door casing is attached to the door frame at the bottom of the window aperture with upholstery solution. Pull the covering away from the door frame.

Remove the four drive screws securing the mill board casing to the door frame.

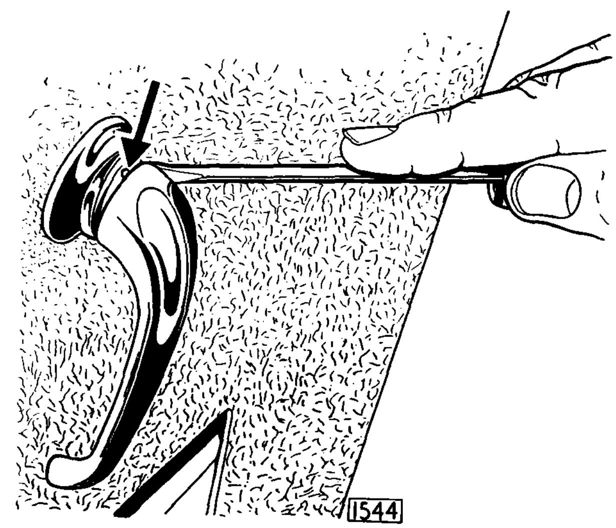


Fig. 27. Showing the location of the interior door lock handle retaining pin.

Insert a screwdriver between the handle and the spring cap and press the cap inwards (see Fig. 27).

This will expose the retaining pin which should be tapped out. The handle, spring clip and escutcheon can now be removed.

Remove the window regulator handle which is secured in the same way as the door handle.

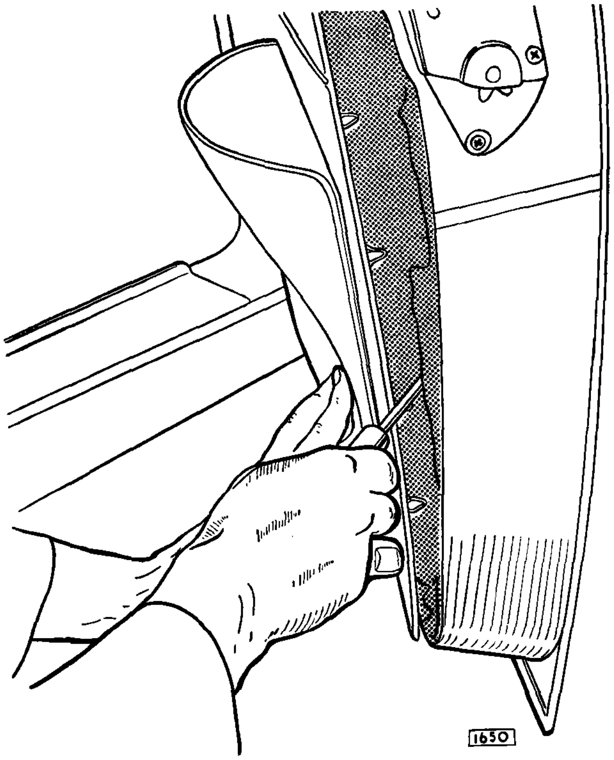


Fig. 28. Removal of the door trim casing.

Insert a thin bladed screwdriver between the door casing and the door frame. Prise off the door casing which is secured by twenty-one clips on the front door and eighteen clips on the rear door.

Refitting

Refitting is the reverse of the removal procedure.

FRONT AND REAR DOOR WINDOW FRAMES AND GLASS

Removal

Remove the door trim casing as described previously.

Pull off the clear plastic sheet which is stuck to the door frame with upholstery solution.

Remove the five round headed screws, serrated and plain washers securing the window frame just below the top of the door panel.

Collect all the packing pieces.

Care should be taken to replace the same number of packing pieces under their respective screws.

Remove the two bolts, serrated and plain washers securing the two legs of the window frame to the door. Collect the wooden packing pieces.

Unclip the weather strip from the door frame, this

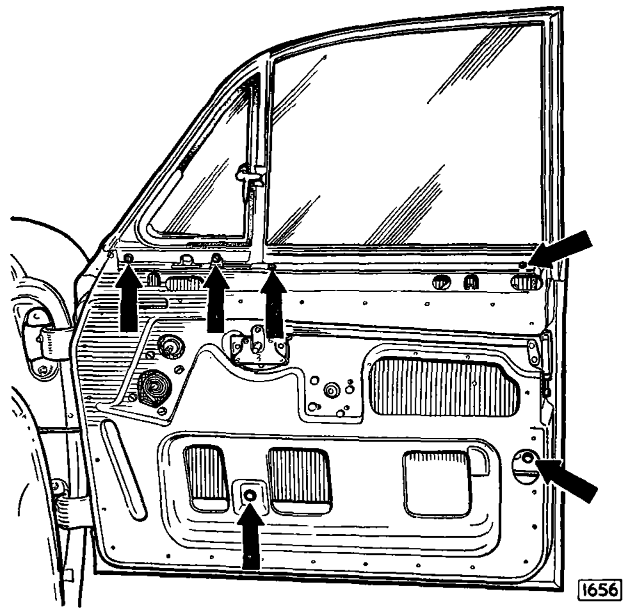


Fig. 29. The location of the window frame securing screws.

is secured by four clips. Withdraw the window frame from the door frame.

Slide the glass out of the retaining channel.

Refitting

Refit the four clips securing the weather strip to the outer inside edge of the door frame.

Clip the weather strip in position.

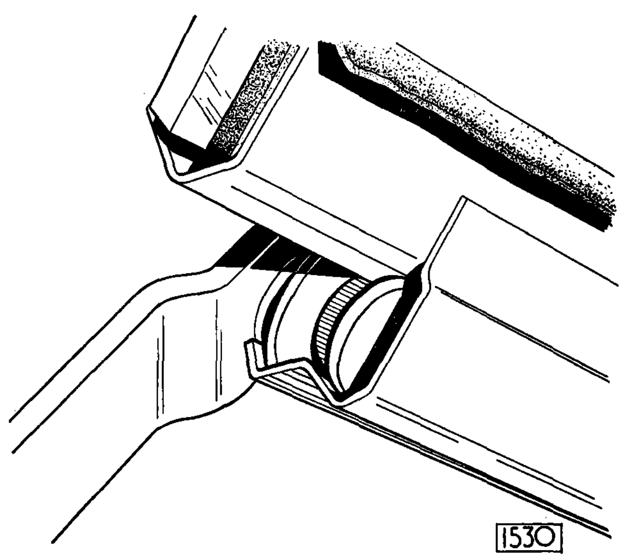


Fig. 30. Showing the window regulator arm and channel.

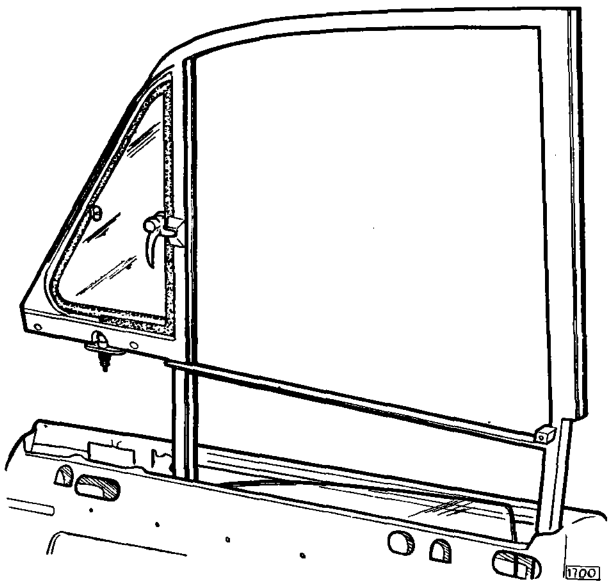


Fig. 31 Removal of the front window frame.

Place a layer of sealing compound on the section of the door frame on to which the no draught ventilator window in the window frame seats.

Place the door glass into position on the window winding mechanism slide channel, and slide the glass into position between the door frame.

Insert the window frame into the door frame. On the rear door it is necessary to wind up the window glass approximately one third of its maximum height before inserting the window frame. Refit all screws and bolts finger tight.

Insert the four round headed screws, serrated and plain washers which secure the window frame to the door. Replace the various packing pieces under the round headed screws.

Refit the bolt, serrated and plain washers securing the window frame bracket furthest away from the door hinge and replace the wooden packing pieces.

Refit the bolt, serrated and plain washer securing the window frame bracket nearest the door hinge and replace any wooden packing piece.

The window frame should clear the front screen pillar by $\frac{1}{16}''$ (1.5 mm.).

When the correct clearance has been achieved tighten the four round headed screws and two bolts securing the window frame to the door.

Refit the round headed screw, serrated and plain washer securing the metal tab on the door frame end to the window frame.

Remove any excess sealing compound from the bottom of the no draught ventilator.

Refit the door trim casing and wooden capping straps as described.

FRONT NO DRAUGHT VENTILATOR

Removal

Remove the trim casing from the front door as described on page N.17.

The no draught ventilator adjustment and securing

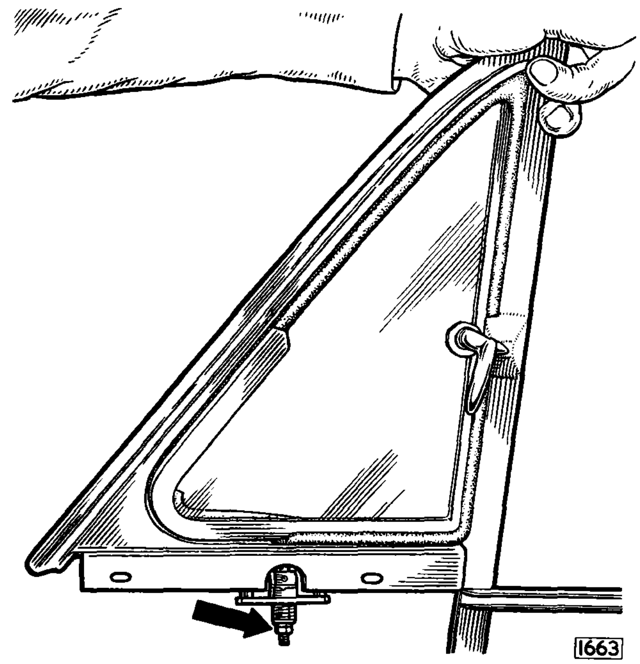


Fig. 32. Showing the front N.D.V. light adjustment nut.

mechanism is visible through a small aperture in the door frame.

Remove the locknut, nut and washer securing the spring against the quadrant on the N.D.V. post.

Remove the pin and segment on the N.D.V. post.

Remove the two screws securing the front N.D.V. hinge to the window frame.

Turn the N.D.V. catch to allow it to open.

Withdraw the N.D.V. from the window frame.

Refitting

Care should be taken not to leave any parts between the inner and outer door frames.

Refitting is the reverse of the removal procedure.

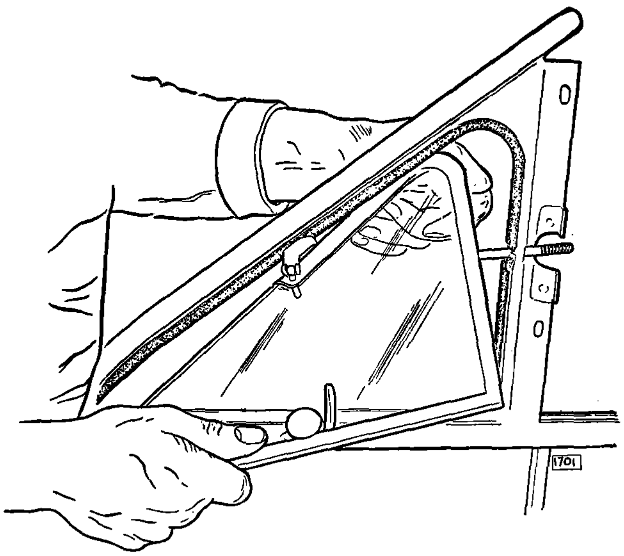


Fig. 33. Removal of front N.D.V. glass from frame.

REAR NO DRAUGHT VENTILATOR

Removal

Remove the nut, screw and fibre washer securing the rear N.D.V. bracket to the catch arm which operates the N.D.V.

Open the N.D.V.

Remove the five screws securing the rear N.D.V. light hinge to the window frame.

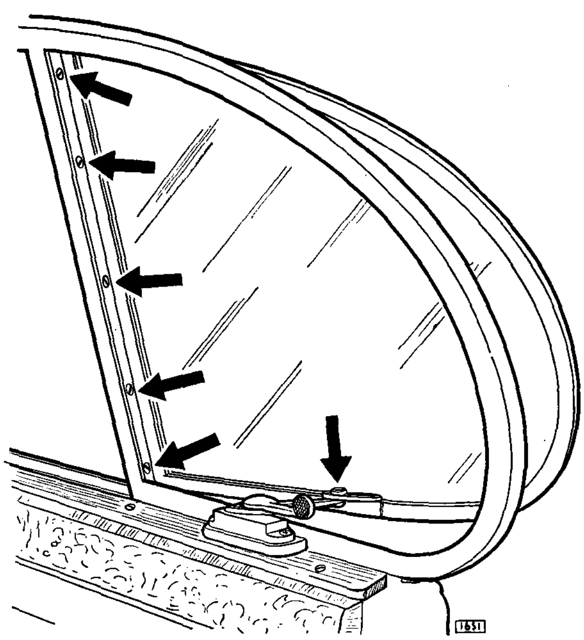


Fig. 34. Removal of rear N.D.V.

Refitting

Refitting is the reverse of the removal procedure.

FRONT WINDOW REGULATOR

Removal

Remove the door casing and window glass as described on pages N.17 and N.18.

Remove the felt placed over the window regulator spindle.

Remove the four screws and serrated washers securing the window regulator to the door frame.

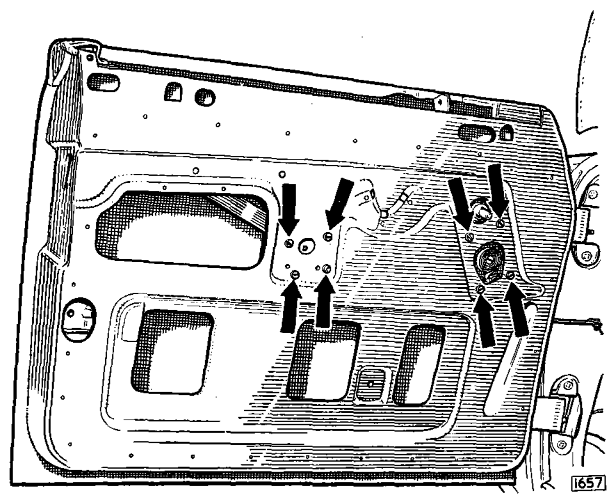


Fig. 35. Showing the screws securing the window winding mechanism to the door frame.

Remove four screws and serrated washers securing the window regulator spring to the door frame.

Withdraw the window regulator mechanism from the door frame.

Refitting

Refitting is the reverse of the removal procedure.

REAR WINDOW REGULATOR

Removal

Remove the door casing and window as described on pages N.17 and N.18.

Remove the piece of felt placed over the window regulator spindle.

Remove the four screws and serrated washers securing the window regulator mechanism to the door frame.

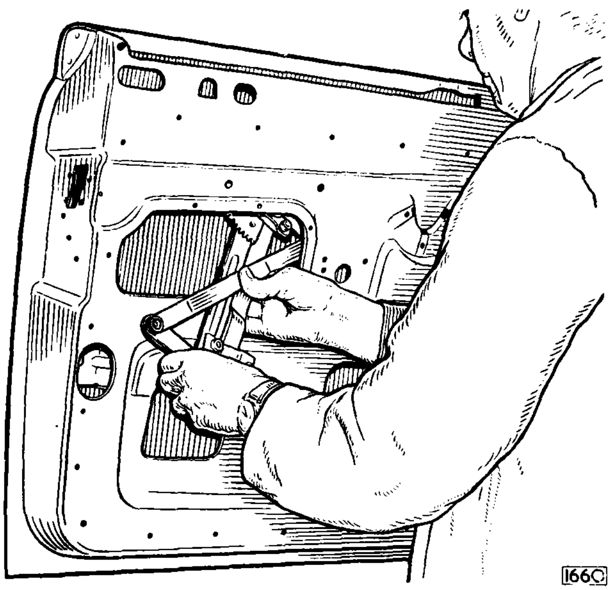


Fig. 36. Removal of window winding mechanism.

Withdraw the window regulator mechanism from the door frame.

Refitting

Refitting is the reverse of the removal procedure.

FRONT SEATS AND SEAT RUNNERS

Removal

Remove the cushion from the front seat.

Slide the seat fully rearward.

Remove the two bolts and plain washers securing the front of the seat runners to the body floor.

Slide the seat forwards and remove the two long screws and spring washers securing the rear of the seat runners to the body floor ; remove the seat.

Disconnect the two slide springs and push the seat slide forward exposing the bolts securing the rear of the seat slides to the seat.

Remove the bolts and spring washers.

Push the seat slides to the rear exposing the front bolts securing the seat slides to the seat.

Unscrew the bolts and remove the slide.

Refitting

Refitting is the reverse of the removal procedure.

REAR SEAT AND SQUAB

Removal

Lift the rear seat cushion upward off the two locating pins on the rear seat and remove the rear seat.

Remove the two round headed screws, serrated and plain washers securing the bottom of the rear seat squab to the back of the seat pan.

Lift the rear squab to disengage the metal retaining strip and withdraw the squab.

Refitting

Refitting is the reverse of the removal procedure.

POLISHED WOOD CAPPINGS

Removal of Upper and Lower Capping on the Door Pillar

Insert a thin bladed screwdriver between the trim casing and the centre door pillar. Prise off the trim casing.

Knock the wooden capping downward with the hand and remove. The wooden capping is secured by two clips.

Removal of Capping Rail at the Side of the Windscreen

Release the two nuts with serrated and plain washers securing the screen rail to the body.

Remove the screw securing the bottom of the side capping rail to the body.

Pull away the sealing rubber around the top of the front door aperture. This will expose the screw securing the side capping rail.

Withdraw the side capping rail.

Removal of the Rear Cant Rail

Pull away the sealing rubber around the top of the rear door aperture. This will expose the screws securing the rear cant rail to the body.

Withdraw the cant rail.

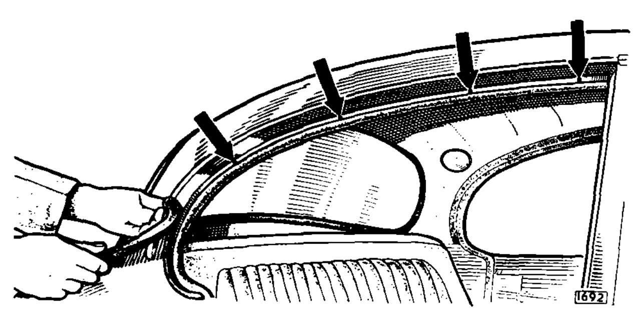


Fig. 37. Showing the four screws securing the rear cant rail.

Removal of the Front Cant Rail

Pull away the sealing rubber around the top of the front door aperture. This will expose the screws securing the front cant rail to the body.

Remove the three screws securing the front cant rail to the body.

Withdraw the cant rail.

Refitting

Refitting is the reverse of the removal procedure.

COURTESY LIGHT AND CAPPING

Removal

Pull off the courtesy light glass from the two plastic prongs securing it to the lamp body.

Remove the two screws securing the wooden base to the body of the car.

Disconnect the positive battery lead.

Disconnect the electrical connections at the rear of the courtesy light.

Refitting

Refitting is the reverse of the removal procedure.

COVER FOR REAR AIR DISTRIBUTION PIPES

Removal

Release the catch and slide each front seat as far rearward as possible. Remove the two front seat cushions.

Unscrew the chrome plated knob situated between the two front seats at the rear of the leather cover.

Remove the gear lever knob if a manual gearbox is fitted.

Lift the leather cover clear of the rear securing stud and pull the cover rearwards slightly to release the two locating clips under the heater controls. Remove the leather cover by lifting upward and pulling to the rear.

Refitting

Refitting is the reverse of the removal procedure.

HEATER CONTROL PANEL AND HEATER PIPES

Remove the gearbox heater pipe cover as described previously.

Remove the round headed screw and serrated washer securing the heater control panel at the bottom. Collect the packing pieces.

Remove the two bolts, serrated and plain washers securing the top of the control panel to the two nuts welded to the underside of the newspaper tray, at the bottom of the instrument panel.

Disconnect the two heater control wires from the rear of the heater control panel. Withdraw the heater control panel.

The heater pipes are secured by upholstery solution. Disconnect the rear heater pipes from the air distribution box under the facia panel.

Remove the two round headed screws and serrated washers securing the rear distribution box to the top of the propeller shaft tunnel.

Withdraw the heater pipe.

Refitting

When refitting the heater pipes they should be kept as low as possible at the sides of the propeller shaft tunnel or the pipes may be pierced by clips on the inside of the leather cover.

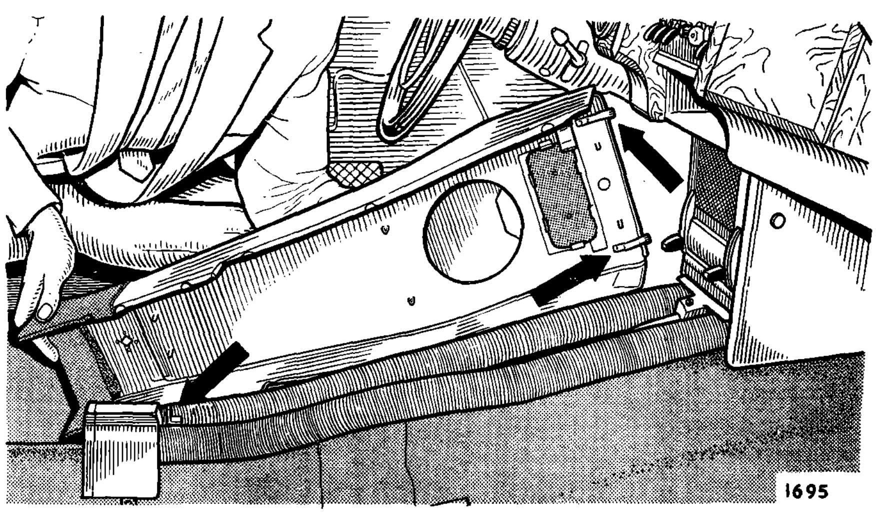


Fig. 38. Showing the heater pipe cover attachment points.

REMOVAL OF LOCK MECHANISM

Remove the door trim casing as described on page N.17.

First release the circlip holding the bottom of the outside handle connecting link (E or Ea, Fig. 41) to the dowel (F) on the intermediate lever. This is accessible through an aperture in the inner door panel.

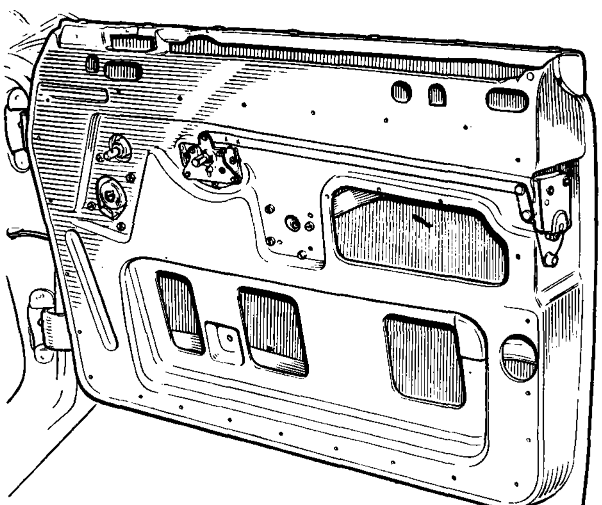


Fig. 39. Showing the door locks in position.

Removing Lock and Remote Control Units.

These are detached from the door by unscrewing the four lock screws (G) and the three remote control screws (H) respectively. (On later production where the remote control can be detached from the lock only one unit need be removed.)

Removing Outside Handle Base Plate Assembly

This is retained from inside the door by two (No. 10 A.N.F.) bolts (I). (On early production two screws were used on rear doors.)

Removing Outside Push Button Handle

This should not be removed unless it is necessary to fit a new handle. In this event, remove the two (No. 10 A.N.F.) nuts (J).

Removing Striker Unit

Do not disturb the three fixing screws (K) unless it is necessary to make adjustments or fit a new replacement.

Refitting

Remote controls must be fitted in the locked position. In the case of front doors the remote control is supplied pinned in the locked position as illustrated at (L) ready for fitting.

Securing the Lock and Remote Control Units

The lock and remote control units are " plant-on " fitting and at this stage should be loosely fitted to the door by means of their respective screws (G) and (H).

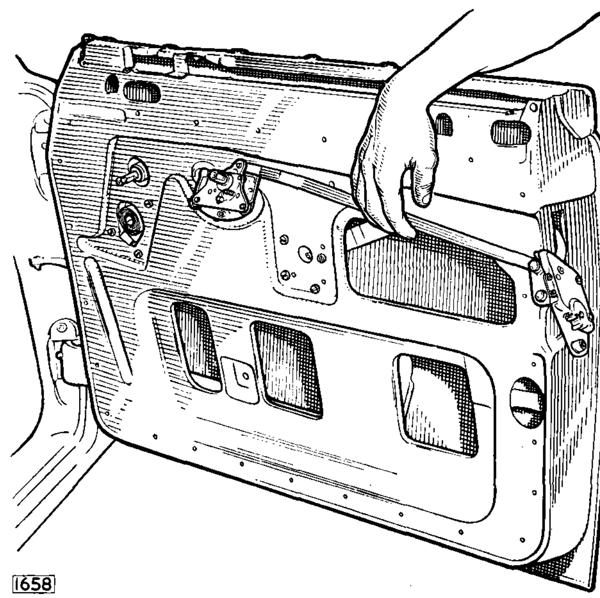


Fig. 40. Showing the door lock being placed in position.

Note : On later production where the remote control is supplied separately, the connecting link has to be attached to the dowel on the lock operating lever (M). A waved and plain washer are interposed between the lever (M) and the connecting link. The assembly is retained by a circlip.

The four " Phillips " type screws (G) holding the lock unit should be tightened next, then the remote control unit aligned by sliding it through its elongated holes *towards* the lock unit. The operating lever (M) will then be in contact with the lock case as illustrated and the three securing screws (H) can be tightened.

Fitting the Outside Push Button Handle

First ensure that the packing washer (N) is fitted to the front fixing stud. The handle can then be located on the door and retained from inside by two (No. 10 A.N.F.) nuts (J) with shakeproof washers.

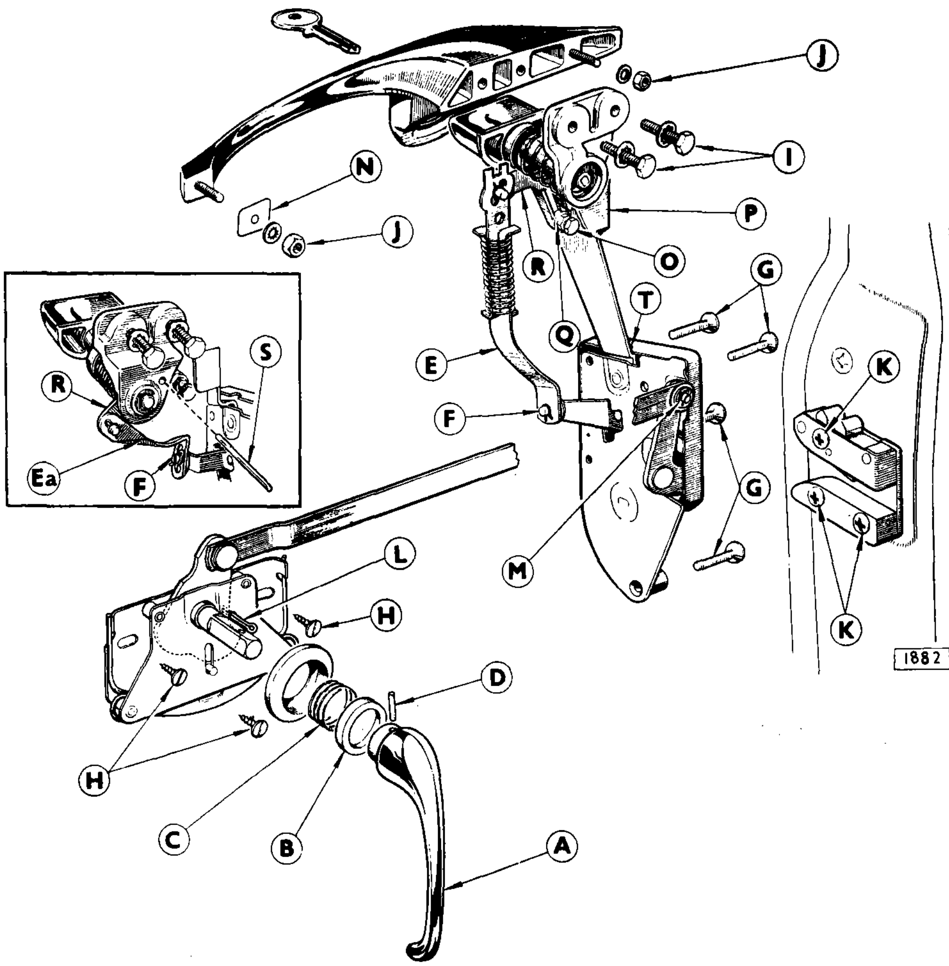


Fig. 41. Showing the door lock mechanism.

Fitting Handle Base-plate Assembly

The base-plate assemblies are stamped L.H. (left-hand) or R.H. (right-hand). The appropriate assembly should be held in position inside the door panel and the clearance between the push button plunger (O) and the lock contactor (P) checked through the aperture in the inner door panel. The clearance should be $\frac{1}{32}''$. To adjust, release the locknut (Q), screw the plunger bolt (O) in or out as required and re-tighten the locknut.

Before finally fitting the assembly, the appropriate connecting link (E) (Ea on rear doors) should be attached to the dowel on the plunger operating lever (R) and retained by a circlip. The links must be fitted in the positions illustrated. In the case of the extendable link (E) used on front doors the middle of the three holes should be used.

The base-plate assembly can then be secured from inside the door by two (No. 10 U.N.F.) bolts (I) (with shakeproof washers) which pass into the back of the outside handle.

Connecting Push Button Mechanism to the Lock Unit

First ensure that the remote control cam is set in the locked position. On front doors it is retained by the split pin (L) as illustrated.

Fit the bottom of the link (E), (with a plain washer interposed), to the dowel (F) on the lock intermediate lever. The link is retained by a circlip.

Important : Provision is made for the plunger operating lever (R) on rear doors to be pegged in the locked position prior to fitting the link (Ea). This is done by inserting a short length of $\frac{1}{8}''$ dia. rod (S) through a hole in the base-plate assembly.

To compensate for any variations in fitting both links are provided with three holes at one end. **In certain cases it may also be necessary to crank or bend the links slightly.**

At this stage remove the split pin (L) from the remote control on front doors and the rod (S) from the base-plate assembly on rear doors in order that the locking operation can be checked, as follows :—

Depress the push button, the plunger (O) should clear the lock contactor (P). Conversely, when the remote control is set in the unlocked position the plunger (O) should pass squarely behind the lock contactor (P) coming into contact with it when the push button is operated.

Fitting and Adjusting Striker Unit

Attach the striker loosely by means of its three screws (K) which pass through the door pillar into an adjustable tapping plate.

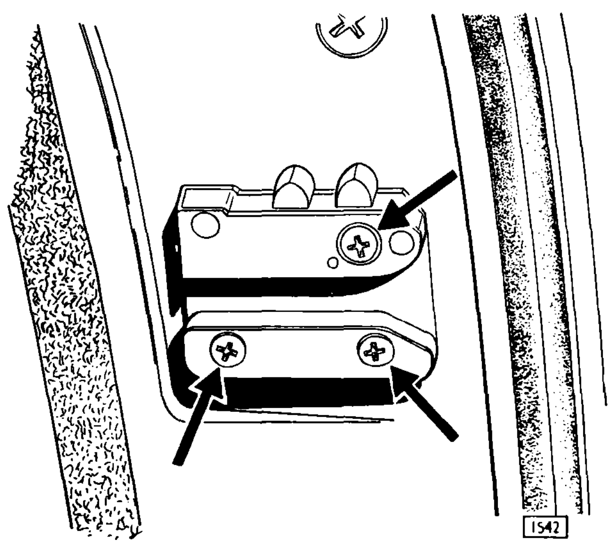


Fig. 42. Location of the door striker plate securing screws.

Positioning is carried out by a process of trial and error until the door can be closed easily but without rattling and no lifting or dropping of the door is apparent. Ensure that the securing screws are finally tightened.

Important : The striker must be retained in the horizontal plane relative to the door axis.

Master Check for Correct Alignment

Front Doors

Fit an inside handle **vertically downwards** on the remote control spindle.

Turn the inside **forward** into the locked position. It will automatically return to the central position when released. Close the door while holding the push button in the **fully depressed** position. The door will remain locked although the push button may be **freely depressed.**

Insert the key in the slot in the push button and turn in the appropriate direction. Push button control will then be restored and the door can be opened.

After turning the key will automatically return to the **horizontal** position when it can be removed.

Important : The key must be removed from the locking device before closing a door in the locked position.

Rear Doors :

Fit an inside handle **vertically upwards** on the remote control spindle.

Turn the inside handle **rearward** into the locked position where it will be automatically retained.

Close the door. It will then be locked although the push button may be freely depressed.

To unlock, the inside handle is returned to the central position when push control is restored.

LUBRICATION

Before fitting the door casing ensure that any moving parts are adequately greased.

After assembly introduce a few drops of thin machine oil into the oil hole (T) provided on top of each lock case and into the private lock key slots. These items should be lubricated once a month.

Important : The private lock cylinders must not under any circumstances be lubricated with grease.

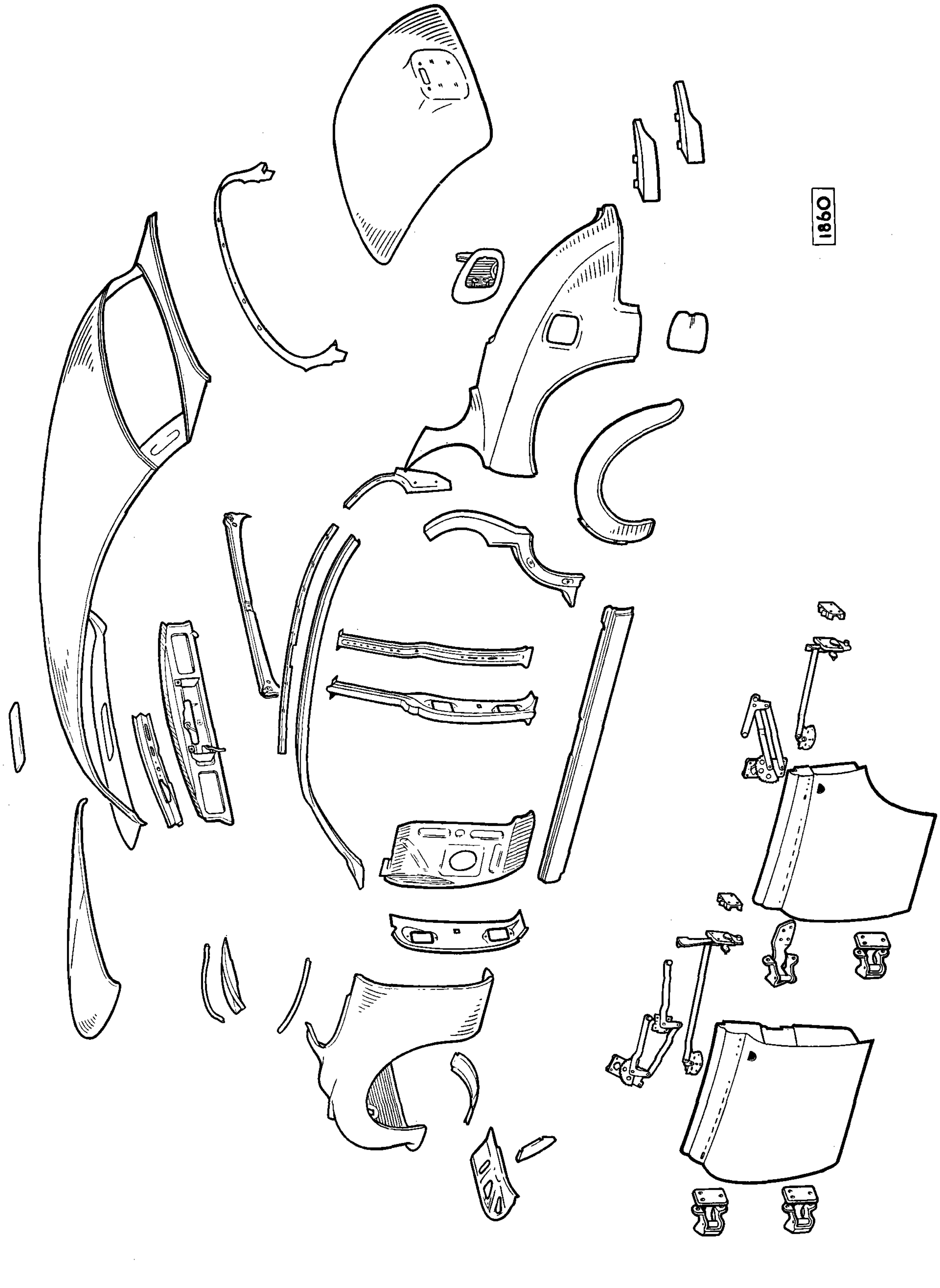


Fig. 43. Body panels.

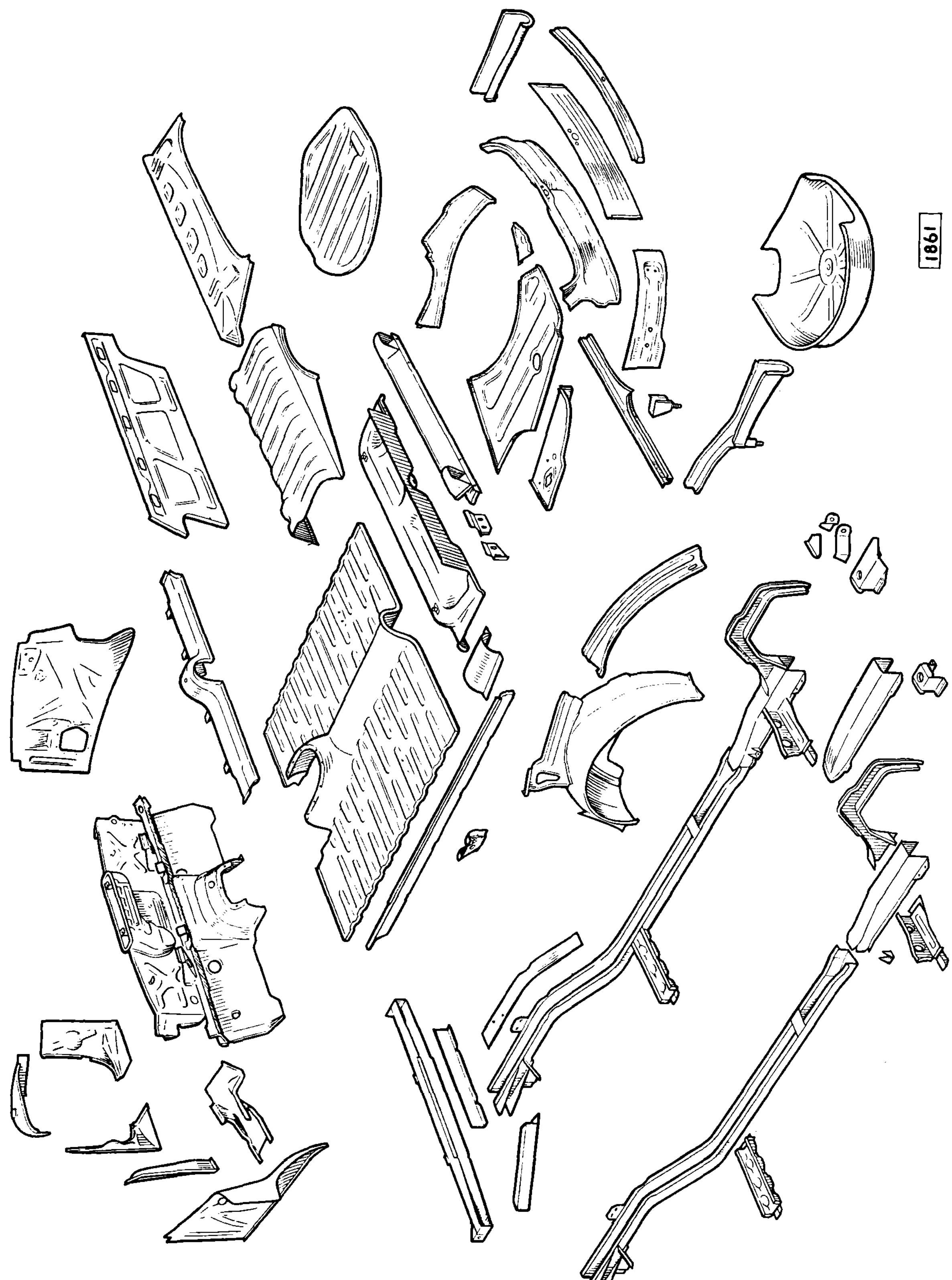


Fig. 44. Body underframe components.

ACCIDENTAL DAMAGE

The repair of integral construction bodies varies in some degree, depending on the extent of the damage, to that of separate body and chassis construction.

Superficial damage can be effected in a similar manner to that employed on " all steel " bodies which is familiar to all body repairers.

Repairs to rectify extensive damage affecting the main members of the underframe must be carried out so that when the repair is completed the main mounting points for the engine, front and rear suspensions, etc., are in correct relation to each other.

When checking for or rectifying distortion in the main underframe members, reference should be made to the diagrams in the section headed " Checking Body Underframe Alignment " which gives the important dimensions to be observed.

Replacement Body Panels

Where the existing panels or members are badly damaged and it is not possible to effect a satisfactory repair in position, the affected panels will have to be cut out and replacement panels welded in their place.

It will frequently be found advantageous to use only a part of a given panel so that the welded joint can be made in a more accessible position. Great care must, of course, be taken when cutting the mating portions of the panel to ensure that perfect matching is obtained.

For example, if damage to a front wing is confined to the forward end a simpler and quicker repair can be effected by cutting the front wing off between the wheel aperture and the wing valance. If the replacement front wing is then cut to match, a simple butt weld can be made and after cleaning down with a sanding disc and filling with plumber's lead the joint should be invisible.

Any unused portions of replacement panels should be retained as it will often be found that they can be used for some future repair job.

Where a replacement panel to be fitted forms part of an aperture such as for a door or the luggage boot lid, an undamaged door or lid should be temporarily hinged in position and used as a template to assist location while the replacement panel is clamped and welded in position.

Similarly, an undamaged radiator grille can be used as a template to accurately form the aperture when fitting a replacement front wing or wings.

Before any dismantling takes place after accidental damage a check of the underframe alignment should be carried out.

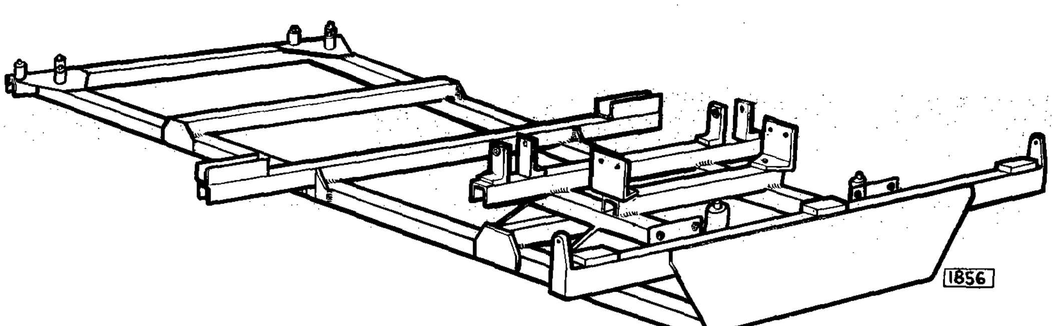


Fig. 45. Body underframe jig TFA.1329.

CHECKING BODY UNDERFRAME ALIGNMENT

Checking for Distortion in the Horizontal Plane

The plan view of the body on page N.30 provides the important dimensions for checking for distortion in the underframe. These dimensions can be measured actually on the underside of the body or by dropping perpendiculars from the points indicated by means of a plumb-bob on to a clean and level floor. If the latter method is adopted the area directly below each point should be chalked over and the position at which the plumb-bob touches the floor marked with a pencilled cross.

Checking for Distortion in the Vertical Plane

For checking the underframe for distortion in the vertical plane the side elevation gives the details of the important dimensions from a datum line.

If the relative distance between two points **above** the datum line is required one dimension should be subtracted from the other.

If the relative distance between a point above the datum line and the straight section of the chassis side member is required, add the dimension "D"—$3\frac{13}{16}$" (9.7 cm.)—to the dimension above the datum line.

If it is required to check the dimensions from ground level raise up the car at the front and rear and insert four blocks or stands of exactly equal height between the ground and the straight section of the chassis side members.

The blocks should be positioned at the front end to the rear of the jacking tube and at the rear end immediately in front of the rear spring front mounting bracket—**do not allow the weight of the car to rest on the blocks, use them only as test pieces.**

The distance from the ground to any given check point will be: height of blocks + "D" ($3\frac{13}{16}$"—9.7 cm.) + distance from datum line to check point.

KEY TO ALIGNMENT DIAGRAM

Symbol	Measurement taken from	Dimension
A	Forward face of front cross-member to centre of front wheel	$22\frac{1}{2}$" (57.15 cm.)
B	Centre of front wheel to centre of rear wheel (wheelbase)	$107\frac{3}{8}$" (272.75 cm.)
C	Centre of rear wheel to rear panel of luggage compartment	$36\frac{21}{32}$" (93.05 cm.)
D	Datum line to straight section of chassis side member	$3\frac{13}{16}$" (9.70 cm.)
E	Datum line to underside of front cross member	1" (2.55 cm.)
F	Datum line to centre of tube in chassis side member for front suspension cross-member mounting	$2\frac{3}{16}$" (5.55 cm.)

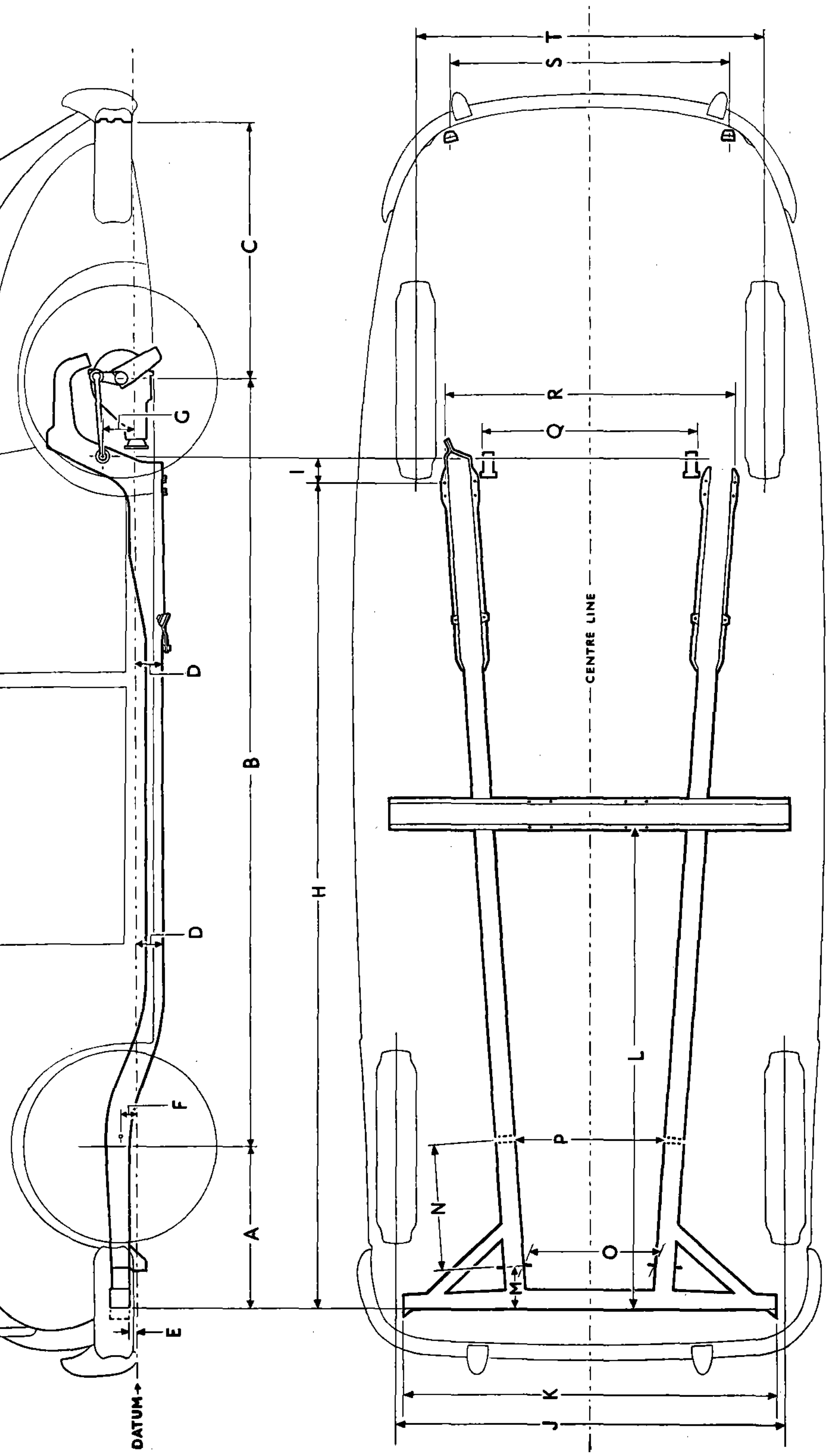


Fig. 46. Underframe alignment diagram.

KEY TO ALIGNMENT DIAGRAM (continued)

Symbol	Measurement taken from	Dimension
G	Datum line to centre of hole in rear torque arm bracket	$3\frac{7}{8}''$ (9.85 cm.)
H	Forward face of front cross-member to centre of outside rear hole of rear spring centre mounting (measured parallel to centre line of car)	$114\frac{13}{16}''$ (291.60 cm.)
I	Centre of outside rear hole of rear spring centre mounting to centre of hole in rear torque arm bracket (measured parallel to centre line of car)	$3\frac{7}{16}''$ (8.75 cm.)
J	Front Track—Disc wheels Wire wheels	4′ 7″ (1.397 m.) 4′ $7\frac{1}{2}''$ (1.410 m.)
K	Outer ends of front cross-member	50″ (127.00 cm.)
L	Forward face of front cross-member to centre line of front holes for the rear engine mounting support channel (measured parallel to centre line of car)	$67\frac{31}{32}''$ (172.65 cm.
M	Forward face of front cross-member to forward face of front suspension cross-member mounting bracket (measured along chassis side member)	$5\frac{25}{32}''$ (14.70 cm.)
N	Forward face of front suspension cross-member mounting bracket to tube in chassis side member for front suspension cross-member mounting	$17\frac{27}{32}''$ (45.30 cm.)
O	Inner faces of chassis side members at joints with front suspension cross-member mounting brackets	$18\frac{23}{32}''$ (47.55 cm.)
P	Inner faces of chassis side members at front suspension cross-member mounting tubes	$21\frac{1}{32}''$ (53.40 cm.)
Q	Outer faces of rear torque arm brackets	$29\frac{9}{64}''$ (74.00 cm.)
R	Outer rear holes of rear spring centre mounting brackets	$40\frac{1}{16}''$ (101.75 cm.)
S	Centres of rear bumper mountings	$40\frac{1}{32}''$ (101.65 cm.)
T	Rear Track—Disc wheels Wire wheels	4′ $5\frac{3}{8}''$ (1.356 m.) 4′ $6\frac{1}{8}''$ (1.375 m.)

WELDING METHODS

The following are the principal methods of welding used in the assembly of the body and underframe panels. The instructions given below for breaking the different types of welds should be adhered to when removing a damaged panel as this will facilitate the assembly of the new panel.

Spot Welding

This type of welding is used for the jointing of two or more overlapping panels and consists of passing electric current of high amperage through the panels by means of two copper electrodes.

This results in complete fusion of the metal between the electrodes forming a " spot " weld which is frequently repeated along the length of the panels to be joined. Spot welds can easily be recognised by slight indentation of the metal.

Lap joints on the outer body panels which are spot welded together are usually lead filled and in this case it will be necessary to direct the flame of an oxy-acetylene torch on to the lead so that the filling can be melted and wiped off by means of a piece of cloth.

Breaking Spot Welds

Spot welds cannot be broken satisfactorily other than by drilling ; any attempt to separate the panels by using a chisel will result in the tearing of the metal in the vicinity of the spot welds.

Use a $\frac{3}{16}$" (4.7 mm.) diameter drill and carefully drill out each weld. There is no necessity to drill completely through both panels ; if the " spot " is drilled out of one of the panels the weld can be completely broken by inserting a thin sharp chisel between the two panels and tapping lightly with a hammer.

Where possible, drill the spot welds completely out of the panel that is to be left in position on the body. This will allow the new panel to be joined to the mating panel on the body by gas welding through the holes in the overlapping flange. (This does not apply if spot welding equipment is available).

If this is not possible, and the holes have to be drilled out in the damaged panel, new holes can be drilled in the replacement panel and the same type of weld effected.

Gas Welding

This type of welding is carried out by means of oxy-acetylene equipment and is used for the jointing of overlapping panels or the butt welding of the edges of two panels.

Breaking Gas Welds

Gas welds may be broken either by means of a sharp chisel or by cutting through with a hacksaw ; welding can be removed by grinding with a pointed emery wheel.

EXHAUST SYSTEM (3.4 and 3.8 litre)

Removal

Remove the two nuts, bolts and plain washers securing the tail pipe under the rear bumper to the bracket of the body on the left hand side.

Slacken the two clips securing the exhaust down pipes to the silencers.

Remove the nut, bolt and washer securing the front of the silencers to the body.

Remove the two bolts, nuts and washers securing the middle of the silencers to the body.

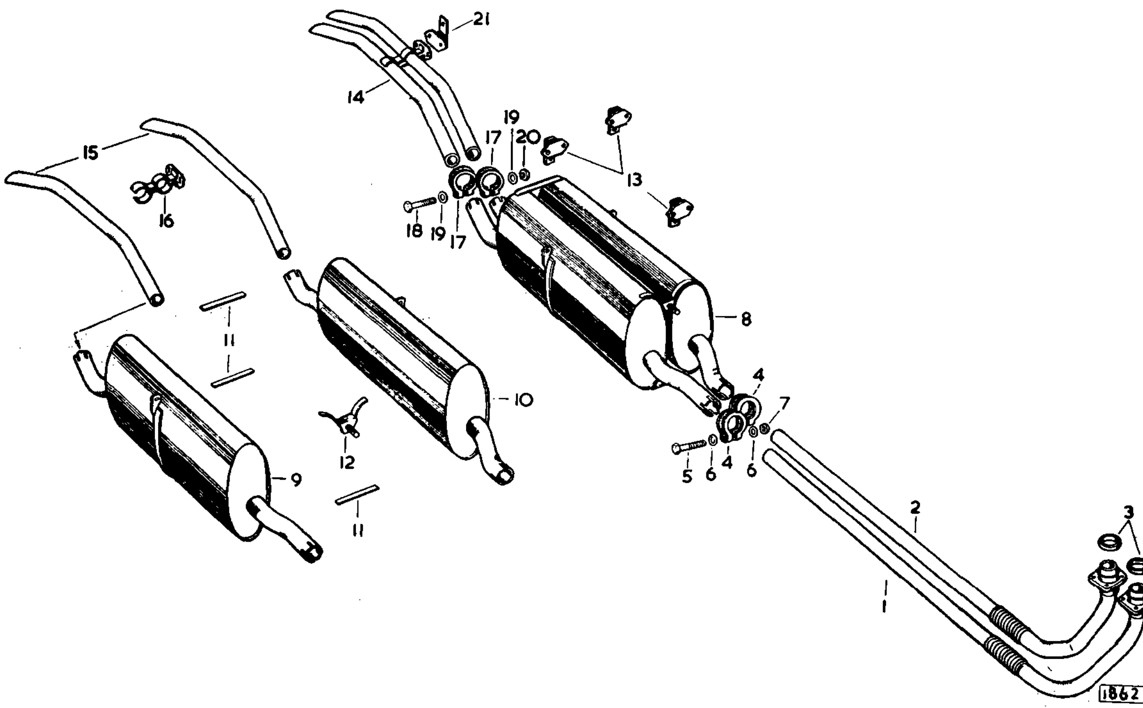
Lower the tail pipes and withdraw the silencers from the down pipes.

Remove the four nuts and washers securing each downpipe to the exhaust manifolds on the engine, when the downpipes can be removed. Collect the sealing rings which are between the exhaust manifold and the downpipe.

Refitting

Renew the copper sealing rings when refitting the exhaust downpipes to the exhaust manifolds.

Refitting is the reverse of the removal procedure.



1. Front down pipe
2. Rear down pipe
3. Copper sealing ring
4. Clip
5. Bolt
6. Plain washer
7. Nut
8. Twin silencer assembly
9. Inner silencer
10. Outer silencer
11. Strap
12. Strap assembly
13. Rubber mounting
14. Exhaust tail pipe assembly
15. Tail pipe
16. Mounting bracket
17. Clip
18. Bolt
19. Plain washer
20. Nut
21. Rubber mounting

Fig. 47. 3.4 and 3.8 litre exhaust system components.

EXHAUST SYSTEM (2.4 LITRE)

Removal

Remove the nut, bolt and washer securing the tail pipe under the rear bumper on the left hand side to the bracket on the body.

Slacken the clip securing the exhaust downpipe to the silencer.

Remove the two nuts, bolts and washers securing the silencer to the body.

Remove the nut, bolt and washer securing the downpipes to the bell housing bracket.

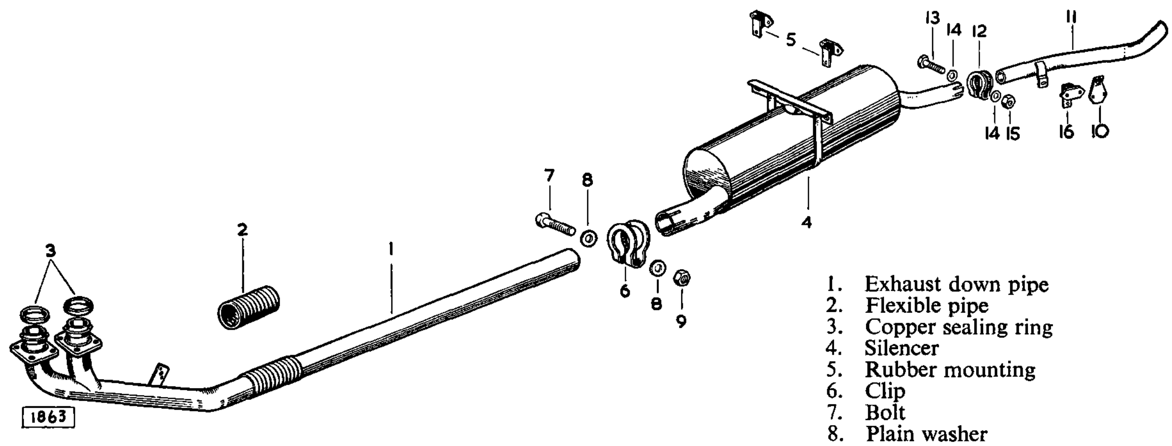
Remove the four nuts and washers securing each downpipe flange to the exhaust manifolds on the engine.

Remove the copper sealing rings.

Refitting

Renew the copper sealing rings when refitting the exhaust downpipes to the manifolds.

Refitting is the reverse of the removal procedure.



1. Exhaust down pipe
2. Flexible pipe
3. Copper sealing ring
4. Silencer
5. Rubber mounting
6. Clip
7. Bolt
8. Plain washer
9. Nut
10. Bracket
11. Tail pipe
12. Clip
13. Bolt
14. Plain washer
15. Nut
16. Rubber mounting

Fig. 48. 2.4 litre exhaust system components.

SUPPLEMENTARY INFORMATION
TO
SECTION N "BODY & EXHAUST SYSTEM"

MODIFIED DOOR LOCKS

Reference Pages : N.17, 18, 23, 24 and 25

Later cars are equipped with modified door locks to prevent the lock jamming when the outside button and inside lever are operated at the same time.

The removal and refitting of the door lock mechanism is as follows :—

REMOVAL OF LOCK MECHANISM

First release the spring clip holding the bottom of the outside handle connecting link (E or Ea, Fig. 1) to the dowel (F) on the intermediate lever. This is accessible through an aperture in the inner door panel.

REMOVING LOCK AND REMOTE CONTROL UNITS

These are detached from the door by unscrewing the four lock screws (G) and the three remote control screws (H) respectively. (On later cars where the remote control can be detached from the lock, only one unit need be removed).

REMOVING OUTSIDE HANDLE BASE PLATE ASSEMBLY

This is retained from inside the door by two (No. 10 A.N.F.) bolts (1). (On early production models two screws were used on the rear doors).

REMOVING OUTSIDE PUSH BUTTON HANDLE

This should not be removed unless it is necessary to fit a new handle. In this event, remove the two (No. 10 A.N.F.) nuts (J).

REMOVING STRIKER UNIT

Do not disturb the three fixing screws (K) unless it is necessary to make adjustments or fit a new replacement.

FITTING LOCK MECHANISM

Remote controls must be fitted in the locked position. In the case of front doors the remote control is supplied pinned in the locked position as illustrated at (L) ready for fitting.

SECURING THE LOCK AND REMOTE CONTROL UNITS

The lock and remote control units are " plant-on " fitting and at this stage should be loosely fitted to the door by means of their respective screws (G) and (H).

***Note.** On later production where the remote control is supplied separately, the connecting link has to be attached to the dowel on the lock operating lever (M). A waved and plain washer are interposed between the lever (M) and the connecting link. The assembly is retained by a spring clip.

The four " Phillips " type screws (G) holding the lock unit should be tightened next, then the remote control unit aligned by sliding it through its elongated holes **towards** the lock unit. The operating lever (M) will then be in contact with the lock case as illustrated and the three securing screws (H) can be tightened.

FITTING THE OUTSIDE PUSH BUTTON HANDLE

First ensure that the packing washer (N) is fitted to the front fixing stud. The handle can then be located on the door and retained from inside by two (No. 10 A.N.F.) nuts (J) with shakeproof washers.

FITTING HANDLE BASE-PLATE ASSEMBLY

The base-plate assemblies are stamped L.H. (left-hand) or R.H. (right-hand). The appropriate assembly should be held in position inside the door panel and the clearance between the push button plunger (0) and the lock contactor (P) checked through the aperture in the inner door panel. The clearance should be $\frac{1}{32}''$. To adjust, release the locknut (Q), screw the plunger bolt (0) in or out as required and re-tighten the locknut.

Before finally fitting the assembly, the appropriate connecting link (E) (Ea on rear doors) should be attached to the dowel on the plunger operating lever (R) and retained by a circlip. The links must be fitted

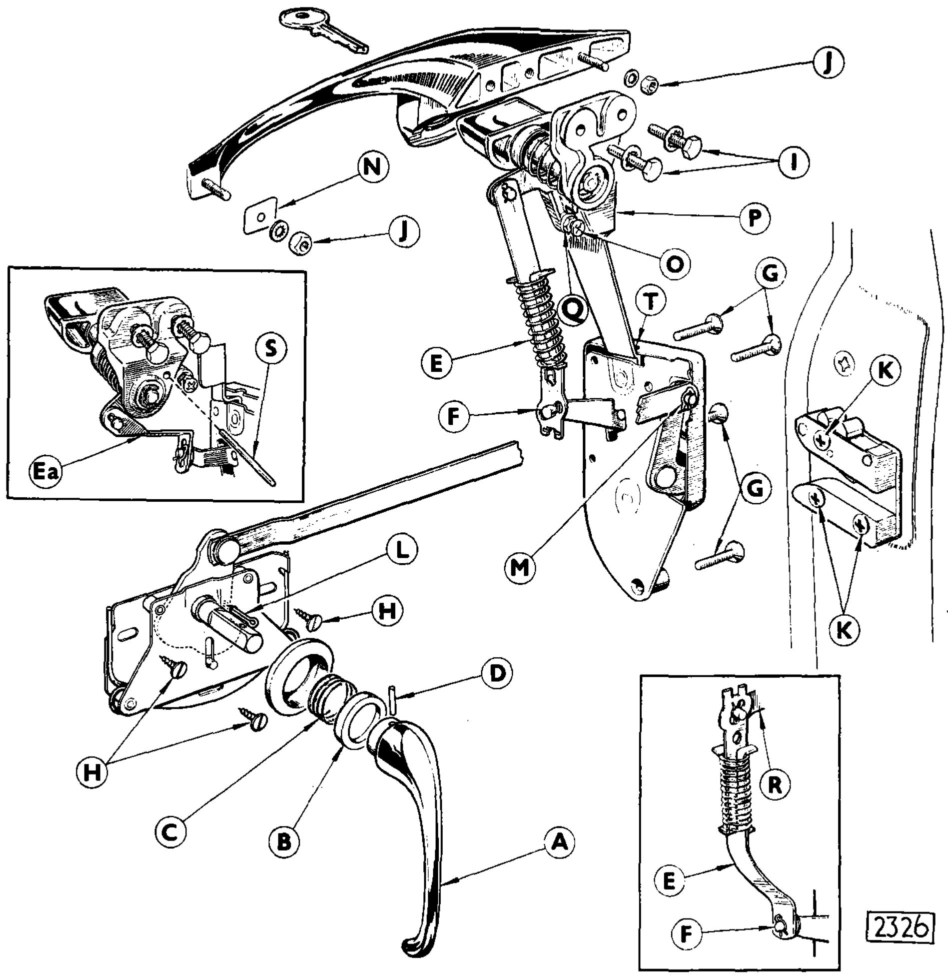


Fig. 1. Exploded view of the door lock.

in the positions illustrated. In the case of the extendable link used on early production front doors this was fitted in the reverse position, the middle of the three holes being used (see inset). **Note :** It is recommended that this link is replaced by the latest extendable type wherever practicable.

At this stage the base-plate assembly is secured from inside the door by two (No. 10 A.N.F.) bolts (I) (with shakeproof washers) which pass into the outside handle.

CONNECTING PUSH BUTTON MECHANISM TO THE LOCK UNIT

First ensure that the remote control cam is set in the locked position. On front doors it is retained by the split pin (L) as illustrated.

Important : Provision is made for the plunger operating lever (R) on rear doors to be pegged in the locked position prior to fitting the link (Ea). This is done by inserting a short length of $\frac{1}{8}''$ diameter rod (S) through a hole in the past-plate assembly as illustrated.

To compensate for variations in fitting, the links (E and Ea) are provided with three holes at the bottom end. It will be observed that one of these can be aligned with the dowel (F) on the intermediate lever. The link is simply pressed on being automatically retained by its spring clip.

At this stage remove the split pin (L) from the remote control on the front doors and the rod (S) from the base plate assembly on the rear doors in order that the locking operation can be checked, as follows :—

Depress the push button, the plunger (O) should clear the lock contactor (P). Conversely, when the remote control is set in the unlocked position the plunger (O) should pass squarely behind the lock contactor (P) coming into contact with it when the push button is operated.

FITTING AND ADJUSTING STRIKER UNIT

Attach the striker loosely by means of its three screws (K) which pass through the door pillar into an adjustable tapping plate.

Positioning is carried out by a process of trial and error until the door can be closed easily but without rattling and no lifting or dropping of the door is apparent. Ensure that the securing screws are finally tightened.

Important : The striker must be retained in the horizontal plane relative to the door axis.

MASTER CHECK FOR CORRECT ALIGNMENT

Front Doors

Fit an inside handle **vertically downwards** on the remote control spindle. Turn the handle forward into the locked position. It will automatically return to the central position when released. Close the door while holding the push button in the **fully depressed** position. The door will remain locked although the push button may be **freely depressed.**

Insert the key in the slot in the push button and turn in the appropriate direction. The push button control will then be restored and the door can be opened.

After turning, the key will automatically return to the **horizontal** position when it can be removed.

Important : The key must be removed from the lock before closing a door in the locked position.

Rear Doors

Fit an inside handle **vertically upwards** on the remote control spindle. Turn the inside handle **rearward** into the locked position where it will be automatically retained.

Close the door. It will then be locked although the push button may be freely depressed.

To unlock, the inside handle is returned to the central position when push button control is restored.

LUBRICATION

Before fitting the door casing ensure that any moving parts are adequately greased.

After assembly introduce a few drops of thin machine oil into the oil hole (T) provided on top of each lock case and into the private lock key slots. These items should be lubricated once a month.

Important : The private lock cylinders must not under any circumstances be lubricated with grease.

FEATURES OF LOCK OPERATION

Free Push Buttons

When doors are locked the push buttons may be freely depressed. No amount of pressure on the outside button will force or damage the lock.

Two Door Locking

Either front door can be locked from inside or outside irrespective of which door was last used as an exit. This feature is invaluable in cases of traffic congestion and parking.

Self Cancelling

If either front door is closed after accidentally setting the inside handle in the locked position, locking is automatically cancelled. This action obviates the risk of locking oneself out of the car.

Keyless Locking

However, front doors can be locked from **outside** without using the key, a great advantage in inclement weather or under heavy traffic conditions where instant locking is desirable. This is achieved by setting the inside handle in the locked position and while closing the door, **deliberately** holding the push button in the **fully depressed** position. The key will then be used for unlocking either front door in the usual way.

SEAT BELT ANCHORAGE POINTS

Models affected	Commencing Chassis Nos.	
	R.H. Drive	L.H. Drive
2.4 litre Mark 2	111418	126652
3.4 litre Mark 2	158371	177753
3.8 litre Mark 2	207313	219801

On cars with the above chassis numbers and onwards, mounting points for the attachment of seat belt anchor bolts are provided. Earlier cars had two holes, one plain and one tapped, at the floor anchorage positions; later cars have only a single $\frac{7}{16}$" (11.1 mm.) U.N.F. tapped hole, as shown in the illustration. For the official Jaguar Seat Belts only the tapped hole will be used for anchorage purposes.

Note : The tapped holes in the floor are blanked off with plastic cross headed screws. The tapped hole in each centre pillar is blanked off with a chrome plated escutcheon.

Full fitting instructions and all necessary attachment bolts and eyebolts are supplied with Jaguar seat belt kits. The part numbers are as follows.

	Part No.
Front seat belt (lap/diagonal)	9212
Rear Seat Belt (diagonal)	9213

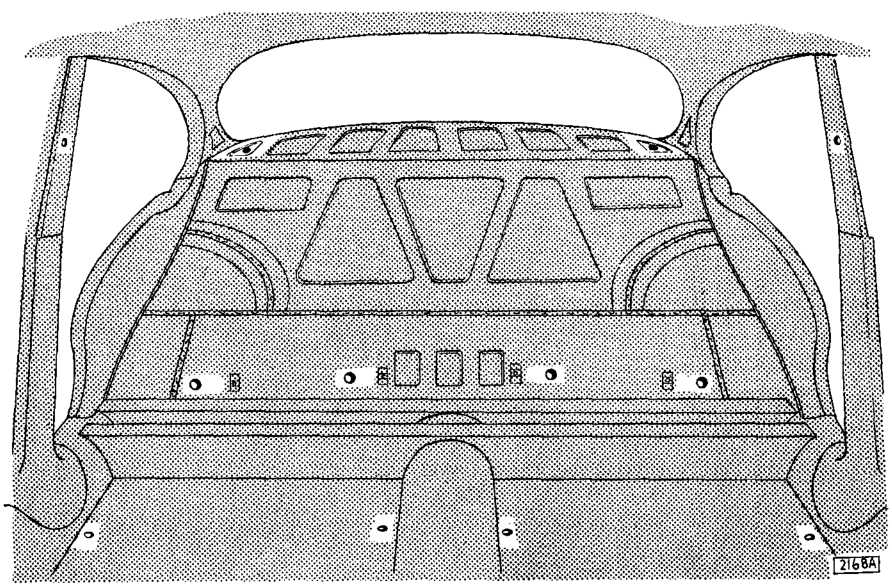


Fig. 2. Seat belt anchorage points

SECTION O

HEATING & WINDSCREEN WASHING EQUIPMENT

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

CAR HEATING AND VENTILATING SYSTEM

WINDSCREEN WASHING EQUIPMENT

HEATING AND WINDSCREEN WASHING EQUIPMENT

CAR HEATING AND VENTILATING SYSTEM

The car heating and ventilating equipment consists of a heating element and an electrically driven fan mounted on the engine side of the scuttle. Air from the heater unit is conducted :—

(a) To a built-in duct situated under the instrument panel.
(b) To the rear compartment via twin pipes.
(c) To vents at the bottom of the windscreen to provide demisting and defrosting.

Either fresh air or the air from the interior of the car can be introduced into the system at the will of the driver.

FRESH AIR is introduced into the system by opening the scuttle ventilator and switching on the fan. Air from the interior of the car can be RE-CIRCULATED by closing the scuttle ventilator and switching on the fan.

TEMPERATURE CONTROL

The temperature control (marked " Hot-Cold ") situated below the instrument panel operates a valve which controls the flow of air through the heater. When the control is placed in the " Cold " position the supply of air from the heating element is completely cut off so that cold air can be admitted for ventilating the car in hot weather.

Placed in the " Hot " position the maximum amount of air passes through the heating element. By placing the control in intermediate positions varying degrees of heat can be obtained.

DISTRIBUTION CONTROL

The distribution control (marked " Car-Screen ") controls the proportion of air directed to the windscreen or the interior of the car.

Placed in the fully upward position the maximum amount of air will be admitted into the car interior. Placed in the fully downward position the maximum amount of air is directed to the windscreen for rapid demisting or defrosting. By placing the control in intermediate positions varying proportions of air can be directed into the car interior and to the windscreen.

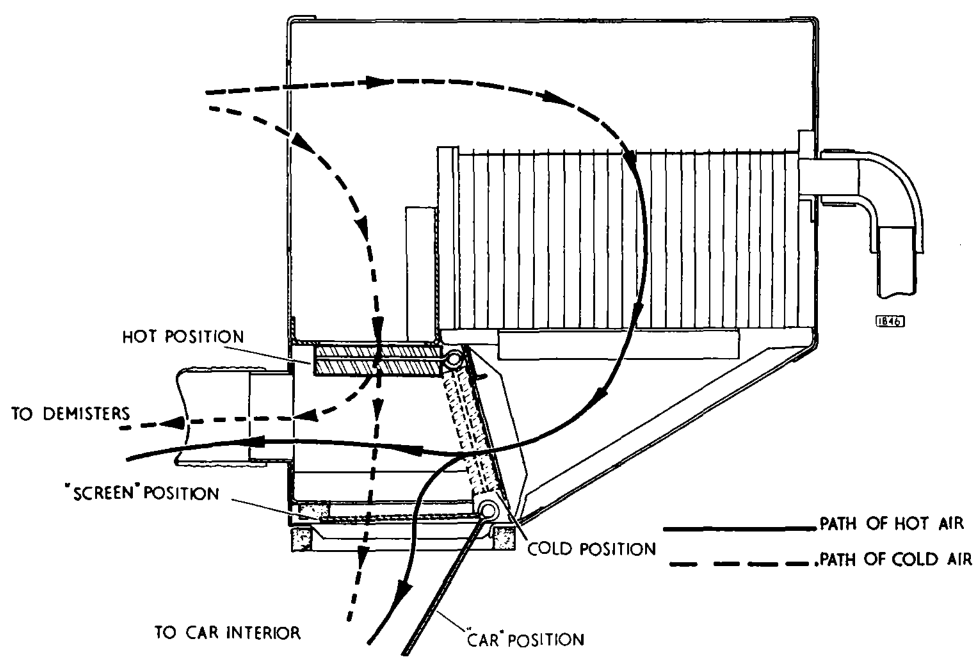


Fig. 1. Showing the passage of air through the heater unit.

FAN SWITCH

The heater fan for the car heating and ventilating system considerably increases the flow of air through the system and is controlled by a three position switch (marked " Fan ").

Lift the switch to the second position for slow speed and to the third position for maximum speed, whichever is required.

Operation of the fan is required mainly when the car is stationary or running at a slow speed. At higher road speeds it will be found possible to dispense with the fan as air will be forced through the system due to the passage of the car through the air.

COLD WEATHER

To obtain re-circulated air heating, demisting and de-frosting:

(a) CLOSE scuttle ventilator.
(b) Set temperature control to the DESIRED POSITION.
(c) Switch ON fan at required speed.
(d) Set distribution control to the DESIRED POSITION.

To obtain fresh air heating, demisting and de-frosting:

(a) OPEN scuttle ventilator.
(b) Set temperature control to the DESIRED POSITION.
(c) Switch ON fan at required speed.
(d) Set distribution control to the DESIRED POSITION.

To obtain rapid demisting or de-frosting:

(a) CLOSE scuttle ventilator.
(b) Set temperature control to HOT.
(c) Switch ON fan—fast position.
(d) Set distribution control to SCREEN.

HOT WEATHER

To obtain ventilation and demisting:

(a) OPEN scuttle ventilator.
(b) Set temperature control to COLD.
(c) Switch ON fan at required position.
(d) Set distribution control to DESIRED POSITION.

To obtain rapid demisting:

(a) OPEN scuttle ventilator.
(b) Set temperature control to COLD.
(c) Switch ON fan—fast position.
(d) Set distribution control to SCREEN.

HEATER UNIT

Removal

Drain the water from the radiator and cylinder block.

Remove the two chrome screws securing the side panels on each side of the heater control panel.

Slacken the screw securing the outer casing of the water tap control wire at the rear of the heater control panel.

Slacken the screw securing the inner wire of the water tap control.

Unclip the heater air distribution wire from the spring clip on the lever.

Remove the bonnet as described on page N.7, Section N.

Disconnect one of the battery terminals.

Disconnect the two wires from the fan at the snap connectors.

Unscrew the wing nut in the centre of the paper element air cleaner and remove the complete air cleaner.

Unscrew the two bolts and three nuts securing the heater body to the scuttle.

Disconnect the water hose at the heater control tap.

Disconnect the water hose at the heater pipe leading to the heater matrix.

Withdraw the heater body and control wires.

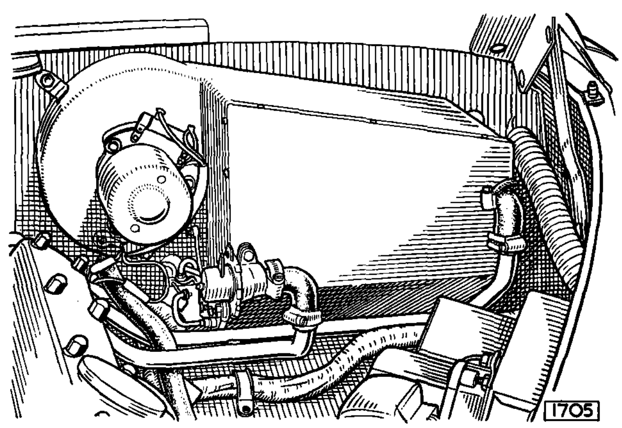


Fig. 2. Location of the heater unit and heater tap.

Refitting

When refitting the heater body smear some sealing compound around the holes of the demister sealing rubber.

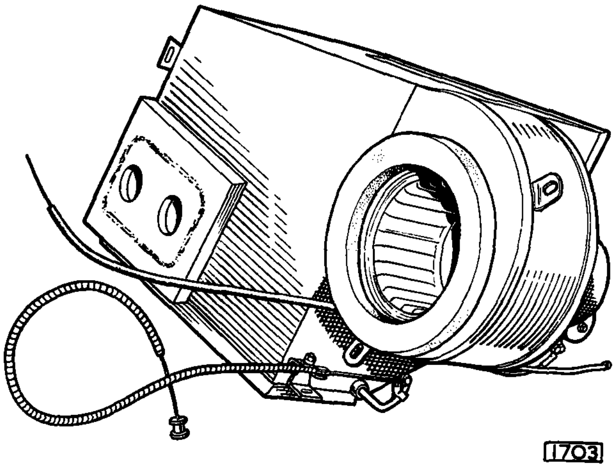


Fig. 3. Sealing the demister ducts.

Place the lever (A, Fig. 4) in the fully open (HOT) position, that is, as far as possible towards the heater casing.

Feed the control wire through the lever bracket couplings and tighten the screw securing the wire to the lever (A, Fig. 5).

Tighten the screw securing the outer cable to the bracket (B).

Press the flap operating lever (B, Fig. 4) on the side of the heater box into the fully shut "screen" position and place the heater distribution control lever in the screen position.

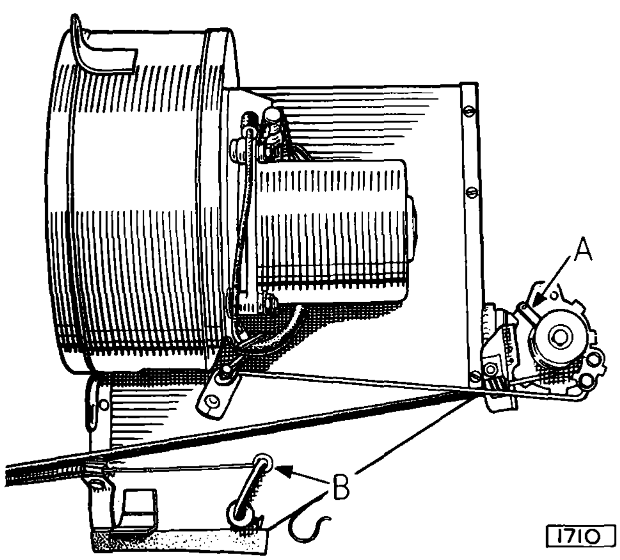


Fig. 4. Setting the heater flap control wires.

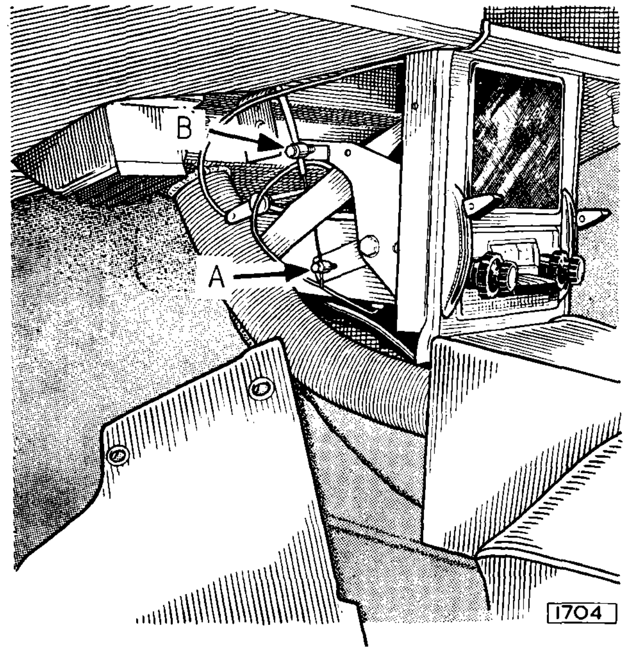


Fig. 5. Setting the heater operating levers.

Feed the control wire through the lever bracket coupling and tighten the screw securing the wire to the lever. Tighten the screw securing the outer cable to the bracket.

Refitting is the reverse of the removal procedure.

HEATER WATER CONTROL TAP

Removal

Slacken the bolt securing the outer plastic cover for the remote control wire on the water control tap.

Slacken the locknut and setscrew securing the remote control wire to the valve lever on the control tap.

Withdraw the remote control wire from the tap.

Slacken the locknut and setscrew securing the heater control flap wire to the valve lever on the water control tap.

Withdraw the wire and spring washers securing the water control tap to the heater body.

Withdraw the water control tap and rubber sealing washer.

Refitting

Examine the rubber sealing washer for deterioration.

Refitting is the reverse of the removal procedure.

FAN SWITCH

Removal

Disconnect one of the battery terminals.

Remove the two thumb screws securing the instrument panel to the body.

Remove the three " Lucar " connectors at the rear of the fan switch.

Unscrew the chrome bezel securing the fan switch to the instrument panel taking care not to scratch the face of the instrument panel.

Remove the fan switch from the rear of the instrument panel.

Refitting

Refitting is the reverse of the removal procedure.

FAN MOTOR

Removal

Remove the heater as described on page O.4.

Unscrew the nut securing the fan on the motor spindle. Withdraw the fan.

Remove the three nuts, plain and rubber washers securing the fan motor.

Remove the rubber washer and earth wire from the securing bolts.

Refitting

Refitting is the reverse of the removal procedure.

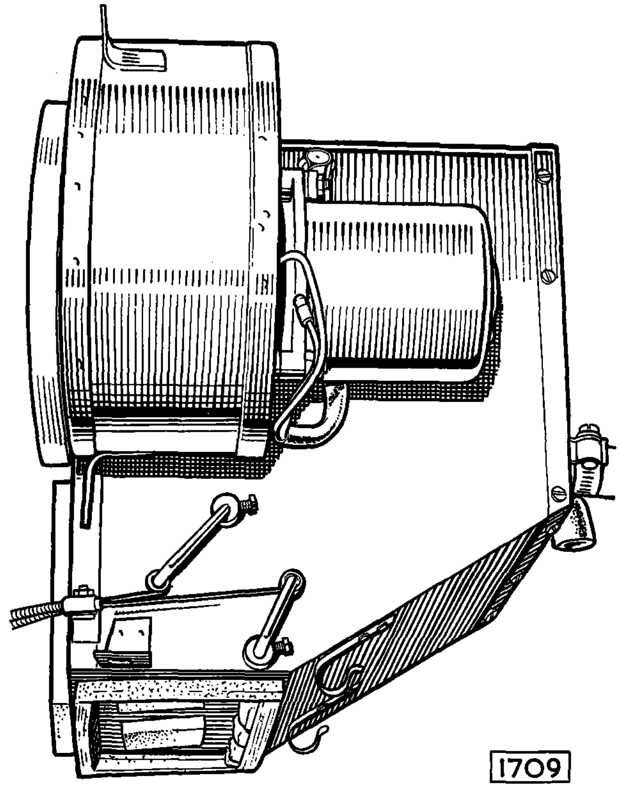


Fig. 6. Showing the early type of heater unit.

WINDSCREEN WASHING EQUIPMENT

The windscreen washer is electrically operated and comprises a glass water container mounted in the engine compartment which is connected to jets at the base of the windscreen. Water is delivered to the jets by an electrically driven pump incorporated in the water container.

OPERATION

The windscreen washer should be used in conjunction with the windscreen wipers to remove foreign matter that settles on the windscreen.

Lift the switch lever (marked " Washer ") and release immediately when the washer should operate at once and continue to function for approximately seven seconds. Allow a lapse of time before operating the switch for a second time.

Warning

If the washer does not function immediately check that there is water in the container. The motor will be damaged if the switch is held closed for more than one or two seconds if the water in the container is frozen.

The washer should not be used under freezing conditions as the fine jets of water spread over the windscreen by the blades will tend to freeze up.

In the summer the washer should be used freely to remove insects before they dry and harden on the screen.

FILLING-UP

The water should be absolutely CLEAN. If possible use SOFT water for filling the container, but if this is

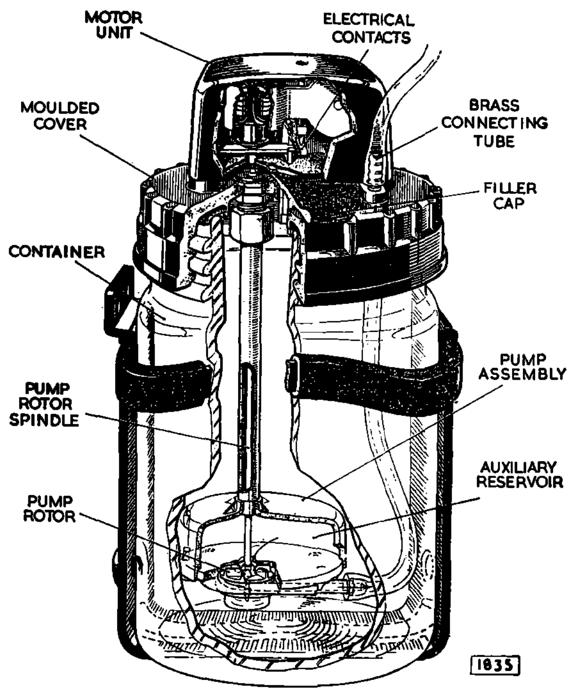


Fig. 7. Windscreen washer water container.

not obtainable and hard water has to be used, frequent operation and occasional attention to the nozzle outlet holes will be amply repaid in preventing the formation of unwelcome deposits.

The correct water level is up to the bottom of the container neck. Do not overfill, or unnecessary splashing may result. Always replace the rubber filler cover correctly after filling, pressing it fully home.

It is not possible to empty the container completely with the pump. **Refilling is necessary when the water level has fallen so that the top of the auxiliary reservoir is uncovered.** About 30 full operations will be obtained from one filling.

When using the washer, an indication of the need to refill the container is given by the behaviour of the unit. The time taken for the auxiliary reservoir to refill increases as the water level in the container falls.

As soon as the water level has fallen to the top of the auxiliary reservoir, the amount of water delivered to the windscreen will decrease with successive operations and the time the unit runs will, in proportion, become less.

If the water level is allowed to fall still further, until it is down to the bottom of the auxiliary reservoir, the automatic action will cease and water will be delivered to the windscreen only as long as the switch is operated. This will continue until the water level has fallen to the inlet orifices, when the pump will be above the water level and no water will be available for delivery to the windscreen.

Do not continue to operate the switch after the available water has been used up, otherwise damage may be caused to the unit.

Refilling the container will restore normal operation of the unit.

COLD WEATHER

To avoid damage by frost, add denatured alcohol (methylated spirits) as follows :—

The underside of the rubber filler cover will be found to form a measure. Two measures of denatured alcohol should be added per container of water. USE NO OTHER ADDITIVES WHATSOEVER.

ADJUSTING THE JETS

With a screwdriver turn each nozzle in the jet holder until the jets of water strike the windscreen in the area swept by the wiper blades. It may be necessary to adjust the nozzles slightly after a trial on the road due to jets of water being deflected by the airstream.

JET NOZZLES

Cleaning

To clear a blocked jet nozzle completely unscrew the nozzle from the jet holder. Clear the small orifices

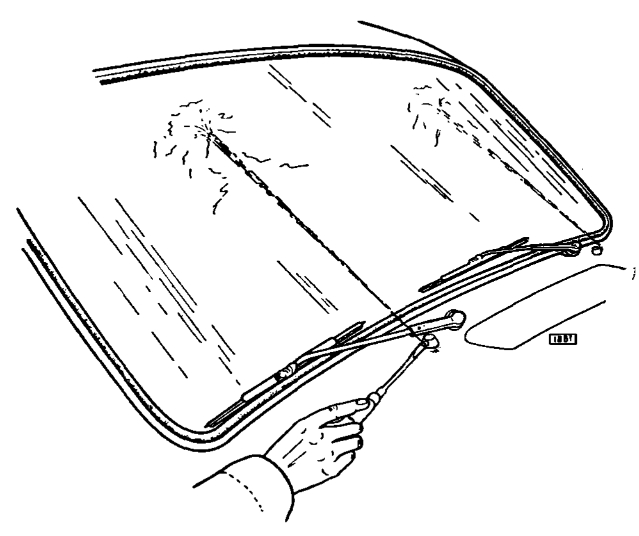


Fig. 8. Adjusting the windscreen washing jets.

with a thin piece of wire or blow out with compressed air ; operate the washer with the nozzle removed. Allow the water to flush through the jet holder and then replace the nozzle.

LUBRICATION

If, after lengthy service, the motor is found to be running slowly, unscrew the moulded cover from the container and apply one or two drops only of thin machine oil to the felt pad situated in the gap between the cover and the motor unit. Do not over-lubricate or excess oil may find its way into the water container when the cover is refitted, with consequent smearing of the windscreen.

SUPPLEMENTARY INFORMATION
TO SECTION O
"HEATING & WINDSCREEN WASHING EQUIPMENT"

covering

LUCAS 5SJ SCREEN JET WINDSCREEN WASHER

Commencing Chassis Numbers:

	R.H. Drive	L.H. Drive
2.4 litre	118878	127760
3.4 litre	168957	180137
3.8 litre	233919	224086

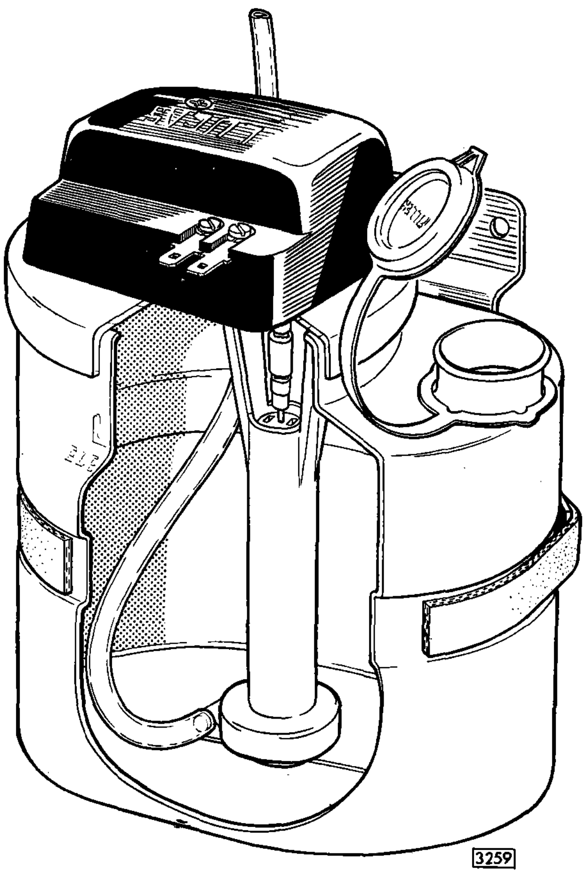


Fig. 9 Windscreen washer water container (later cars)

Description

The Lucas 5SJ Screen Jet is an electrically operated unit comprising of a small permanent magnet motor driving a centrifugal pump through a 3-piece Oldham coupling and a high density polythene water container mounted in the engine compartment. The container is connected to two water jets at the base of the windscreen.

Operation

The windscreen washer should be used in conjunction with the windscreen wipers to remove any foreign matter that settles on the windscreen.

Lift the switch lever (marked "Washer" on the indicator strip) when the washer should operate at once and continue to function until the switch is released.

Warning

If the washer does not function immediately, check that there is water in the container. The motor will be damaged if the switch is held pressed for more than one or two seconds if the water in the container is frozen. The washer should not be used under freezing conditions as the fine jets of water spread over the windscreen by the blades will tend to freeze up.

DATA

Nominal Voltage of Unit ..	12
Maximum Current Consumption	2.0 amp.
Resistance between Commutator Segments	2.8-3.1 Ohm.
Minimum Water Delivery Pressure	4.5 lb/sq. in. (0.32 kg/cm^2)
Minimum Water Delivery per. sec.	3.5 c.c.
Container Capacity	2¼ pints (1.1 litres)
Usable Quantity of Water ..	2 pints (1 litre)
Diameter of Nozzle Orifice ..	0.25″-0.28″ (6.3-7 mm.)

Filling Up

The correct water level is up to the bottom of the container neck. Do not overfill or unnecessary splashing may result. Always replace the filler cover correctly after fill'ng up.

It is not possible to empty the container with the pump. Refilling is necessary when the water level has fallen below the level of the pump.

Keep the pump filler clean and the container free from sediment.

Cold Weather

The water container can be given a safe degree of protection down to —28°F. (—33°C.) by the use of proprietary antifreeze solvents as marketed by Trico or as Holts Screenwash. Instructions regarding the use of the solvent will be found on the container.

Denatured alcohol (Methylated spirits) must NOT be used. The use of this chemical will discolour the paintwork.

Servicing—Testing in Position

(a) Testing with a voltmeter :—

Connect a suitable direct current voltmeter to the motor terminals, observing the polarity as indicated on the moulding housing. Operate the switch. If a low or zero voltage is indicated, the A4 fuse, switch and external connections should be checked and corrected as necessary.

If the voltmeter gives a reverse reading, the connections to the motor must be transposed.

If supply voltage is registered at the motor terminals but the unit fails to function, an open-circuit winding or faulty brush gear can be suspected. Dismantle the motor as described under the heading "Dismantling".

(b) Checking the external nozzles and tubes :—

If the motor operates but little or no water is delivered to the screen, the external tubes and nozzles may be blocked.

Remove the external plastic tube from the short connector on the container and, after checking that the connector tube is clear, operate the washer switch.

If a jet of water is ejected, check the external tubes and nozzles for damage or blockage.

If no water is ejected, proceed as detailed under the heading "Dismantling".

(c) Testing with an ammeter :—

Connect a suitable direct current ammeter in series with the motor and operate the switch. If the motor does not operate but the current reading exceeds that given in "DATA", remove the motor and check that the pump impeller shaft rotates freely.

If the shaft is difficult to turn, the water pump unit must be replaced.

If the shaft turns freely, the fault lies in the motor which must be dismantled and its component parts inspected.

Dismantling

(a) Disconnect the external tube and the electrical connections and remove the cover from the container.

(b) Remove the self-tapping screw which secures the motor to the cover and pull away the motor unit.

Take care not to lose the loose intermediate coupling which connects the armature coupling to the pump spindle coupling.

(c) Remove the armature coupling from the armature shaft as follows :—

Hold the armature shaft firmly with a pair of snipe-nosed pliers and, using a second pair of pliers, draw off the armature coupling.

(d) Remove the two self-tapping screws from the bearing plate. The bearing plate and rubber gasket can now be removed.

(e) Remove the two terminal screws. The terminal nuts and brushes can be removed and the armature withdrawn.

Take care not to lose the bearing washer which fits loosely on the armature shaft.

(f) The pole assembly should not normally be disturbed. If, however, its removal is necessary, make careful note of its position relative to the motor housing. The narrower pole piece is adjacent to the terminal locations.

Also the position of the pole clamping member should be observed. When fitted correctly, it locates on both pole pieces but, if fitted incorrectly, pressure is applied to one pole piece only.

Bench-Testing

If the motor has been overheated, or if any part of the motor housing is damaged, a replacement motor unit must be fitted.

(a) Armature :—

If the armature is damaged, or if the windings are loose or badly discoloured, a replacement armature must be fitted.

The commutator must be cleaned with a fluffless, petrol-moistened cloth or, if necessary, by polishing with a strip of very fine glass paper.

The resistance of the armature winding should be checked with an ohm meter. This resistance should be in accordance with that given in "DATA".

(b) Brushes :—

If the carbon is less than $\frac{1}{16}$" (1.59 mm.) long a new brush must be fitted.

Check that the brushes bear firmly against the commutator.

Re-assembling

Re-assembling of the unit is the reverse of the dismantling procedure. The following points should be observed :—

(a) Make sure the bearing recess in the motor is filled with Rocol Molypad molybdenised grease. Remove excessive grease from the face of the bearing boss.

(b) Check that the pole piece assembly does not rock and that the pole pieces are firmly located on the circular spigot. Ensure that the pole piece assembly and the clamping member are the right way round.

(c) Before replacing the motor unit on the cover, ensure that the armature coupling is pushed fully home and that the intermediate coupling is in place.

Performance Testing

Equipment required :—

D.C. supply of appropriate voltage
D.C. voltmeter, first grade, moving co l
0-3 amp. D.C. ammeter
0-.15 lb/in² (0-1 kg/cm²) pressure gauge.
Pushbutton with normally open contacts
Two-jet nozzle
On-off tap
100 c.c. capacity measure
4′ 6″ (1.37 mm.) length of plastic tubing.

(a) Connect up the equipment as shown in Fig. 10. The water level in the container must be 4″ (101.6 mm.) above the base of the pump assembly. The pressure gauge and nozzle must be 18″ (457.2 mm.) above the water level.

(b) Open the tap.

(c) Depress the pushbutton for approximately 5 seconds and check the voltmeter reading which should be the same as the supply voltage. On releasing the switch, close the tap to ensure that the plastic tubing remains charged with water.

(d) Empty the measuring cylinder.

(e) Open the tap and operate the push switch for precisely 10 seconds after which period release the switch and close the tap.

During the 10 second test the current and pressure valves should be in accordance with those given in "DATA" and at least 35 c.c. of water should have been delivered.

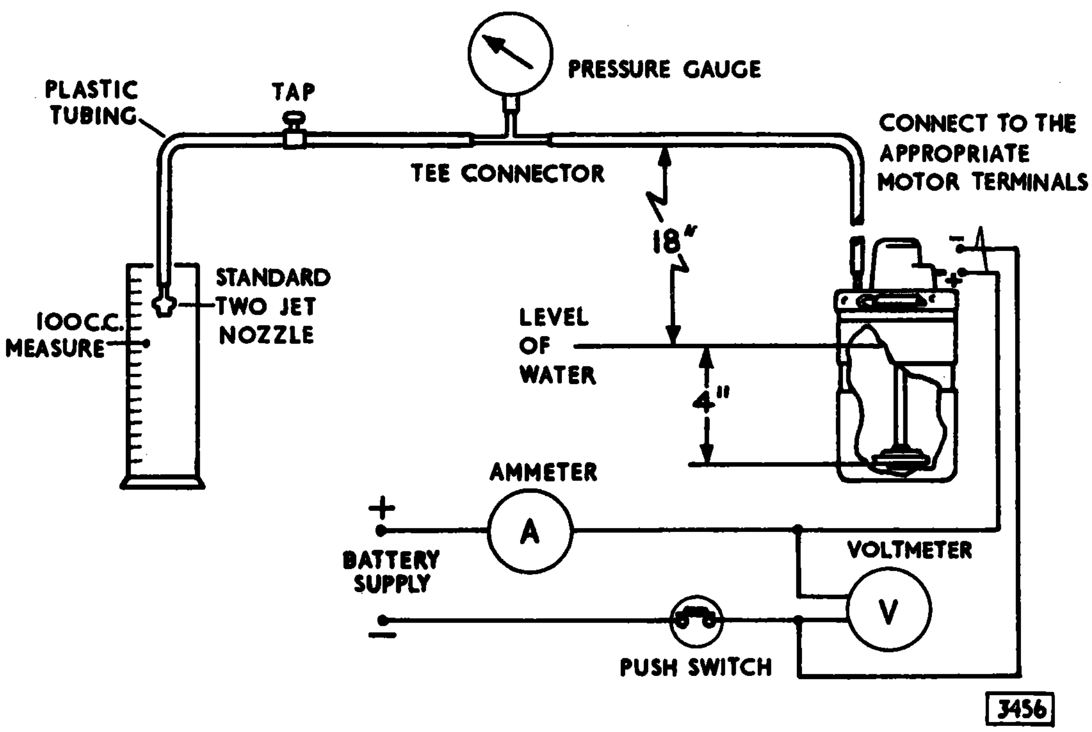


Fig. 10. Performance testing the equipment.

SECTION P

ELECTRICAL AND INSTRUMENTS

MARK 2 MODELS

2·4, 3·4 and 3·8 litre

INDEX

Battery

Distributor

Flasher Units

Fuse Unit

Generator
(Fitted to 2.4 litre models)

Generator
(Fitted to 3.4 and 3.8 litre models)

INDEX *(continued)*

Horns

Lamps

Voltage and Current Regulator

Starter Motor

Starter Drive

INDEX *(continued)*

Windscreen Wiper

Miscellaneous

Instruments

INDEX *(continued)*

Instruments *(continued)*

BATTERY

Batteries having " GT " as their first two model letters are of the semi-linkless type, the short intercell connectors being partially exposed to enable testing of individual cells to be effected. The " BV " battery is of the " clean top " pattern, in which small holes are provided over each intercell connector to enable the prongs of a heavy discharge tester to be inserted for testing purposes.

DATA

	2.4 litre	3.4 litre	3.8 litre
Battery type	GTW.9A/3 GT.9A GTZ.9A	BV.11A	BV.11A
Voltage	12	12	12
Number of plates per cell ..	9	11	11
Capacity at 10 hour rate ..	51	60	60
Capacity at 20 hour rate ..	58	67	67

ROUTINE MAINTENANCE

Wipe away any foreign matter or moisture from the top of the battery, and ensure that the connections and the fixings are clean and tight.

About once a month, or more frequently in hot weather, examine the level of the electrolyte in the cells. If necessary add distilled water to bring the level up to the top of the separators.

The use of a Lucas battery filler will be found helpful in this topping-up process, as it ensures that the correct electrolyte level is obtained automatically and also prevents distilled water from being spilled over the battery top.

Distilled water should always be used for topping-up. In an emergency however, drinking water, clean rain water or melted snow may be used. Salt water, chlorinated water, chemically softened water or stagnant water must not be used.

NOTE : Never use a naked light when examining a battery, as the mixture of oxygen and hydrogen given off by the battery when on charge, and to a lesser extent when standing idle, can be dangerously explosive.

REMOVAL

Mark the positions of the bonnet hinges relative to the bonnet. Remove the four set-bolts securing the bonnet to the hinges.

Release the two spring clips and remove the battery cover.

Remove the two securing screws and detach the terminals from the lugs.

Unscrew the two battery securing bolts and detach the retaining band and rubber.

Lift out the battery from the tray.

REFITTING

Refitting is the reverse of the removal procedure. Before refitting the cables clean the terminals and coat with petroleum jelly.

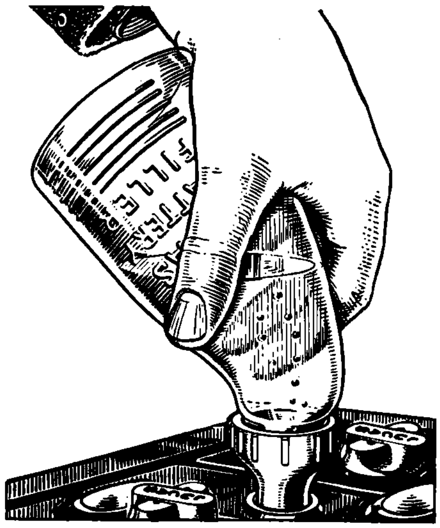


Fig. 1. Lucas battery filler

BATTERY PERSISTS IN LOW STATE OF CHARGE

First consider the conditions under which the battery is used. If the battery is subjected to long periods of discharge without suitable opportunities for recharging a low state of charge can be expected. A fault in the generator or regulator, or neglect of the battery during a period of low or zero mileage may also be responsible for the trouble.

Vent Plugs

See that the ventilating holes in each vent plug are clear.

Level of Electrolyte

The surface of the electrolyte should be level with the tops of the separators. If necessary, top up with distilled water. Any loss of acid from spilling or spraying (as opposed to the normal loss of **water** by evaporation) should be made good by dilute acid of the same specific gravity as that already in the cell.

Cleanliness

See that the top of the battery is free from dirt or moisture which might provide a discharge path. Ensure that the battery connections are clean and tight.

Hydrometer Tests

Measure the specific gravity of the acid in each cell in turn with a hydrometer. To avoid misleading readings, do not take hydrometer readings immediately after topping-up.

The readings given by each cell should be approximately the same. If one cell differs appreciably from the others, an internal fault in the cell is indicated.

The appearance of the electrolyte drawn into the hydrometer when taking a reading gives a useful indication of the state of the plates. If the electrolyte is very dirty, or contains small particles in suspension, it is possible that the plates are in a bad condition.

The specific gravity of the electrolyte varies with the temperature, therefore, for convenience in comparing specific gravities, this is always corrected to 60°F., which is adopted as a reference temperature. The method of correction is as follows :—

For every 5°F. **below** 60°F. **deduct** .002 from the observed reading to obtain the true specific gravity at 60°F.

For every 5°F. **above** 60°F. **add** .002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be that indicated by a thermometer actually immersed in the electrolyte, and not in the air temperature.

Compare the specific gravity of the electrolyte with the values given in the table and so ascertain the state of charge of the battery.

If the battery is in a discharged state, it should be recharged, either on the vehicle by a period of daytime running or on the bench from an external supply, as described under " Recharging From An External Supply ".

Discharge Test

A heavy discharge tester consists of a voltmeter, 2 or 3 volts full scale, across which is connected a shunt resistance capable of carrying a current of several hundred amperes. Pointed prongs are provided for making contact with the inter-cell connectors.

Press the contact prongs against the exposed positive and negative terminals of each cell. A good cell will maintain a reading of 1.2—1.5 volts, depending on the state of charge, for at least 6 seconds. If, however, the reading rapidly falls off, the cell is probably faulty and a new plate assembly may have to be fitted.

State of Charge	Home and Climates Ordinarily Below 90°F. (32.2°C.) Specific Gravity of Electrolyte (Corrected to 60°F.)	Climates Frequently Over 90°F. (32.2°C.) Specific Gravity of Electrolyte (Corrected to 60°F.)
Fully charged	1.270—1.290	1.210—1.230
About half discharged	1.190—1.210	1.120—1.150
Completely discharged	1.110—1.130	1.050—1.070

RECHARGING FROM AN EXTERNAL SUPPLY

If the battery tests indicate that the battery is merely discharged, and is otherwise in a good condition, it should be recharged, either on the vehicle by a period of daytime running or on the bench from an external supply.

If the latter, the battery should be charged at the rate specified until the specific gravity and voltage show no increase over three successive hourly readings. During the charge the electrolyte must be kept level with the tops of the separators by the addition of distilled water.

Battery Model	Recharging Rate Amperes
GTW.9A/3	5
GT.9A	5
GTZ.9A	5
BV.11A	6

A battery that shows a general falling-off in efficiency, common to all cells, will often respond to the process known as " cycling ". This process consists of fully charging the battery as described above and then discharging it by connecting to a lamp board, or other load, taking a current of 5 amperes. The battery should be capable of providing this current for at least 7 hours before it is fully discharged, as indicated by the voltage of each cell falling to 1.8. If the battery discharges in a shorter time, repeat the " cycle " of charge and discharge.

PREPARING NEW UNFILLED, UNCHARGED BATTERIES (MODELS GTW.9A/3, GT.9A AND BV.11A) FOR SERVICE

Preparation of Electrolyte

Batteries should not be filled with acid until required for initial charging.

Electrolyte of the specific gravity required is prepared by mixing distilled water and concentrated sulphuric acid, usually of 1.835 specific gravity. The mixing must be carried out either in a lead-lined tank or in a suitable glass or earthenware vessel. Slowly add the acid to the water, stirring with a glass rod. **Never add the water to the acid,** as the resulting chemical reaction causes violent and dangerous spurting of the concentrated acid. The approximate proportions of acid and water are indicated in the following table :

Battery	Specific Gravity of Acid Required When Filling	
	Home and Climates Ordinarily Below 90°F (32.2°C.) Specific Gravity of Acid (Corrected to 60°F.)	Climates Frequently Over 90°F. (32.2°C.) Specific Gravity of Acid (Corrected to 60°F.)
GTW.9A	1.340	1.290
GT.9A	1.270	1.210

To obtain Specific Gravity (corrected to 60°F.) of :	Add 1 vol. of acid of 1.835 S.G. (corrected to 60°F.) to :
1.340	2.0 volumes of water
1.290	2.7 volumes of water
1.270	2.9 volumes of water
1.210	4.0 volumes of water

Heat is produced by the mixture of acid and water, and the electrolyte should be allowed to cool before taking hydrometer readings—unless a thermometer is used to measure the actual temperature, and a correction applied to the reading and before pouring the electrolyte into the battery.

Filling the Battery

The temperature of the acid, battery and filling-in room must not be below 32°F.

Carefully break the seals in the filling holes and **half-fill** each cell with electrolyte of the appropriate specific gravity. Allow the battery to stand for at least six hours, in order to dissipate the heat generated by the chemical action of the acid on the plates and separators. Completely fill the battery and allow to stand for a further two hours and then proceed with the initial charge.

Initial Charge Rate

Battery Model	Charging Rate (Amperes)
GTW.9A/3	3.5
GT.9A	3.5
BV.11A	4.0

Charge at this rate until the voltage and specific gravity readings show no increase over five successive hourly readings. This will take from 40 to 80 hours, depending on the length of time the battery has been stored before charging.

Keep the current constant by varying the series resistance of the circuit or the generator output.

This charge should not be broken by long rest periods. If, however, the temperature of any cell rises above the permissible maximum quoted in table, the charge must be interrupted until the temperature has fallen at least 10°F. below that figure. Throughout the charge, the electrolyte must be kept level with the top of the separators by the addition of acid solution of the same specific gravity as the original filling-in acid, until specific gravity and voltage readings have remained constant for five successive hourly readings. If the charge is continued beyond that point, top up with distilled water.

At the end of the charge carefully check the specific gravity in each cell to ensure that, when corrected to 60°F., it lies within the specified limits. If any cell requires adjustment, some of the electrolyte must be siphoned off and replaced either by distilled water or by acid of the strength originally used for filling-in, depending on whether the specific gravity is too high or too low. Continue the charge for an hour or so to ensure adequate mixing of the electrolyte and again check the specific gravity readings. If necessary, repeat the adjustment process until the desired reading is obtained in each cell. Finally, allow the battery to cool, and siphon off any electrolyte above the tops of the separators.

PREPARING NEW "DRY-CHARGED" BATTERIES, MODEL (GTZ9A) FOR SERVICE.

Filling the Cells.

Carefully break the seals in the filling holes and fill each cell with correct specific gravity acid to the top of the separators in one operation. The temperatures of the filling room, battery and acid should be maintained at between 60°F. and 100°F. If the battery has been stored in a cool place, it should be allowed to warm up to room temperature before filling.

Freshening Charge

Batteries filled in this way are up to 90% charged, and capable of giving a starting discharge one hour after filling. When time permits however, a short freshening charge will ensure that the battery is fully charged.

Such a freshening charge should be 5 amperes for not more than 4 hours.

During the charge the electrolyte must be kept level with the top of the separators by the addition of distilled water. Check the specific gravity of the electrolyte at the end of the charge ; if 1.270 acid was used to fill the battery, the specific gravity should now be between 1.270 and 1.290 ; if 1.210 acid, between 1.210 and 1.230.

Maintenance in Service

After filling, a dry-charged battery needs only the attention normally given to all lead-acid type batteries.

Maximum Permissible Electrolyte Temperature During Charge	
Home and Climates normally below 90°F. (32.2°C.)	Climates frequently over 90°F. (32.2°C.)
100°F. (37.7°C.)	120°F. (48.8°C.)

Specific Gravity of Acid Required When Filling Battery	
Home and Climates Ordinarily Below 90°F. (32.2°C.) Specific Gravity of Acid (Corrected to 60°F.)	Climates Frequently Over 90°F. (32.2°C.) Specific Gravity of Acid (Corrected to 60°F.)
1.270	1.210

DISTRIBUTOR (DMBZ.6A)

REMOVAL

Spring back the clips and remove the distributor cap.

Disconnect the low tension wire from the distributor terminal.

Disconnect the vacuum pipe by unscrewing the union nut at the vacuum advance unit.

Slacken the distributor plate pinch bolt and withdraw the distributor.

REFITTING

Refitting is the reverse of the removal procedure, but it will be necessary to reset the ignition timing as follows :—

Ignition Timing

Set the micrometer adjustment in the centre of the scale.

Connect the low tension wire to the terminal on the distributor body.

Enter the distributor into the cylinder block with the vacuum advance unit connection facing the cylinder block.

Rotate the rotor-arm until the driving dog engages with the distributor drive shaft.

Rotate the engine until the rotor-arm approaches the No. 6 (front) cylinder segment in the distributor cap.

Slowly rotate the engine until the ignition timing scale on the crankshaft damper is the appropriate number of degrees before the pointer on the sump. (See Data).

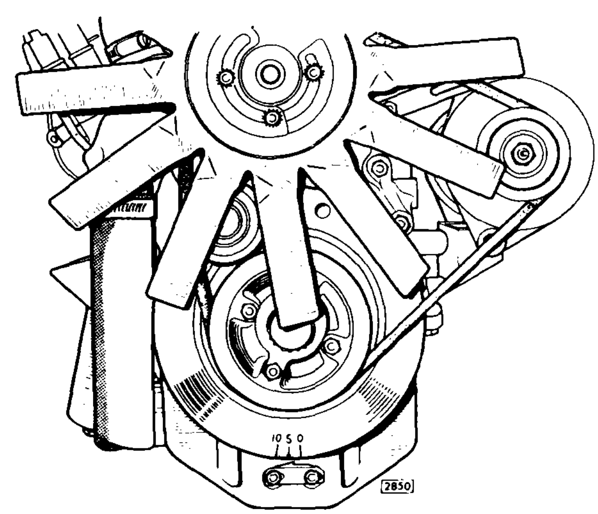


Fig. 2. Ignition timing scale on crankshaft damper.

Connect a 12 volt test lamp with one lead to the distributor terminal (or the CB terminal of the ignition coil) and the other to a good earth.

Slowly rotate the distributor body until the points are just breaking, that is, when the lamp lights up.

Tighten the distributor plate pinch bolt.

A maximum of six clicks on the vernier adjustment from this setting, to either advance or retard, is allowed.

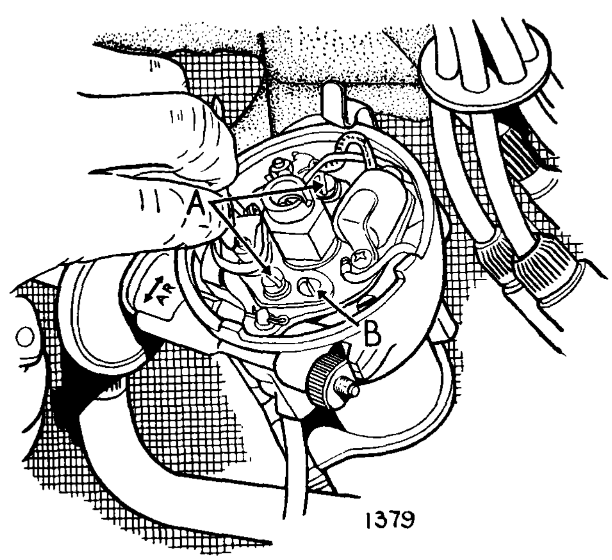
ROUTINE MAINTENANCE

Distributor Contact Breaker Points

Every 2,500 miles (500 miles with new contact set) check the gap between the contact points with feeler gauges when the points are fully opened by one of the cams on the distributor shaft. A combined screwdriver and feeler gauge is provided in the tool kit.

The correct gap is .014"—.016" (.36—.41 mm.).

If the gap is incorrect, slacken the two screws (A) securing the fixed contact plate and turn the eccentric-headed adjustment screw (B) in its slot until the required gap is obtained. Tighten the securing screws and recheck the gap.



A. Screws securing fixed contact plate.
B. Eccentric headed adjusting screw.

Fig. 3. Checking distributor point gap.

Lubrication—Every 2,500 miles

Remove the moulded cover and withdraw the rotor arm. A tight rotor arm can be withdrawn using a pair of suitable levers carefully applied at opposite points below the rotor moulding—never against the metal electrode.

Important : Do not allow oil or grease on or near the contacts when carrying out the following lubrication.

Cam Bearing

To lubricate the cam bearing, inject a few drops of thin machine oil into the rotor arm spindle (A, Fig. 4). Do not remove or slacken the screw located inside the spindle—a space is provided beneath the screwhead to allow the lubricant to reach the cam bearing.

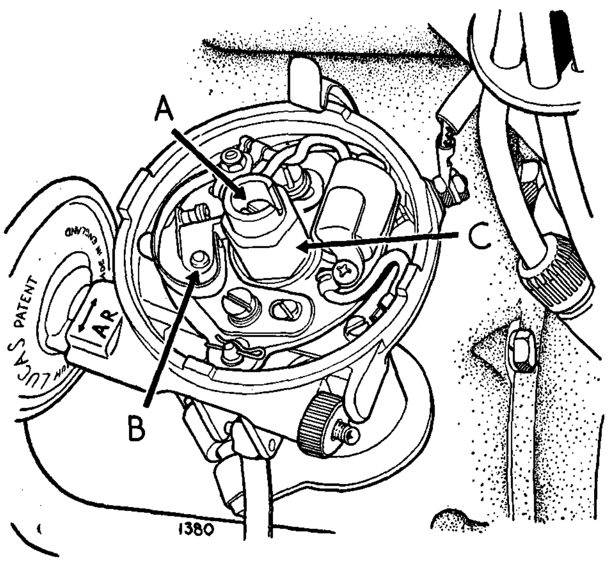


Fig. 4. Distributor lubrication points.

Cam

Lightly smear the faces of the cam (C, Fig. 4) with Mobilgrease No. 2 or with clean engine oil.

Centrifugal Timing Control

Inject a few drops of thin machine oil through a convenient aperture in the contact breaker base plate.

Cleaning

Clean the moulded cover inside and outside with a soft dry cloth. Pay particular attention to spaces between the terminals. Check that the small carbon brush inside the moulding can move freely in its holder.

Whilst the rotor arm is removed, examine the contact breaker. Rough, burned or blackened contacts can be cleaned with fine carborundum stone or emery cloth. After cleaning remove any grease or metallic dust with a petrol-moistened cloth.

Contact cleaning is facilitated by removing the lever to which the moving contact is attached. To do this, remove the nut, insulating piece and electrical connections from the post to which the contact breaker spring is anchored. The contact breaker lever can then be lifted off the pivot post and the spring from the anchor post.

After cleaning and trimming the contacts, smear the pivot post (B, Fig 4) with Ragosine Molybdenised Non-creep Oil or with Mobilgrease No. 2. Reassemble the contact breaker and check the setting.

Refit the rotor arm, carefully locating its moulded projection in the spindle keyway and pushing it on as far as it will go.

Refit the moulded cover and spring the two side clips into position.

DATA

	2.4 litre	3.4 litre		3.8 litre	
Ignition Distributor Type	DMBZ.6A	DMBZ.6A		DMBZ.6A	
Type of Carburetter Air Cleaner	Oil Bath	Oil Bath	Paper Element	Oil Bath	Paper Element
7 to 1 Compression Ratio	40557A	40578A	40640A	40640A	40640A
8 to 1 Compression Ratio	40528A	40576A	40640A	40640A	40640A
9 to 1 Compression Ratio	—	40617A	40665A	40665A	40665A
Cam dwell angle	35° ± 2°	35° ± 2°		35° ±2°	
Contact breaker gap	0.014"—0.016" (0.36—0.41 mm.)	0.014"—0.016" (0.36—0.41 mm.)		0.014"—0.016" (0.36—0.41 mm.)	
Contact breaker spring tension (Measured at free contact)	18—24 ozs. (512—682 gms.)	18—24 ozs. (512—682 gms.)		18—24 ozs. (512—682 gms.)	

IGNITION TIMING

	2.4 litre	3.4 litre		3.8 litre	
Type of Carburetter Air Cleaner	Oil Bath	Oil Bath	Paper Element	Oil Bath	Paper Element
7 to 1 Compression Ratio	6° BTDC	TDC	TDC	TDC	TDC
8 to 1 Compression Ratio	8° BTDC	2° BTDC	7° BTDC	4° BTDC	7° BTDC
9 to 1 Compression Ratio	—	TDC	5° BTDC	10° BTDC	5° BTDC

IGNITION DISTRIBUTOR TEST DATA

			VACUUM TIMING ADVANCE TESTS The distributor must be run immediately below the speed at which the centrifugal advance begins to function to obviate the possibility of an incorrect reading being registered.				CENTRIFUGAL TIMING ADVANCE TESTS Mount distributor in centrifugal advance test rig and set to spark at zero degrees at 100 r.p.m.				
Distributor Type	Lucas Service Number	Lucas Vacuum Unit Number	Vacuum in inches of mercury and advance in degrees Inches	Degrees	No advance in timing below-ins. of mercury	Lucas Advance Springs Number	Accelerate to-RPM and note advance in degrees RPM	Degrees	Decelerate to-RPM and note advance in degrees RPM	Degrees	No advance in timing below-RPM
DMBZ 6A	40557A	424374	20 13 9½ 6½ 4	10—12 9½—11½ 6—8½ 1½—5 0—½	2½	424377	3,500	24—26	2,500 1,650 1,400 950 500	22—24 17—19 15—17 8—10 1—3	300
DMBZ 6A	40528A	423461	18 11½ 7½ 4 2½	11—13 10—12½ 5½—9 0—4 0—½	1	423750	3,200	20—23	2,500 1,700 1,100 800 450	18—20 14—16 11—13 8—11 ½—3½	300
DMBZ 6A	40578A	424374	20 13 9½ 6½ 4	10—12 9½—11½ 6—8½ 1½—5 0—½	2½	425183	3,500	16—18	2,400 1,300 1,100 650	14—16 10—12 7—10 ½—3½	400
DMBZ 6A	40576A	421027	20 12 8½ 6½	8—10 6—8 3—5 ½—3	5	424950	3,200	17—19	2,250 1,000 800 450	15—17 10—12 7½—10½ ½—3½	275
DMBZ 6A	40617A	54410415	20 13 9 7½ 6	7—9 6—8½ 2½—5½ 0—3 0—½	4½	54410416	2,000	12	850 450	7—9 0—2½	325
DMBZ 6A	40640A	54410709	25 14 10 6	6—8 4½—7½ 1—4½ 0—½	5	425183	3,400	19	3,000 2,300 1,300 1,000 500	17—19 14—16 10—12 8—10 1—3	250
DMBZ 6A	40665A	421189	15 12 6 4	7—9 6—9 0—3 0—½	2½	54411290	2,000	13	1,500 1,100 800 550 400	11—13 8—10 6—8 2½—4½ ½—2½	225

Auto advance weights Lucas number 410033/S. One inch of mercury = 0.0345 kg/cm^2

SERVICING

Dismantling

When dismantling, note carefully the position in which the various components are fitted in order to simplify their re-assembly.

Bearing Replacement

The ball bearing at the upper end of the shank can be removed with a shouldered mandrel locating on the inner journal of the bearing.

When fitting a new ball bearing, the shouldered mandrel must locate on both inner and outer journals of the bearing.

The bearing bush at the lower end of the shank can be driven out with a suitable punch.

A bearing bush must be prepared for fitting by allowing it to stand completely immersed in medium viscosity (S.A.E. 30—40) engine oil for at least 24 hours. In cases of extreme urgency, this period of soaking may be shortened by heating the oil to 100°C. for 2 hours and then allowing to cool before removing the bush.

The bush is pressed into the shank with a shouldered mandrel. The mandrel should be hardened and polished and approximately 0.0005" greater in diameter than the distributor shaft. To prevent subsequent withdrawal of the bush with the mandrel, a stripping washer should be fitted between the shoulder of the mandrel and the bush.

Under no circumstances should the bush be over-bored by reamering or by any other means, since this will impair the porosity and therefore the lubricating quality of the bush.

Re-assembly

When re-assembling, Ragosine molybdenised non-creep oil or (failing this) clean engine oil, should be smeared on the shaft and, more lightly, on the contact breaker bearing plate.

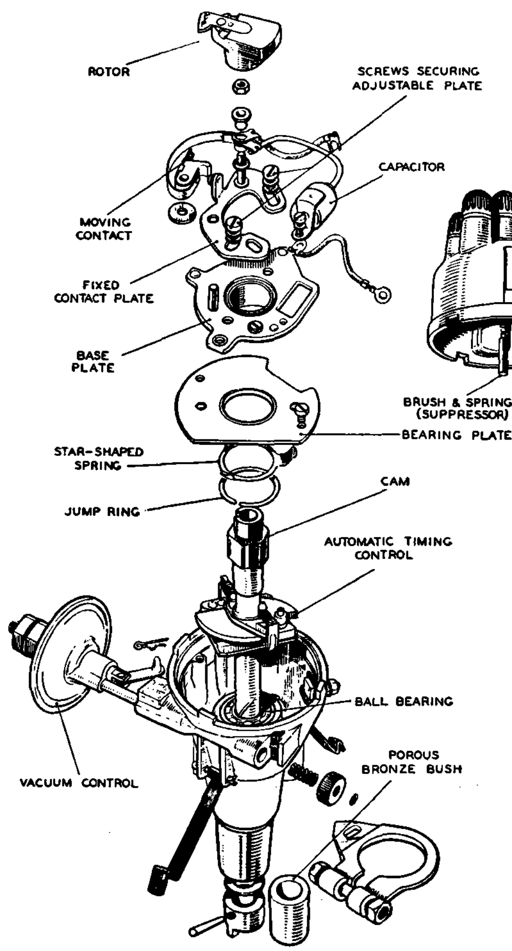


Fig. 5. Exploded view of distributor.

FLASHER UNITS

The flasher unit is housed in a small cylindrical container. Inside a switch is operated automatically by the alternate heating and cooling of an actuating wire. Also incorporated is a small relay to flash the switch warning light when the system is functioning correctly. Failure of this light to flash will indicate a fault. In the event of trouble occurring, the following procedure should be followed :—

(i) Check the bulbs for broken filaments.
(ii) Refer to the wiring diagram and check all flasher circuit connections.
(iii) Switch on the ignition.
(iv) Check with a voltmeter that flasher unit terminal 'B' is at 12 volts with respect to earth.
(v) Connect together flasher unit terminals ' B ' and ' L ' and operate the direction-indicator switch. If the flasher lamps now light, the flasher unit is defective and must be replaced.

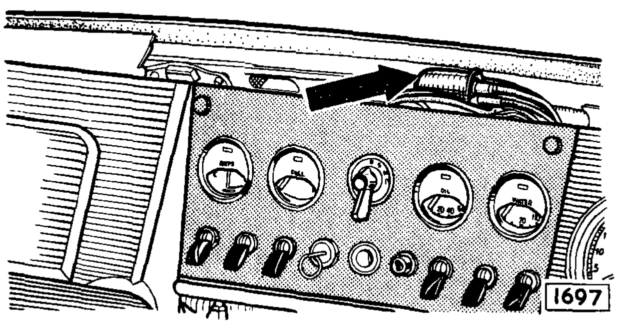


Fig. 6. Showing position of flasher unit behind instrument panel.

The direction-indicator switch is best checked by substitution. It is important that only bulbs of the correct wattage rating (i.e. 21 watts) are used in the flasher lamps.

The side/flasher and rear/stop/flasher lamps are fitted with a double filament bulb. This is the Lucas No. 380 12-volt 21/7-watt non-reversible small bayonet cap bulb.

Special contacts in the direction-indicator switch ensure that responses to the flasher unit take precedence over any simultaneous application of the brake switch.

The switch warning light is Lucas No. 280 12-volt 1.5-watt lilliput Edison screw cap.

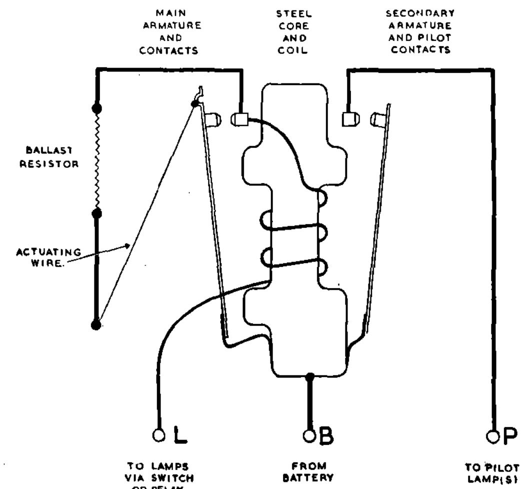


Fig. 7. Flasher unit wiring diagram.

FUSE UNIT

Model SF6 Fuse Unit carries two live glass cartridge type fuses and two spare fuses. Fuses are 35 and 50 ampere capacity.

Only one end of the spare fuses are visible and they are retained in position by a small spring clip.

AUXILIARY—this fuse is in circuit with the Interior Lights, Cigar Lighter and Headlamp Flasher and is 35 amperes capacity.

AUXILIARY IGNITION—this fuse is in circuit with the Heater Fan, Flashing Direction Indicators, Braking Lights, Petrol Gauge, Overdrive Solenoid, Reversing Light, Windscreen Wipers, Overdrive or Automatic Transmission Indicator Light, Oil Pressure Gauge, Water Temperature, Windscreen Washer and Horns ; this is 50 amperes capacity.

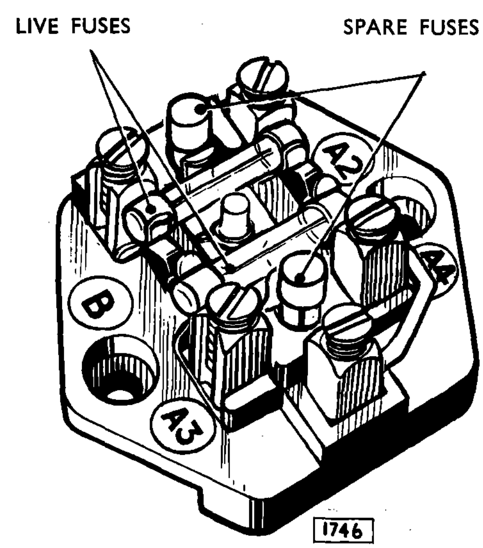


Fig. 8. Fuse unit.

GENERATOR—TYPE C.45. PV-6.

(Fitted to 2.4 litre Models.)

REMOVAL

Disconnect the cables from the two terminals at the rear of the dynamo noting that they are of different sizes.

Remove the nut and bolt securing the adjusting link to the dynamo.

Remove the two nuts and bolts securing the dynamo to the mounting bracket when the dynamo can be lifted out.

Remove the fan belt.

REFITTING

Refitting is the reverse of the removal procedure. When the fan belt has been refitted move the dynamo to a position where it is possible to depress the belt about ½" (12 mm.) midway between fan and dynamo pulleys.

1. GENERAL

The generator is a shunt-wound two-pole two-brush machine, arranged to work in conjunction with a Lucas regulator unit. A fan, integral with the driving pulley, draws cooling air through the generator, inlet and outlet holes being provided in the end brackets of the unit.

The output of the generator is controlled by the regulator unit and is dependent on the state of charge of the battery and the loading of the electrical equipment in use. When the battery is in a low state of charge, the generator gives a high output, whereas if the battery is fully charged, the generator gives only sufficient output to keep the battery in good condition without any possibility of over-charging. An increase in output is given to balance the current taken by lamps and other accessories when in use.

2. ROUTINE MAINTENANCE

(a) **Lubrication**

Every 10,000 miles, inject a few drops of high quality medium viscosity (S.A.E. 30) engine oil into the hole marked " OIL " at the end of the bearing housing.

(b) **Inspection of Brushgear**

Every 10,000 miles the brushgear should be checked as detailed in paragraph 4c.

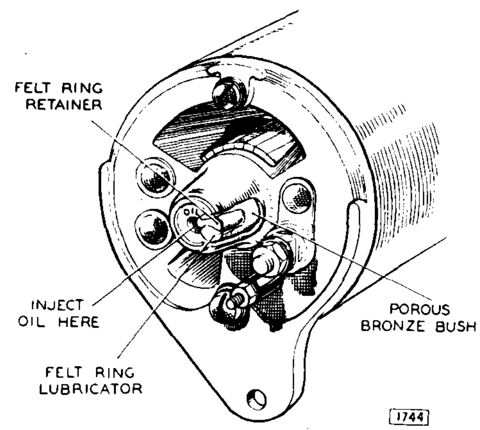


Fig. 9. Generator bush lubrication hole.

(c) **Belt Adjustment**

Occasionally inspect the generator driving belt, and, if necessary, adjust to take up any undue slackness by turning the generator on its mounting. Care should be taken to avoid overtightening the belt, the tension needed being just enough to drive without slipping. See that the machine is properly aligned, otherwise undue strain will be thrown on the generator bearings.

3. PERFORMANCE DATA

Cutting-in Speed	1,300 (max.) r.p.m. at 13.0 generator volts
Maximum Output	25 amperes at 2,050 (max.) r.p.m. at 13.5 generator volts and a resistance load of 0.54 ohm.
Field Resistance	6.0 ohms.

4. SERVICING

(a) **Testing in position to Locate Fault in Charging Circuit**

In the event of a fault in the charging circuit, adopt the following procedure to locate the cause of the trouble.

i. Inspect the driving belt and adjust if necessary (see Para. 2c).

ii. Check that the generator and control box are connected correctly. The larger generator terminal must be connected to control box terminal " D " and the smaller generator terminal to control box terminal " F ".

iii. Switch off all lights and accessories, disconnect the cables from the terminals of the generator and connect the two terminals with a short length of wire.

iv. Start the engine and set to run at normal idling speed.

v. Clip the negative lead of a moving coil type voltmeter, calibrated 0—20 volts, to one generator terminal and the positive lead to a good earthing point on the yoke.

vi. Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to reach 20 volts and do not race the engine in an attempt to increase the voltage. It is sufficient to run the generator up to a speed of 1,000 r.p.m.

If the voltage does not rise rapidly and without fluctuation the unit must be dismantled (see Para. 4b) for internal examination.

Excessive sparking at the commutator in the above test indicates a defective armature which should be replaced.

NOTE: If a radio suppression capacitor is fitted between the output terminal and earth, disconnect this capacitor and re-test the generator before dismantling. If a reading is now given on the voltmeter, the capacitor is defective and must be replaced.

If the generator is in good order, remove the link from between the terminals and restore the original connections, taking care to connect the larger generator terminal to control box terminal " D " and the smaller generator terminal to control box terminal " F ".

(b) **To Dismantle**

i. Take off the driving pulley.

ii. Unscrew and withdraw the two through bolts.

iii. Withdraw the commutator end bracket from the yoke.

iv. Lift the driving end bracket and armature from the yoke. Take care not to lose the fibre thrust washer or collar.

v. The driving end bracket, which on removal from the yoke has withdrawn with it the armature and armature shaft ball-bearing, need not be separated from the shaft unless the bearing is suspected and requires examination, or the armature is to be replaced ; in this event the armature should be removed from the end bracket by means of a hand press.

(c) **Brushgear**

i. Lift the brushes up into the brush boxes and secure them in that position by positioning the brush spring at the side of the brush.

ii. Fit the commutator end bracket over the commutator and release the brushes.

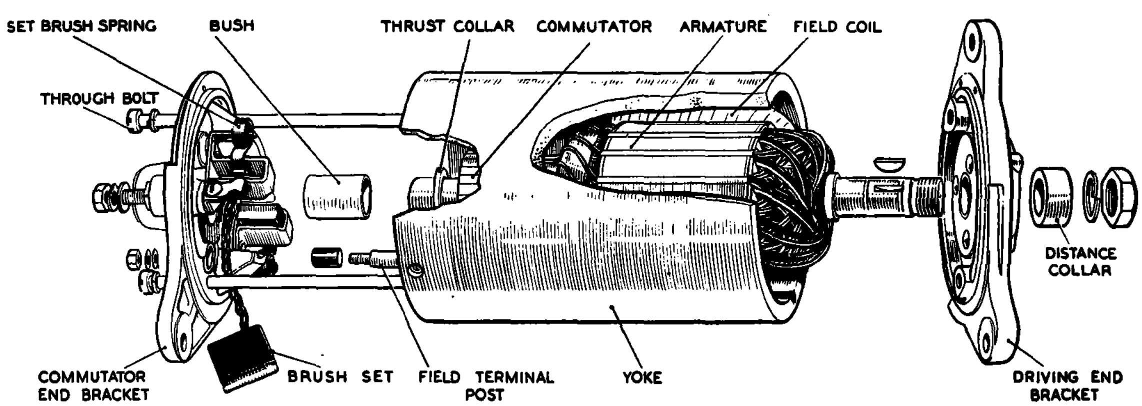


Fig. 10. Exploded view of generator.

iii. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always refit brushes in their original positions. If the brushes are badly worn, new brushes must be fitted and bedded to the commutator. The minimum permissible length of brush is $\frac{11}{16}$".

iv. Test the brush spring tension utilizing a spring balance. The tension of a new spring and a new brush is 28 ozs. but with a brush worn to $\frac{11}{32}$" it may reduce to 20 ozs. Renew any brush spring when the tension falls below these values.

(d) **Commutator**

A commutator in good condition will be smooth and free from pits or burned spots.

Clean the commutator with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of fine glass paper while rotating the armature. To remedy a badly worn commutator, mount the armature, with or without drive end bracket, in a lathe, rotate at high speed and take a light cut with a very sharp tool.

Do not remove more metal than is necessary. Polish the commutator with a very fine glass paper. Emery cloth must not be used on the commutator. Undercut the insulators between the segments to a depth of $\frac{1}{32}$" with a hack saw blade ground to the thickness of the insulator.

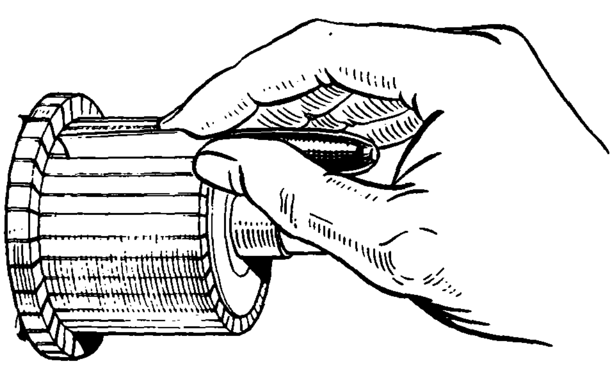


Fig. 11. Undercutting the commutator insulation.

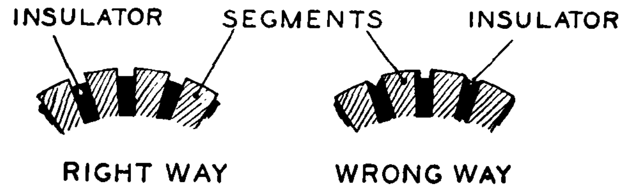


Fig. 12. Showing the correct and incorrect way of undercutting the commutator insulation.

(e) **Armature**

Indication of an open-circuited armature winding will be given by burnt commutator segments. If armature testing facilities are not available, an armature can be checked by substitution.

To remove the armature shaft from the drive end bracket and bearing, support the bearing retaining plate firmly and press the shaft out of the drive end bracket.

When fitting the new armature, support the inner journal of the ball bearing, using a mild steel tube of suitable diameter, whilst pressing the armature shaft firmly home (see also Para. 4h).

(f) **Field Coils**

Measure the resistance of the field coils, without removing them from the generator yoke, by means of an ohm meter connected between the field terminal and the yoke. Field resistance is 6.0 ohms.

If an ohm meter is not available, connect a 12-volt d.c. supply between the field terminal and generator yoke with an ammeter in series.

The ammeter reading in each case should be approximately 2 amperes. Zero reading on the ammeter or an " Infinity " ohm meter indicates an open circuit in the field winding.

If the current reading is much more than 2 amperes, or the ohm meter reading much below 6 ohms, it is an indication that the insulation of one of the field coils has broken down.

In either event, unless a substitute generator is available, the field coils must be replaced. To do this, carry out the procedure outlined below :—

i. Drill out the rivet securing the field coil terminal assembly to the yoke, and unsolder the field coil connections.

ii. Remove the insulation piece which is provided to prevent the junction of the field coils from contacting with the yoke.

iii. Mark the yoke and pole shoes so that the latter can be refitted in their original positions.

iv. Unscrew the two pole shoe retaining screws by means of a wheel-operated screwdriver.

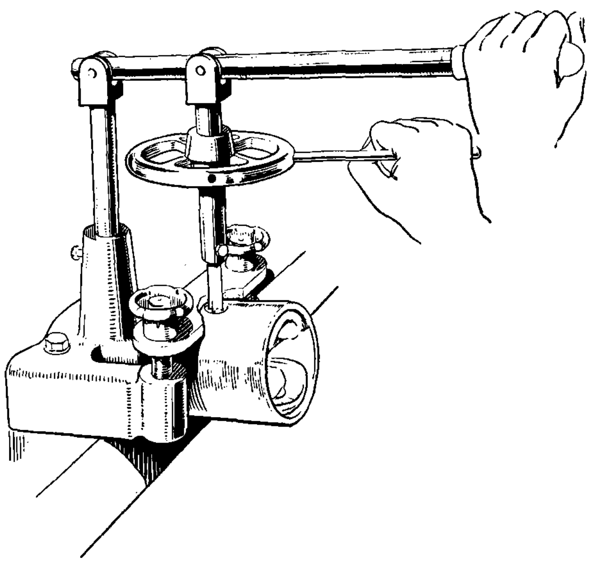


Fig. 13. Tightening the pole shoe retaining screws.

v. Draw the pole shoes and coils out of the yoke and lift off the coils.

vi. Fit the new field coils over the pole shoes and place them in position inside the yoke. Take care to ensure that the taping of the field coils is not trapped between the pole shoes and the yoke.

vii. Locate the pole shoes and field coils by lightly tightening the fixing screws.

viii. Fully tighten the screws by means of the wheel-operated screwdriver.

ix. Replace the insulation piece between the field coil terminal and re-rivet the terminal assembly to the yoke.

(g) **Bearings**

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

To replace the bearing bush in a commutator end bracket, proceed as follows :—

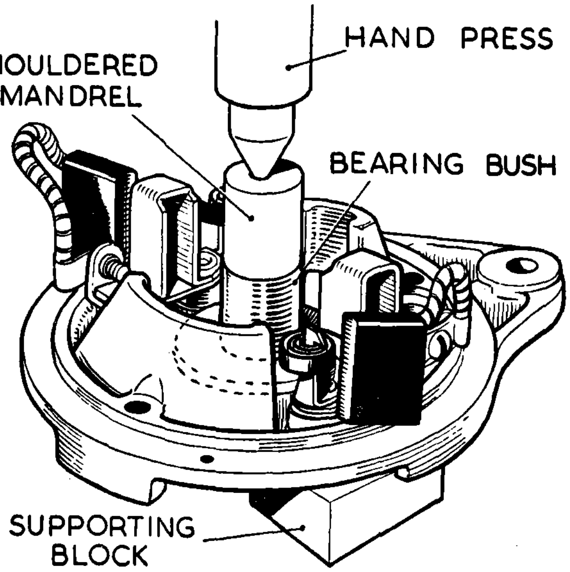


Fig. 14. Method of fitting the porous bronze bush.

i. Remove the old bearing bush from the end bracket. The bearing can be withdrawn with a suitable extractor or by screwing an $\frac{11}{16}$" tap into the bush for a few turns and pulling out the bush with the tap. Screw the tap squarely into the bush to avoid damage to the bracket.

ii. Insert the felt ring in the bearing housing, then press the new bearing bush into the end bracket, using a shouldered, highly polished mandrel of the same diameter as the shaft which is to fit in the bearing, until the visible end of the bearing is flush with the inner face of the bracket.

Porous bronze bushes must not be opened out after fitting, or the porosity of the bush may be impaired.

Note: Before fitting the new bearing bush, it should be allowed to stand for 24 hours completely immersed in a good grade thin engine oil ; this will allow the pores of the bush to be filled with lubricant.

The ball bearing at the driving end is replaced as follows :—

i. Drill out the rivets which secure the bearing retaining plate to the end bracket and remove the plate.

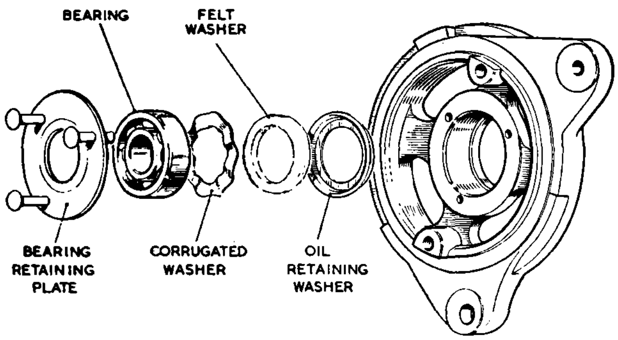


Fig. 15. Exploded view of drive end bearing.

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

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

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

v. Locate the bearing in the housing and press it home.

vi. Fit the bearing retaining plate. Insert the new rivets from the inside of the end bracket and open the rivets by means of a punch to secure the plate rigidly in position.

(h) **To Reassemble**

i. Fit the drive end bracket to the armature shaft. The inner journal of the bearing must be supported by a tube, approximately 4″ long $\frac{1}{8}$″ thick and internal diameter $\frac{11}{16}$″. Do not use the drive end bracket as a support for the bearing whilst fitting an armature.

ii. Fit the yoke to the drive end bracket.

iii. Lift the brushes up into the brush boxes and secure them in that position by positioning the brush spring at the side of the brush.

iv. Fit the commutator end bracket on the armature shaft until the brush boxes are partly over the commutator. Place a thin screwdriver on top of each brush in turn and press the brush down on the commutator.

The brush springs should then position themselves on top of the brushes.

v. Fit the commutator end bracket to the yoke so that the projection on the bracket locates in the yoke.

vi. Refit the two through bolts.

After reassembly lubricate the commutator end bearing (see Para. 2a).

GENERATOR—TYPE C.45. PVS-6.

(Fitted to 3.4 and 3.8 litre Models.)

REMOVAL

Remove the windscreen washer bottle and cage, noting the respective positions of the cables.

Disconnect the cables from the two terminals at the rear of the dynamo noting that they are of different sizes.

Remove the nut and bolt securing the adjusting link to the dynamo.

Remove the two nuts and bolts securing the dynamo to the mounting bracket when the dynamo can be lifted out.

Remove the fan belt.

REFITTING

Refitting is the reverse of the removal procedure. When the fan belt has been refitted move the dynamo to a position where it is possible to depress the belt about ½" (12 mm.) midway between fan and dynamo pulleys.

Except for the differences described below, the instructions given for C.45.PV-6 generator fitted to the 2.4 litre model apply equally to C.45.PVS-6. The essential differences between the two generators concern :

(i) Brushgear inspection.
(ii) Commutator end bearings.

BRUSHGEAR INSPECTION

The yoke is provided with " windows " and a band cover. The instructions given for model C.45.PV-6 under Para. 4(c) (i-iii) need not, therefore, be followed in order to gain access to the brushes for inspection and spring testing—it being only necessary to slacken a single clamping screw and release the band cover.

COMMUTATOR END BEARING

A ball bearing is fitted at the commutator end of the armature shaft. Details are shown in the illustration. The bearing is secured to the shaft by a thrust screw and can be withdrawn with an extractor after the screw has been removed.

When replacing a defective bearing see that the new bearing is clean and packed with high melting point grease. It must be pressed home against the shoulder on the shaft and secured with the thrust screw.

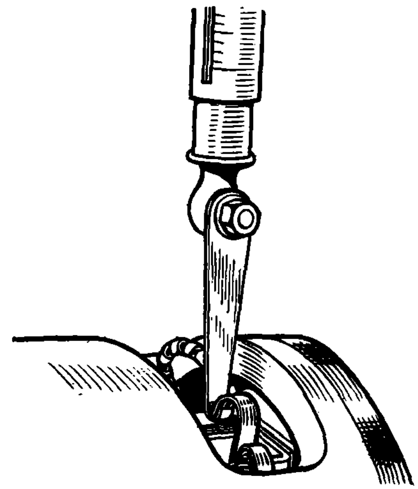


Fig. 16. Testing the brush spring tension.

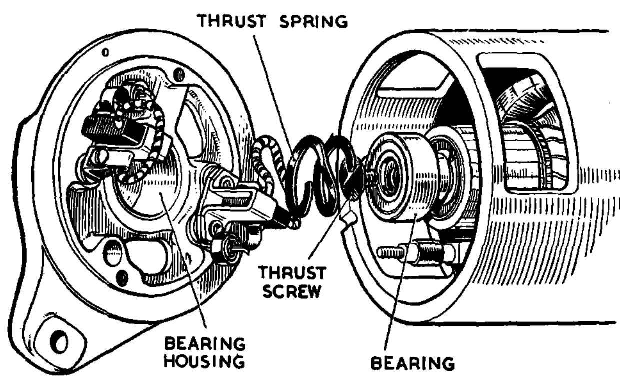


Fig. 17. Showing the commutator end plate removed.

POWER-ASSISTED STEERING GENERATOR

In the instance of generators fitted to cars having power-assisted steering, the pump which supplies the hydraulic pressure is mounted on the rear end of the generator by three studs fitted into the commutator end bracket and the commutator shaft is extended and slotted to accommodate the tongued drive of the pump. The " F " and " D " terminals normally at the rear of the generator are repositioned on the yoke.

When it is necessary to remove the generator the power-assisted steering hydraulic system must be drained, the pipes detached from the hydraulic pump and then the generator and dynamo detached as one unit.

HORNS

It is important to keep the horn mounting bolts tight and to maintain rigid the mountings of any units fitted near the horns. Electrical connections and cabling should be checked occasionally and rectified as required.

Adjustment

A horn in correct adjustment will pass 3.5—4.0 amperes at 12 volts. Adjustment does not alter the note but serves to take up wear of the moving parts which if not corrected will result in loss of power and roughness of tone.

When adjusting, use a first grade 0—10 moving coil ammeter and turn the horn adjustment screw clockwise to increase the current, or anti-clockwise to decrease the current.

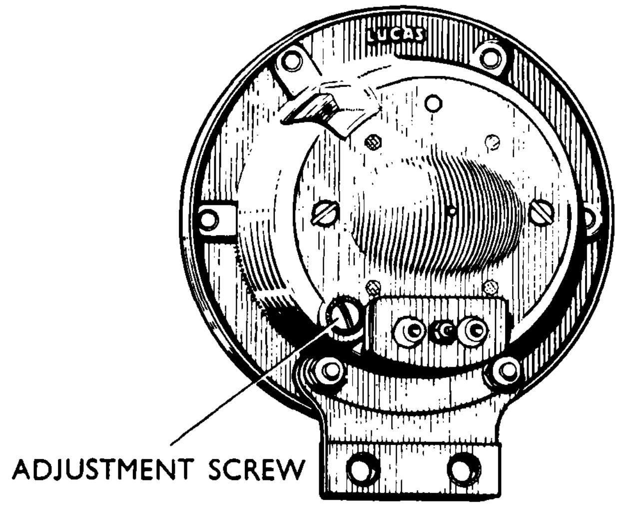


Fig. 18. Horn adjustment screw.

LAMPS

LIGHT BULBS

	Type of Cap	Watts.	Lucas Number	Remarks
Headlight				
Home and R.H. Drive Export	Double B.P.F.	60/36	404	Large globe
U.S.A. and Canada	Sealed beam units			
France	Three spade	45/40	411	Yellow
Germany and Italy	Three spade	45/40	410	
Norway and Sweden	Double B.P.F.	35/35	350	
Continental	Double B.P.F.	35/35	370	
L.H. Drive Export	Double B.P.F.	60/36	406	Large globe
Side Light Map Light Pillar Interior Light Number Plate Luggage Boot Light	M.C.C.	6	989	No. 222 can be used
Front and Rear Flashing Indicators Reversing Light	S.C.C.	21	382	
Rear/Brake Light	S.B.C. off set pin	21/6	380	
Fog Light	Single B.P.F.	48	323	
Rear Interior Light	38 mm. Festoon	6	254	
Instrument Illumination Headlamp Warning Light Ignition Warning Light Fuel Warning Light Handbrake/Brake Fluid Warning Light	M.E.S.	2.2	987	
Switch Indicator Strip Flashing Indicator Warning Light Overdrive Indicator Light Auto-Trans. Indicator Light	M.B.C.	1.6	281	Sub-miniature

HEADLAMPS

The headlamps comprise two Lucas light units with pre-focus double-filament bulbs (excepting U.S.A. export models, which are provided with an adaptor to accept American Sealed Beam Units) front rims and dust excluding rubber rings.

Since the spread of light and its position on the kerbside in the dipped position is a function of lensing and bulb design, special light units and bulbs are fitted to suit lighting regulations of the country in which a car is used. Special care should therefore be taken when replacing a bulb to see that the correct replacement is fitted.

Bulb Replacement

Slacken the single rim securing screw and withdraw the rim and dust excluding rubber ring.

Press the light unit inwards against the three spring-loaded adjustment screws and turn it anti-clockwise to disengage it through the keyhole slots.

Release the bayonet adaptor with a press-in anti-clockwise motion and withdraw the defective bulb.

Note that a notch in the flange of the bulb is arranged to locate with a ridge in the bulb-holder.

Fit the new bulb and refit the adaptor, light unit, dust excluder and front rim.

After fitting, the headlamp setting should be checked.

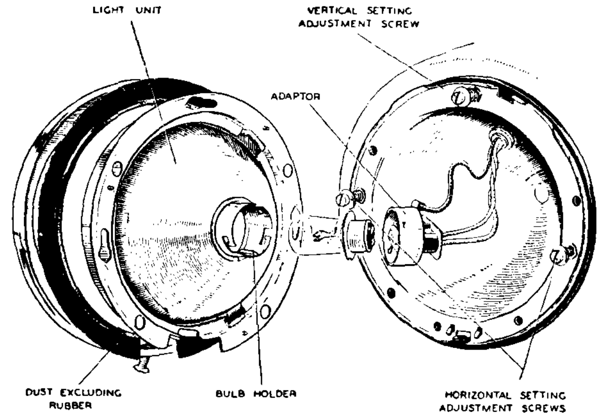


Fig. 19. Showing the headlamp adjustment screws and bulb location.

Headlamp Setting

The headlamps should be set so that when the car is carrying its normal load the driving beams are projected parallel with each other and parallel with the road (see Fig. 20).

When setting, remove the lamp rims and dust excluding rubber rings. Cover one lamp whilst adjusting the other.

Vertical trimming is effected by screwing in (or out) the top spring-loaded screw. Horizontal trimming is effected with the two side screws.

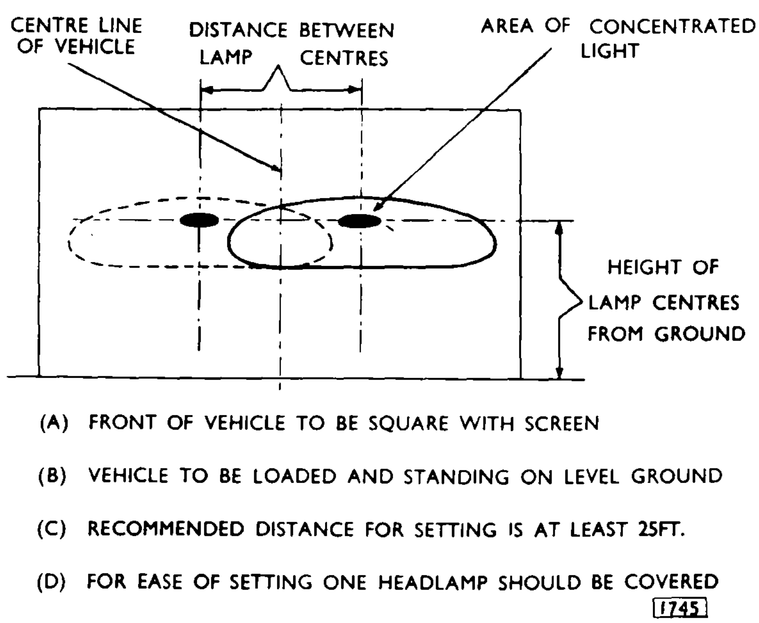


Fig. 20. Headlamp beam setting.

Sidelamp Bulb—Replacement

Remove the screw in the top of the sidelamp nacelle. Turn the rim clockwise a small amount and withdraw the lamp and bulb holder complete. To remove the bulb from the holder, press inwards and rotate anti-clockwise.

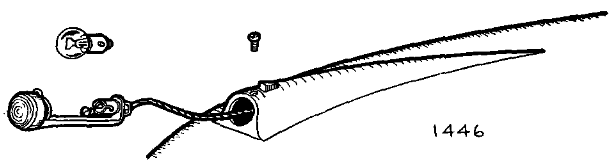


Fig. 21. Sidelamp bulb removal.

Front Flasher Bulb—Replacement

Remove the screw at the bottom of the rim and lift off the rim and glass. Remove the bulb by pressing in and rotating anti-clockwise.

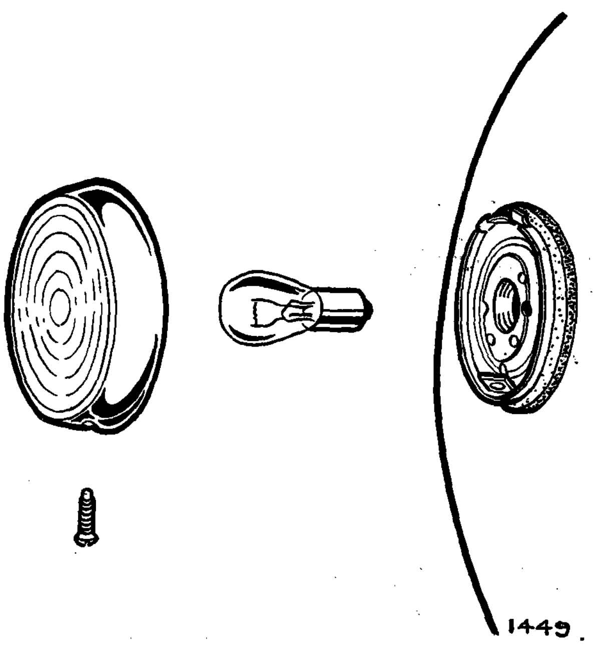


Fig. 22. Front flasher bulb removal.

Rear Flasher Bulb—Replacement

Remove the screw at the bottom of the lamp glass and lift out the glass from its attachment at the top. The flasher bulb is the uppermost of the two bulbs and is removed by pressing inwards and rotating anti-clockwise.

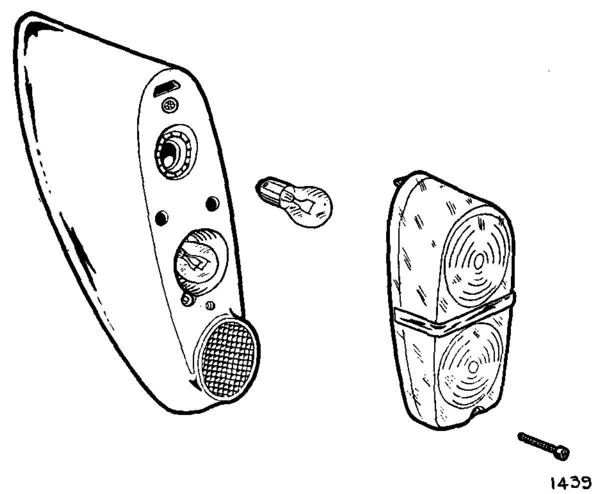


Fig. 23. Rear flasher bulb removal.

Rear/Brake Bulb—Replacement

Remove the screw at the bottom of the lamp glass and lift out the glass from its attachment at the top. The rear and braking light bulb is the lower of the two bulbs. To remove the bulb from its holder, press inwards and rotate anti-clockwise. When fitting a replacement bulb, note that the pins are offset.

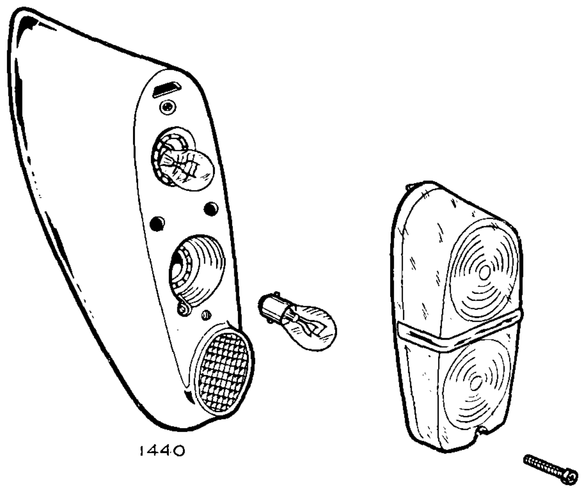


Fig. 24. Rear/Brake bulb removal.

Reverse, Number plate and Luggage Boot Bulbs—Replacement

The reverse light bulb, the two number plate bulbs and the boot light bulb are retained in a holder accessible from the underside of the luggage boot lid. To remove the holder unscrew the two cheese-headed screws when the holder can be withdrawn; all the bulbs are retained in the holder by bayonet fixings. The luggage boot light bulb is accessible without having to remove the holder.

Fog Lamp Bulb—Replacement

Unscrew the screw from the bottom of the lamp, disengage the rim at the top and withdraw the light unit from the back shell. Ease back the earth contact and withdraw the bulb. When replacing the bulb align the groove in the bulb plate with its register in the reflector. When refitting the light unit care must be taken to ensure that the contact blade coupled to the red and yellow cable registers with the centre contact on the bulb.

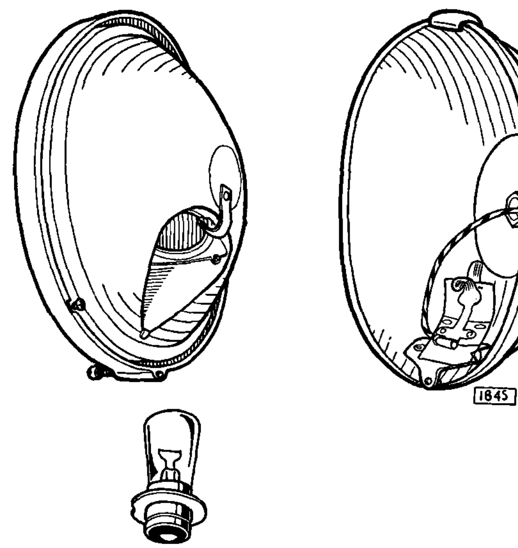


Fig. 25. Fog lamp bulb removal.

Adjusting Fog Lamp Beams

The beam of the fog lamp can be adjusted by slackening the nut of the attachment bolt, access to which is gained from beneath the car, and moving the lamp into the desired position. The nut is then tightened while a second person holds the lamp steady.

RB 310 VOLTAGE AND CURRENT REGULATOR

(a) CHECKING CONTINUITY BETWEEN BATTERY AND CONTROL BOX

If the generator and battery are in order, disconnect the cable from control box terminal " B " and connect it to the negative terminal of a good quality 0—20 moving coil voltmeter.

Connect the positive terminal of the voltmeter to an earthing point on the chassis. If the meter registers battery voltage, i.e., 12 volts, the wiring is in order and the control box settings should be checked.

If there is no reading, re-connect the cable to terminal " B " and examine the wiring between battery and control box for defective cables or loose connections.

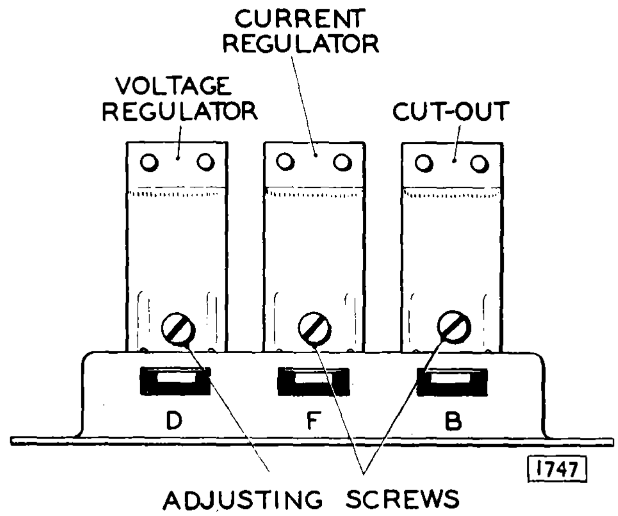


Fig. 26. The RB.310 control box showing the position of the three spring loaded adjusting screws.

(b) VOLTAGE REGULATOR ADJUSTMENT

The regulator is carefully set during manufacture and, in general, it should not be necessary to make further adjustment. However, if the battery fails to keep in a charged condition or if the generator output does not fall when the battery is fully charged, the setting should be checked and, if necessary, corrected.

It is important to check before altering the regulator setting that the low state of charge of the battery is not due to a defective battery or to slipping of the generator belt. Only a good quality MOVING COIL VOLTMETER (0—20 volts) must be used when checking the regulator. The open circuit setting can be checked without removing the cover from the control box.

Disconnect the cable from the control box terminal " B ".

Connect the voltmeter to control box terminal " D " and a good earthing point.

The regulator should be at ambient temperature, i.e., as measured in its immediate vicinity, and adjustment should be completed within thirty seconds, otherwise heating of the shunt coil by the energising current may cause false settings to be made.

Run the engine up until the generator speed reaches 3,000 r.p.m. (2,000 engine r.p.m.) when the open circuit voltage reading should lie within the following limits :—

Regulator Temperature	Voltage Setting
50°F. (10°C.)	15.1—15.7
68°F. (20°C.)	14.9—15.5
86°F. (30°C.)	14.7—15.3
104°F. (40°C.)	14.5—15.1

If the voltmeter reading is outside the specified limits rotate the voltage regulator adjusting screw, which is adjacent to the " D " terminal, clockwise to raise the setting or anti-clockwise to reduce the setting. Check the setting by switching off the engine, restarting and then raising the generator speed to 3,000 r.p.m. (2,000 engine r.p.m.) and make any final adjustment.

(c) CURRENT REGULATOR ADJUSTMENT

When setting the current regulator on the vehicle the generator must be made to develop its full rated output, regardless of the state of charge of the battery at the time of setting. The voltage regulator must therefore be rendered inoperative. To do this, the voltage regulator contacts should be short-circuited with a crocodile clip placed between the insulated fixed contact bracket and the voltage regulator frame

Disconnect the cable from terminal " B " and connect a 0—40 first grade moving coil ammeter between this cable and terminal " B ".

Start the engine and run the generator at about 4,000 r.p.m. (2,700 engine r.p.m.) when the ammeter should read 24-26 amperes. If the ammeter is outside the specified limit rotate the current adjusting screw, which is the centre of the three, clockwise to raise the setting or anti-clockwise to reduce the setting. Check the setting by switching off the engine, restarting and then raising the generator speed to 4,000 r.p.m. (2,700 engine r.p.m.) and make any final adjustment.

Restore the original connections.

(d) CLEANING REGULATOR CONTACTS

After long periods of service it may be found necessary to clean the contacts of the voltage and current regulators. These may be cleaned with fine carborundum stone or fine emery cloth. All traces of metal dust or other foreign matter must be removed with methylated spirits (de-natured alcohol).

(e) CUT-OUT ADJUSTMENT

If the regulator is correctly set but the battery is still not being charged, the cut-out may be out of adjustment. To check the voltage at which the cut-out operates, remove the control box cover and connect the voltmeter between terminals " D " and " E ". Start the engine and slowly increase its speed until the cut-out contacts are seen to close, noting the voltage at which this occurs. This should be 12.7—13.3 volts.

If the operation of the cut-out is outside the specified limit rotate the cut-out adjusting screw, which is adjacent to the " B " terminal, a fraction at a time clockwise to raise the setting or anti-clockwise to reduce the setting. Test after each adjustment by increasing the engine speed and note the voltmeter reading at the instant of contact closure. Electrical settings of the cut-out, like the voltage regulator, must be effected as quickly as possible because of temperature rise effects.

(f) CLEANING CUT-OUT CONTACTS

After long periods of service it may be found necessary to clean the cut-out contacts. These may be cleaned with fine glass paper. All traces of metal dust or other foreign matter must be removed with methylated spirits (de-natured alcohol).

STARTER MOTOR

REMOVAL

Disconnect one of the battery cables.

Disconnect the cable from the terminal at the end of the starter motor.

Slide the two seats rearward as far as possible and remove both seat cushions. Detach the gear lever knob by slackening the locknut. Remove the finisher panel assembly between the two seats by detaching a knob toward the rear end, lifting the end upward to disengage it from the stud, then rearward to disengage the front clips from beneath the finisher panel assembly. Remove the trim panel from the right-hand side of the gearbox cover by withdrawing two thumb screws on its top edge. Detach the right-hand heater hose from the air distributor box situated beneath the dash and remove the circular plate beneath.

Remove the two nuts from the rear ends of the starter motor securing bolts, access to the top nut is gained from inside the car through the circular aperture by removing two screws and a plate and the bottom nut from below the car.

Support the starter motor from below by hand and withdraw both bolts, the heads of which are connected by a curved metal rod, in a forward direction. The starter motor can then be withdrawn from position.

REFITTING

Refitting is the reverse of the removal procedure.

1. GENERAL

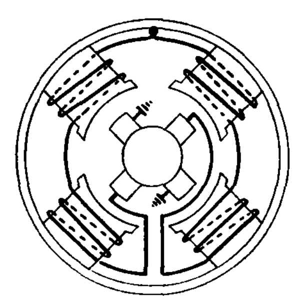
The electric starting motor is a series-wound four-pole four-brush machine having an extended shaft which carries the engine engagement gear, or starter drive as it is more usually named. The diameter of the yoke is $4\frac{1}{2}''$.

The starting motor is of similar construction to the generator except that heavier copper wire is used in the construction of the armature and field coils. The field coils are parallel-connected between the field terminal and the insulated pair of brushes.

2. ROUTINE MAINTENANCE

The only maintenance normally required by the starting motor is the occasional checking of brush-gear and commutator. About every 10,000 miles, remove the metal band cover. Check that the brushes move freely in their holders by holding back the brush springs and pulling gently on the flexible connectors. If a brush is inclined to stick, remove it from its holder and clean its sides with a petrol-moistened cloth. Be careful to replace brushes in their original positions in order to retain " bedding ". Brushes which have worn so that they will not " bed " properly on the commutator or have worn less than $\frac{5}{16}''$ in length must be renewed.

The commutator should be clean, free from oil or dirt and should have a polished appearance. If it is dirty, clean it by pressing a fine dry cloth against it while the starter is turned by hand by means of a spanner applied to the squared extension of the shaft. Access to the squared shaft is gained by removing the thimble-shaped metal cover. If the commutator is very dirty, moisten the cloth with petrol.



MODELS M45G & M418G

Fig. 27. Showing the internal connections of the starter motor.

3. PERFORMANCE DATA

	2.4 litre	3.4 litre 3.8 litre
Type	M.418G	M.45G
Lock Torque	17 lb. ft. with 440-460 amperes at 7.4-7.0 volts	22 lb. ft. with 430-450 amperes at 7.8-7.4 volts.
Torque at 1,000 r.p.m.	8 lb. ft. with 250-270 amperes at 9.4-9.0 volts	8.3 lb. ft. with 200-220 amperes at 10.2-9.8 volts.
Light running current	45 amperes at 7,400-8,500 r.p.m.	45 amperes at 5,800-6,800 r.p.m.

4. SERVICING

(a) TESTING IN POSITION

(i) Switch on the lamps and operate the starter control. If the lights go dim, but the starter motor is not heard to operate, an indication is given that current is flowing through the starting motor windings but that the armature is not rotating for some reason ; possibly the pinion is meshing permanently with the geared ring on the flywheel. In this case the starting motor must be removed from the engine for examination.

(ii) Should the lamps retain their full brilliance when the starter switch is operated, check the circuit for continuity from battery to starting motor via the starter switch, and examine the connections at these units. If the supply voltage is found to be applied to the starting motor when the switch is operated, an internal fault in the motor is indicated and the unit must be removed from the engine for examination.

(iii) Sluggish or slow action of the starting motor is usually due to a loose connection causing a

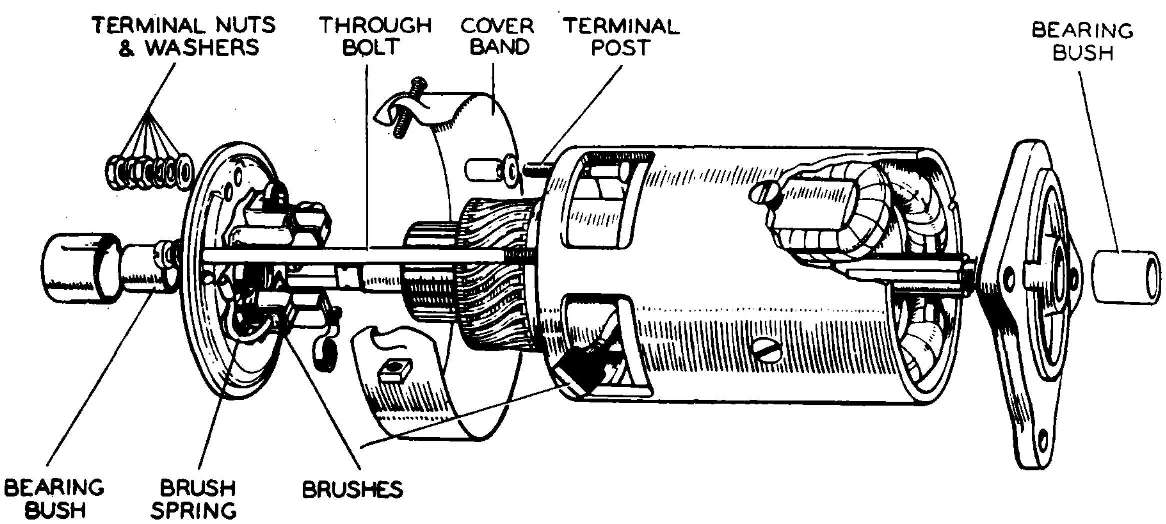


Fig. 28. Exploded view of starter motor.

high resistance in the motor circuit. Check as described above.

(iv) If the motor is heard to operate, but does not crank the engine, indication is given of damage to the drive.

(b) **BENCH TESTING AND EXAMINATION OF BRUSHGEAR AND COMMUTATOR**

(i) If it is necessary to remove the starting motor from the engine, proceed as follows :—
Disconnect one of the battery cables at the battery, to avoid any danger of causing short circuits.
Disconnect the cable from the starter motor.

(ii) After removing the starting motor from the engine secure the body in a vice and test by connecting it with heavy gauge cables to a battery of the appropriate voltage. One cable must be connected to the starter terminal and the other held against the body or end bracket. Under these light load conditions, the starter should run at a very high speed (see Para. 3) without excessive noise and without excessive sparking at the commutator

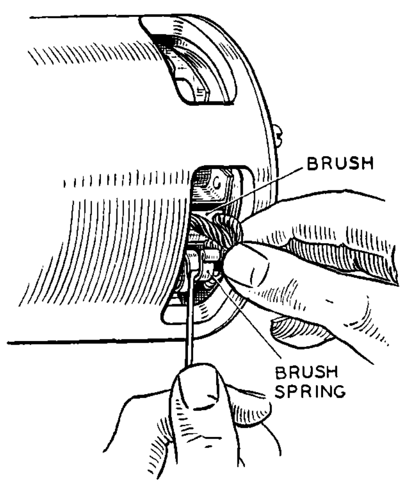


Fig. 29. Checking the brush gear.

(iii) If the operation of the starting motor is unsatisfactory, remove the cover band and examine the brushes and commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they will not bear on the commutator, or if the brush flexible is exposed on the running face, they must be replaced (see Para. 4D).
Check the tension of the brush springs with a spring scale. The correct tension is 30—40 ozs. New springs should be fitted if the tension is low.
If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the armature is rotated.

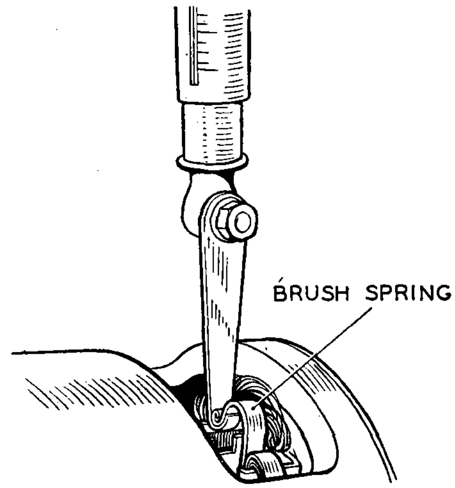


Fig. 30. Testing the brush gear tension.

(iv) Re-test the starter as described under (ii). If the operation is still unsatisfactory, the unit can be dismantled for detailed inspection and testing as follows :—

(c) **TO DISMANTLE**

(i) Remove the cover band, hold back the brush springs and lift the brushes from their holders.
(ii) Remove the nuts from the terminal post which protrudes from the commutator end bracket.
(iii) Unscrew the two through bolts from the commutator end bracket. Remove the commutator end bracket from the yoke.
(iv) Remove the driving end bracket complete with armature and drive from the starting motor yoke. If it is necessary to remove the armature from the driving end bracket, it can be done by means of a hand press after the drive has been dismantled.

(d) **REPLACEMENT OF BRUSHES**

If the brushes are worn to less than $\frac{5}{16}''$ in length, they must be replaced.

Two of the brushes are connected to terminal eyelets attached to the brush boxes on the commutator end bracket and two are connected to the field coils.

The flexible connectors must be removed by unsoldering and the connectors of the new brushes secured in their place by soldering. The brushes are pre-formed so that bedding to the commutator is unnecessary.

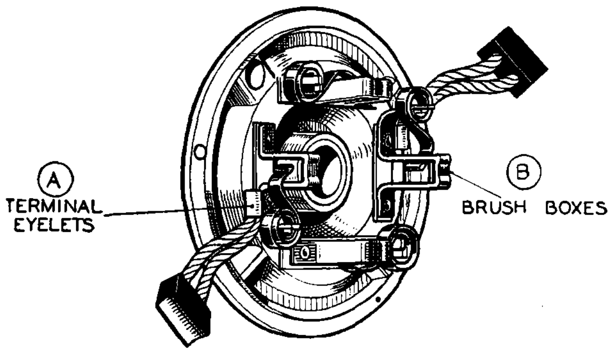


Fig. 31. Commutator end bracket brush connections.

(e) COMMUTATOR

A commutator in good condition will be smooth and free from pits and burned spots. Clean the commutator with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of fine glass paper, while rotating the armature. To remedy a badly worn commutator, dismantle the starter drive and remove the armature from the end bracket. Now mount the armature in a lathe, rotate at a high speed and take a light cut with a very sharp tool. Do not remove any more metal than is necessary. Finally polish with very fine glass paper.

The insulators between the commutator segments MUST NOT BE UNDERCUT.

(f) ARMATURE

Examination of the armature may reveal the cause of failure, e.g. conductors lifted from the commutator due to the starter motor being engaged while the engine is running and causing the armature to be rotated at an excessive speed. A damaged armature must always be replaced—no attempt should be made to machine the armature core or to true a distorted armature shaft.

(g) FIELD COILS

(i) Test the field coils for continuity by connecting a 12-volt test lamp between the starting motor terminal and to each field brush in turn.

(ii) Lighting of the lamp does not necessarily mean that the field coils are in order, as it is possible that one of them may be earthed to a pole-shoe or to the yoke. This may be checked with a 110-volt test lamp, the test leads being connected between the starting motor terminal and a clean part of the yoke. If the lamp lights, defective insulation of the field coils or of the terminal post is indicated. In this event, see that the insulating band is in position and examine the field coils and terminal connections for any obvious point of contact with the yoke. If from the above tests the coils are shown to be open-circuited or earthed and the point of contact cannot be readily located and rectified, either the complete starting motor or the field coils must be replaced. If the field coils are to be replaced, follow the procedure outlined below, using a wheel-operated screwdriver.

Remove the insulation piece which is provided to prevent the intercoil connectors from contacting with the yoke.

Mark the yoke and pole shoes so that the latter can be re-fitted in their original positions.

Unscrew the four pole shoe retaining screws with the wheel-operated screwdriver.

Draw the pole shoes and coils out of the yoke and lift off the coils.

Fit the new field coils over the pole shoes and place them in position inside the yoke.

Take care to ensure that the taping of the field coils is not trapped between the pole shoes and the yoke.

Locate the pole shoes and field coils by lightly tightening the fixing screw.

Fully tighten the screws with the wheel-operated screwdriver.

Replace the insulation piece between the field coil connections and the yoke.

(h) BEARINGS

Bearings which are worn to such an extent that they will allow excessive side-play of the armature shaft must be replaced. To replace the bearing bushes proceed as follows :—

(i) Press the bearing bush out of the end bracket.

(ii) Press the new bearing bush into the end bracket using a shouldered, highly polished mandrel of the same diameter as the shaft which is to fit in the bearing. Porous bronze bushes must not be opened out after fitting, or the porosity of the bush may be impaired.

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

(j) **REASSEMBLY**

The reassembly of the starting motor is a reversal of the dismantling procedure.

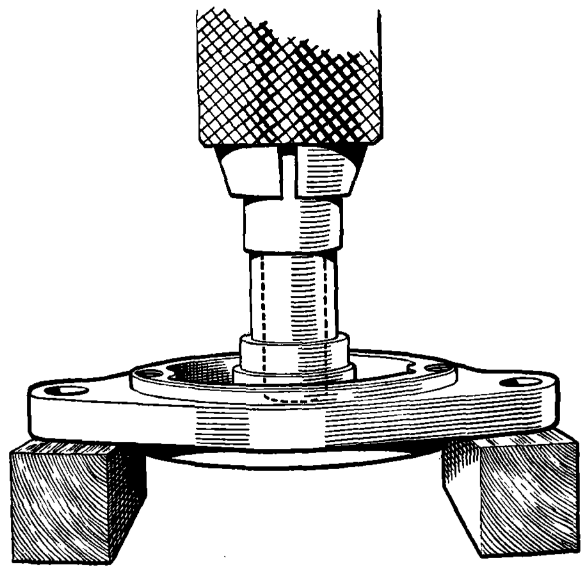


Fig. 32. Method of fitting bush.

STARTER DRIVE

1. **GENERAL**

The pinion is mounted on a threaded sleeve which is carried on splines on the armature shaft, the sleeve being arranged so that it can move along the shaft against a compression spring so as to reduce the shock loading at the moment engagement takes place.

When the starter switch is operated, the shaft and screwed sleeve rotate and, owing to the inertia of the pinion, the screwed sleeve turns inside the pinion causing the latter to move along the sleeve into engagement with the flywheel ring. The starter will then turn the engine.

As soon as the engine fires and commences to run under its own power, the flywheel will be driven faster by the engine than by the starter. This will cause the pinion to be screwed back along the sleeve and so thrown out of mesh with the flywheel teeth. In this manner the drive safeguards the starter against damage due to being driven at high speeds by the engine.

A pinion restraining spring is fitted over the starter shaft to prevent the pinion being vibrated into contact with the flywheel when the engine is running.

2. **ROUTINE MAINTENANCE**

If any difficulty is experienced with the starting motor not meshing correctly with the flywheel, it may be that the drive requires cleaning. The pinion should move freely on the screwed sleeve ; if there is any dirt or other foreign matter on the sleeve it must be washed off with paraffin.

In the event of the pinion becoming jammed in mesh with the flywheel, it can usually be freed by turning the starter motor armature by means of a spanner applied to the shaft extension at the commutator end.

This is accessible by removing the cap which is a push fit.

3. **DISMANTLING AND REASSEMBLY**

Having removed the armature as described in the section dealing with starting motors the drive can be dismantled as follows :—

Remove the split pin (A) from the shaft nut (B) at the end of the starter drive. Hold the squared starter shaft extension at the commutator end by means of a spanner and unscrew shaft nut (B). Lift off the main spring (C), washer (D), screwed sleeve with pinion (E), collar (F), pinion restraining spring (G) and restraining spring sleeve (H).

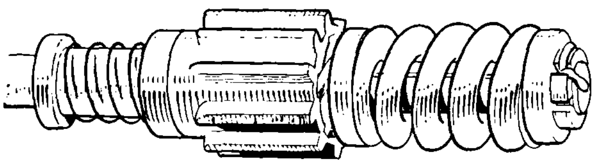


Fig. 33. Showing the starter drive assembled.

Note: If either the screwed sleeve or pinion are worn or damaged they must be replaced as a pair, not separately.

The reassembly of the drive is a reversal of the dismantling procedure.

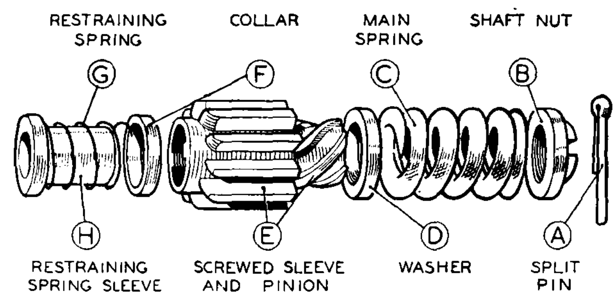


Fig. 34. Exploded view of the starter drive assembly.

WINDSCREEN WIPER

REMOVAL OF WIPER MOTOR AND CABLE

Withdraw the wiper arms from the spindles.

Unscrew the large nut connecting cable guide to the wiper motor.

Remove the single screw securing the plate covering the electrical connections on the wiper motor. Withdraw the electrical cables from the wiper motor complete with the rubber retainer.

From the underneath of the right hand front wing remove the three screws securing the wiper motor to the wing valance.

The wiper motor cable can now be removed as an assembly by drawing the cable through the guide tube.

Disconnecting the Cable

Remove the four small set bolts from the gear cover.

Lift off the cover, remove the circlip from the post in the gear wheel.

Remove the washer, spring, shaped washer and connecting link from the post. Lift out the connecting link from the crosshead.

Lift out the cable ferrule from the gear casing.

REFITTING

Refitting is the reverse of the removal procedure.

REMOVAL OF WHEELBOXES

Remove the side facia panel as described on page 44.

Remove the glove box as described on page 45.

Withdraw both wiper arms from the spindles.

From outside the car unscrew the large nuts securing the wheelboxes to the scuttle.

Remove the chrome distance pieces and rubber seals.

Remove the backplates from the wheelboxes by removing the two screws.

Pull the cable away from the worm wheels and slide off the spacer tubing.

From inside the car withdraw the wheelboxes and spacers.

REFITTING

Refitting is the reverse of the removal procedure. When refitting ensure that the flared end of tube from motor to first wheelbox registers with outer narrow slot in cover plate.

DATA

Wiping Speed	
Normal :	45—50 cycles per minute
High :	60—70 cycles per minute
Light Running Current	
Normal Speed	2.7—3.4 amperes
High Speed :	2.6 (or less) amperes
Stall Current	10—11 amperes (DR3)
Control Switch	79.SA.
Pressure of Blades against Windscreen	
Arms with leaf type springs :	4.5—7.5 ounces
Arms with coil type springs :	5.5—7.5 ounces
Maximum permissible force to move cable rack in protective tubing with motor, arms and blades disconnected	6.0 lbs.

DESCRIPTION

The windscreen wiper is a two-speed, thermostatically protected, self-parking, cable rack unit.

The cable rack comprises a flexible inner core of steel wire wound with a wire helix. The rack passes through protective tubing from an underbonnet mounted motor to a pair of scuttle mounted wheelboxes. A reciprocating motion is imparted to the rack by a crank in the wiper gearbox and transmitted to the wiper arm spindles by engagement of the rack with a gear in each wheelbox.

The motor is controlled by a switch giving Park, Normal and High speed operation. The higher speed is intended to be used when driving fast through heavy rain or light snow. It should not be used in heavy snow or with a dry or drying windscreen. If overloaded, the motor windings will overheat and cause the thermostat to trip and isolate the motor from the supply. Provided the obstruction or other cause of excessive heating is removed, normal working resumes automatically when the temperature falls to a safe value.

MAINTENANCE

Efficient wiping is dependent upon having a clean windscreen and wiper blades in good condition.

Use methylated spirits (de-natured alcohol) to remove oil, tar spots and other stains from the windscreen. Silicone and wax polishes should not be used for this purpose.

Worn or perished wiper blades are readily removed for replacement.

When necessary, adjustments to the self-parking mechanism can be made by turning the knurled nut near the cable rack outlet. Turn the nut only one or two serrations at a time and test the effect of each setting before proceeding.

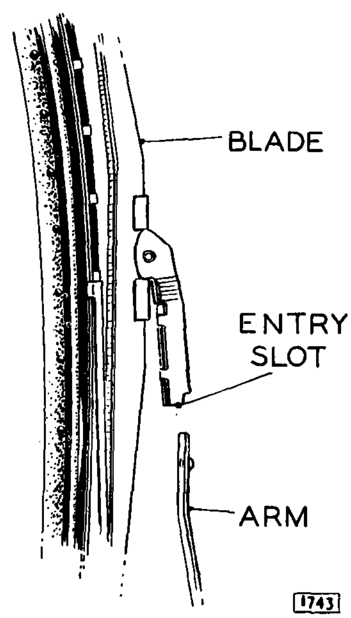


Fig. 35. Wiper blade to arm attachment.

FAULT DIAGNOSIS

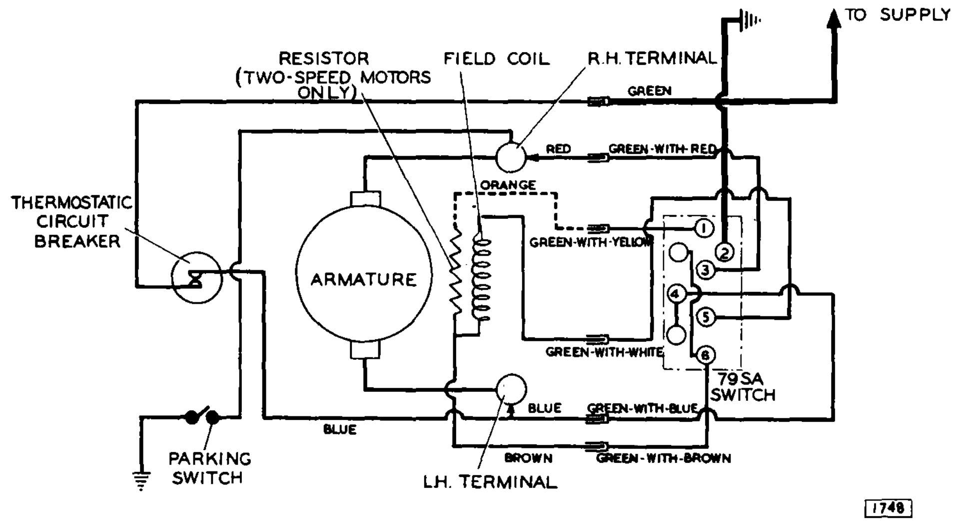
Poor performance can be electrical or mechanical in origin and not necessarily due to a faulty motor, for example :—

Low voltage at the motor due to poor connections or to a discharged battery ;

Cable rack binding in protective tubing ;

Excessive loading on the wiper blades ;

Wheelboxes loose, out of alignment or spindles binding in the bearing housing.



INTERNAL CONNECTIONS OF SWITCH:- 'HIGH' (1-2-3)(4-5): 'NORMAL' (2-3-6) (4-5): 'PARK' (3-5) (4-6)

Fig. 36. Wiring connections switch to wiper.

TESTING

Unless the origin of the fault is apparent, proceed as follows to determine the cause of failure.

Measuring Supply Voltage

Using a first grade moving coil voltmeter, measure the voltage between the motor supply terminal (to which the green cable is connected) and a good earthing point. This should be 11.5 volts with wiper working normally. If the reading is low, check the battery, switch (by substitution), cabling and connections.

Measuring Light Running Current

If the normal running terminal voltage is correct, disconnect the cable rack at the wiper gearbox and measure the light running current with a first grade moving coil ammeter connected in the supply cable.

As this involves removing the gearbox cover, the opportunity can be taken to observe the speed of operation by counting the revolutions per minute of the final gear.

The light running current must not exceed 3.4 amperes at Normal speed (45—50 c.p.m.). If it does, fit a new windscreen wiper motor.

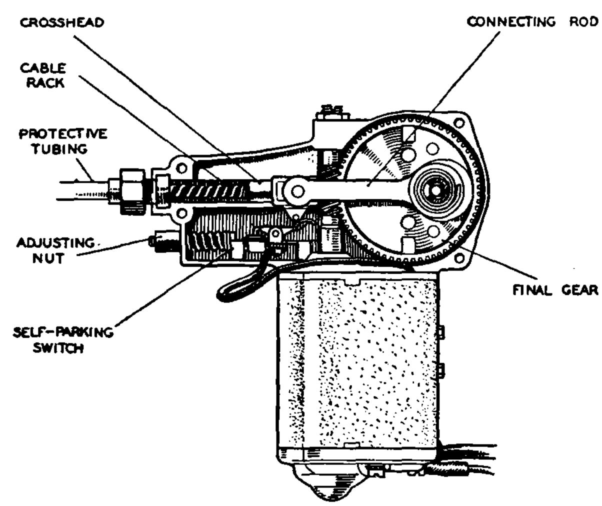


Fig. 37. Showing the DR3 wiper motor with cover plate removed.

Checking Cable Rack and Tubing

The maximum permissible force to move the cable rack in its protective tubing is 6 pounds with the wiper arms, blades and motor disconnected. The measurement can be made by hooking a spring balance in the hole in the cross-head (into which a pin on the connecting rod is normally located) and withdrawing the rack with the balance.

Binding of the rack can be due to kinked or flattened tubing or to faulty installation. Minor faults can be cleared with a suitable tested mandrel sold specifically for checking wiper installations. Badly kinked or flattened tubing must be renewed. Any bends of less than 9″ radius must be reformed.

At the wheelboxes the flared ends of the intermediate tubing should be located in the inner wide slots of the wheelbox clamp plates but the end of the main tubing should be located in the outer narrow slot.

The cable rack should be well lubricated with Duckhams HBB grease.

Checking Wheelboxes

Check the wheelboxes for misalignment or looseness and rectify as required.

Renew seized wheelboxes.

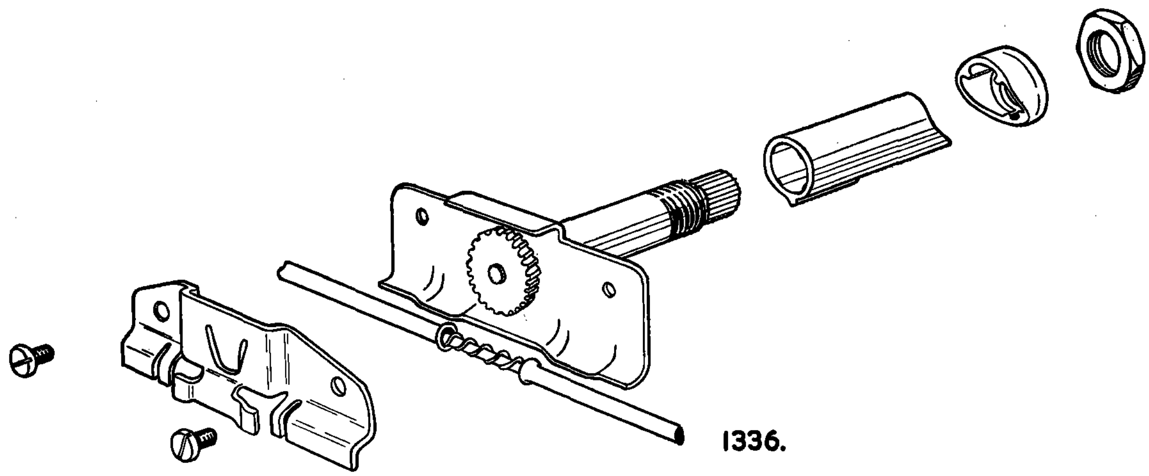


Fig. 38. Exploded view of wheelbox.

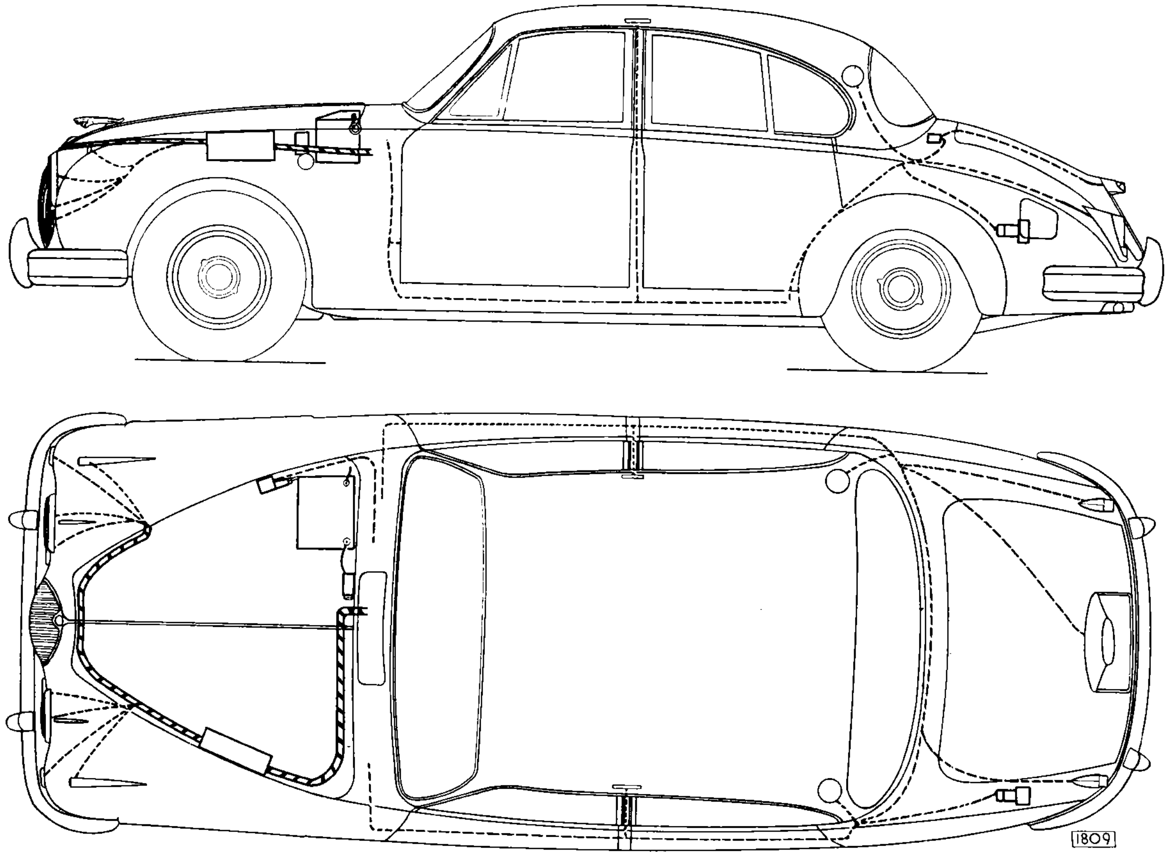


Fig. 39. Layout of wiring harnesses.

MISCELLANEOUS

ELECTRIC CLOCK

Removal

Detach the earthing lead from the battery. Remove both the speedometer and the revolution counter from the instrument panel as detailed under " Speedometer and Odometer, Removal " and " Revolution Counter and Clock, Removal ". Detach the clock from the hidden face of the revolution counter by removing two nuts. The flexible setting drive can be removed by slackening the knurled sleeve.

Adjustment

At the back of the time clock is a small screw surrounded by a semi-circular scale. If the clock is gaining, turn the screw towards the minus sign (—) : if the clock is losing, turn the screw towards the positive sign (+).

Note: The action of setting the hands automatically restarts the clock.

Refitting

Refitting is the reverse of the removal procedure.

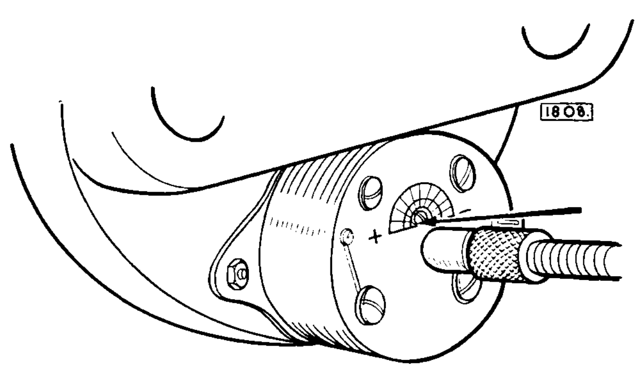


Fig. 40. Adjustment screw for clock.

BRAKE FLUID AND HANDBRAKE WARNING LIGHT

Renewing the Bulb

Unscrew the bezel of the lamp exercising care to control the run of the spring loaded bulb beneath. Feed the bulb into the spring loaded bulb holder, ensure the red transparent window is retained in the bezel by a small circlip, position the designation plate on the bulb holder and screw on the bezel.

The bulb holder can be removed from the hidden face of the side facia panel after the bezel and bulb have been removed but it will be necessary to remove the side facia panel first.

CARBURETTER MIXTURE CONTROL WARNING LIGHT (2.4 Litre Model)

Renewing the Bulb

Remove the dash casing from beneath the steering column by withdrawing four screws and the two screwed bezels from the flexible odometer and clock setting drives. Withdraw the bulb holder from the rear of the light unit above the lever quadrant and withdraw the bulb by rotating it anti-clockwise. Replace the bulb and the remaining components by reversing the removal sequence.

The lamp unit can be removed from the hidden face of the side facia panel after the bulb holder has been removed by unscrewing the body of the unit and withdrawing the red transparent window from the front face of the facia board, the chrome bezel can be prised out if necessary. The replacement of the lamp unit is the reverse of the removal sequence but the angled bracket must not be omitted.

SETTING THE CARBURETTER MIXTURE CONTROL WARNING LIGHT SWITCH

(2.4 Litre Model)

Remove the dash casing from beneath the steering column by withdrawing four screws and the two screwed bezels from the flexible odometer and clock setting drives. Set the lever of the carburetter mixture control $\frac{1}{4}''$ (6.350 mm.) from the bottom limit of its travel when a click will be heard and utilizing the two nuts on the threaded shank of the switch position the switch so the warning light ceases to glow when the ignition is switched " on ". Actuate the lever up and down once or twice and make any final adjustments necessary. Replace the components by reversing the removal sequence.

OVERDRIVE AND INTERMEDIATE SPEED HOLD SWITCHES

Removal

Detach the earth lead from the battery. Remove the dash casing from beneath the steering column by withdrawing four screws and detaching the screwed bezels from the flexible odometer and clock setting drives.

Remove the overdrive or intermediate speed hold switches from the hidden face of the instrument facia by rotating the screwed ring anti-clockwise and collecting the escutcheon plate.

Refitting

Refitting is the reverse of the removal procedure.

FLASHING INDICATOR CONTROL

Removal

Detach the earth lead from the battery. Detach the upper and lower switch covers from around the steering column by withdrawing two sunken screws and three screws from below. Remove the dash casing from below the steering column by withdrawing four screws and detaching the screwed bezels from the flexible odometer and clock setting cable drives. Disconnect the seven cable harness at the snap connectors on the left-hand side of the steering column. Detach the flasher indicator control from the left-hand side of the steering column by withdrawing two horizontally positioned screws from the right-hand side.

Refitting

Refitting is the reverse of the removal procedure. Insert the wires into the multi-snap connector so that similar coloured wires are opposite each other.

FLASHING INDICATOR WARNING LIGHT BULB

Replacement

Detach the earth lead from the battery.

Detach the upper switch cover from above the steering column by withdrawing the two most sunken screws from below. Withdraw one or both flasher indicator warning lamp bulb holders from the outer sockets of the upper switch cover. Remove the bulb from the holder by applying inward pressure and rotating it 90° in either direction. The bulb is replaced by inserting the cap into the bulb holder and rotating it 90° until the notches inside the bulb holder are located. The bulb holder and upper switch are refitted by reversing the removal procedure.

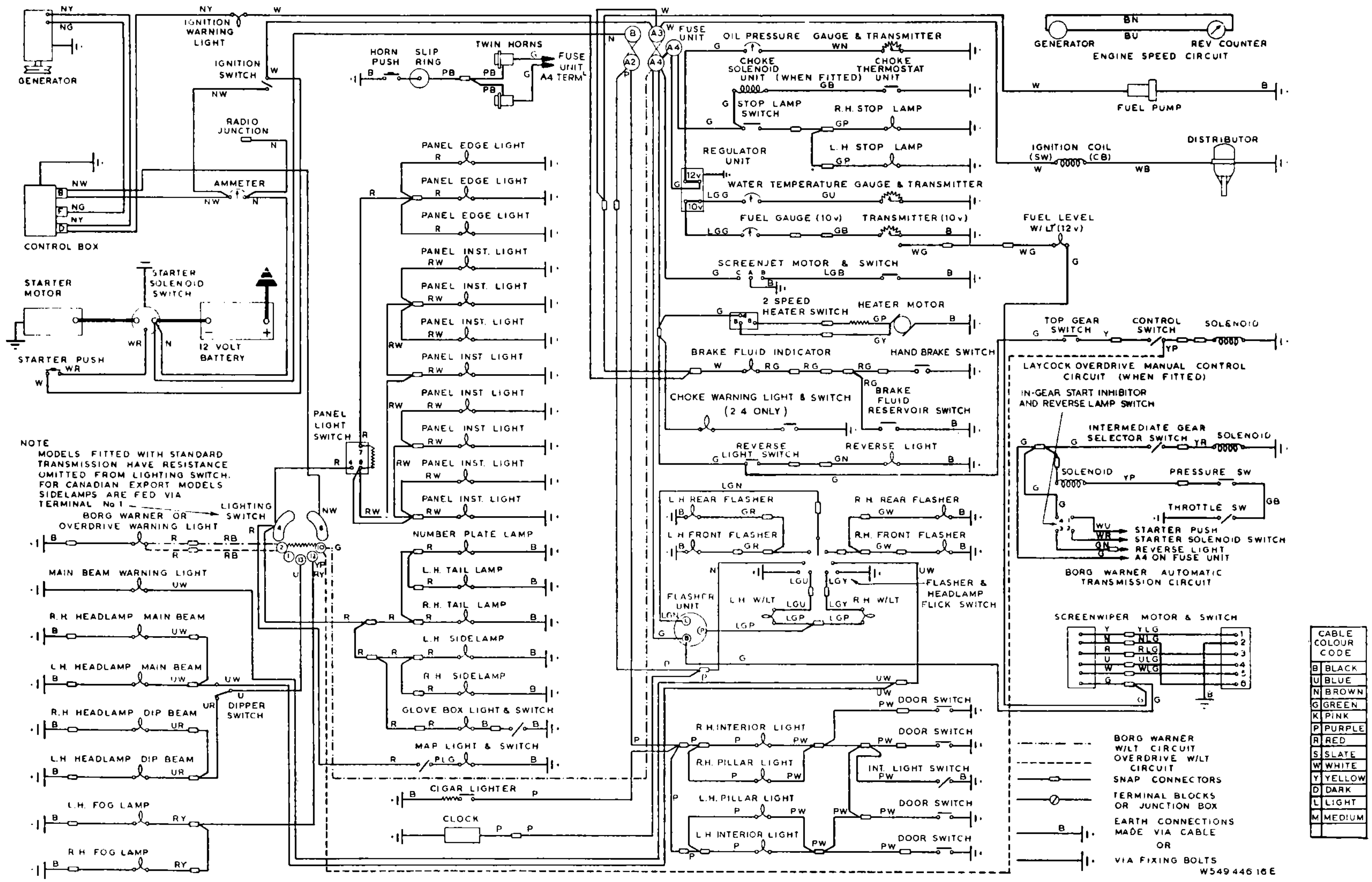
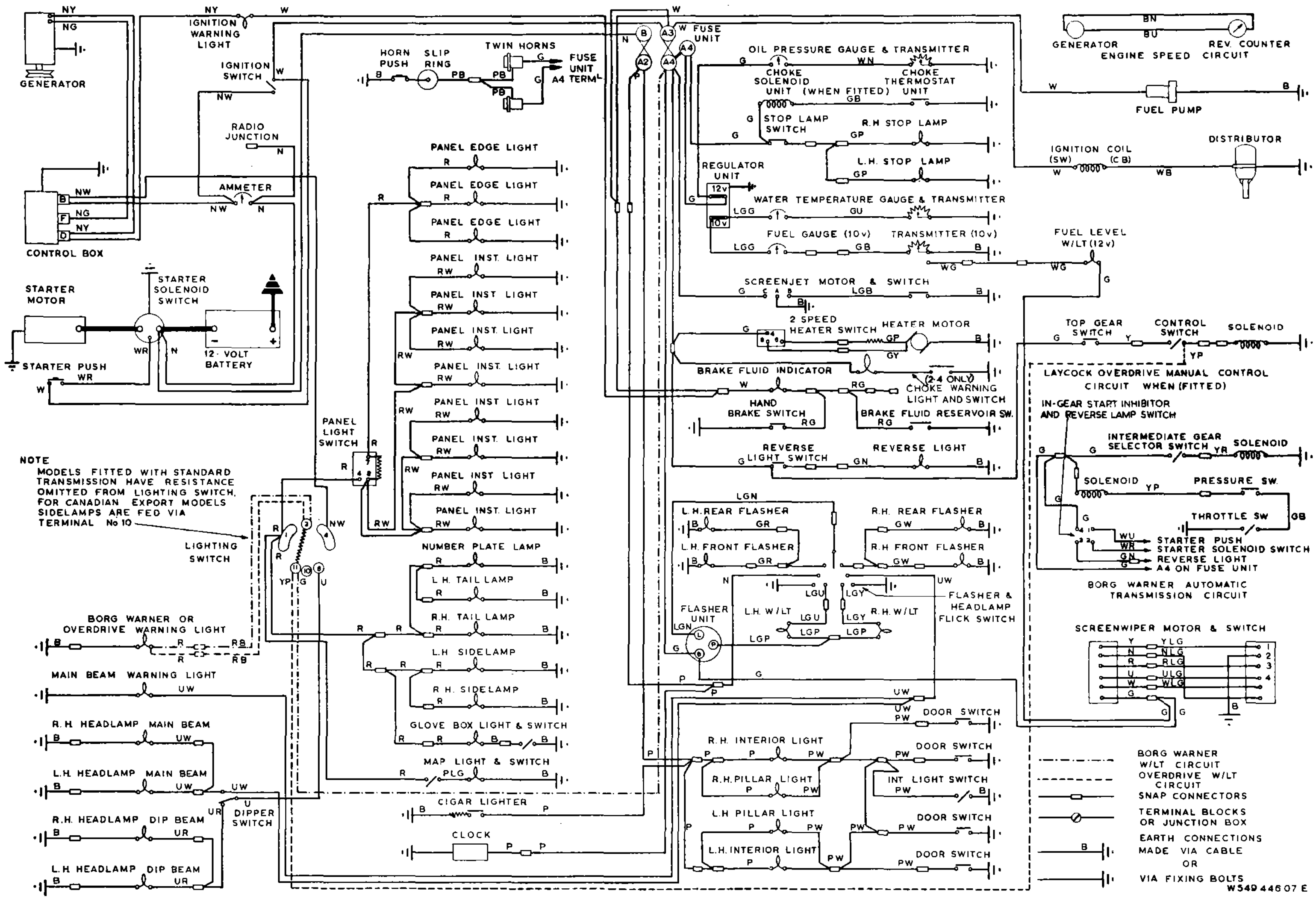


Fig. 41. Wiring diagram for Home and Right-hand drive Export models.



CABLE COLOUR CODE	
B	BLACK
U	BLUE
N	BROWN
G	GREEN
K	PINK
P	PURPLE
R	RED
S	SLATE
W	WHITE
Y	YELLOW
D	DARK
L	LIGHT
M	MEDIUM

Fig. 42. Wiring diagram for Left-hand drive **models**

THE INSTRUMENTS

DASH CASINGS

Removal

Detach one or both dash casings situated beneath the glove box and side facia panel by withdrawing four screws each and in the instance of the dash casing on the steering column side, the screwed bezels of the flexible odometer and clock setting drives.

Refitting

The refitting is the reversal of the removal sequence but in the instance of the dash casing on the steering column side it will be necessary to attach the flexible odometer and clock setting drives to the casing before attaching the latter to the underside of the instrument panel.

THE INSTRUMENT PANEL

Opening

Detach the earth lead from the battery.

Remove the ignition key and cigar lighter for safe keeping. Hinge the centre instrument panel downward on its bottom edge after withdrawing two thumb screws situated in each top corner beneath the screen rail.

Removal

The instrument panel can be removed completely by detaching the earth lead from the battery, identifying and removing the leads from the hidden faces of the instruments, cigar lighter and switches. Removing the electrical harness and clips from the instrument panel posts by withdrawing one screw from each, then removing one harness clip and screw from each hinge inside the instrument panel aperture and two bolts from the extended portion of each hinge, access to which is gained through the newspaper tray beneath.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following point.

That the leads are refitted in accordance with their colour coding, utilizing the wiring diagram as a reference.

Closing

Closing is the reverse of the opening procedure but particular attention must be given to the following points.

i. That the leads are replaced in accordance with their colour coding, utilizing the wiring diagram as a reference.
ii. That the clips securing the main harness to the body structure viewed through the instrument panel aperture will in no way foul the centre terminal of the cigar lighter otherwise a direct short will occur when the battery is connected.

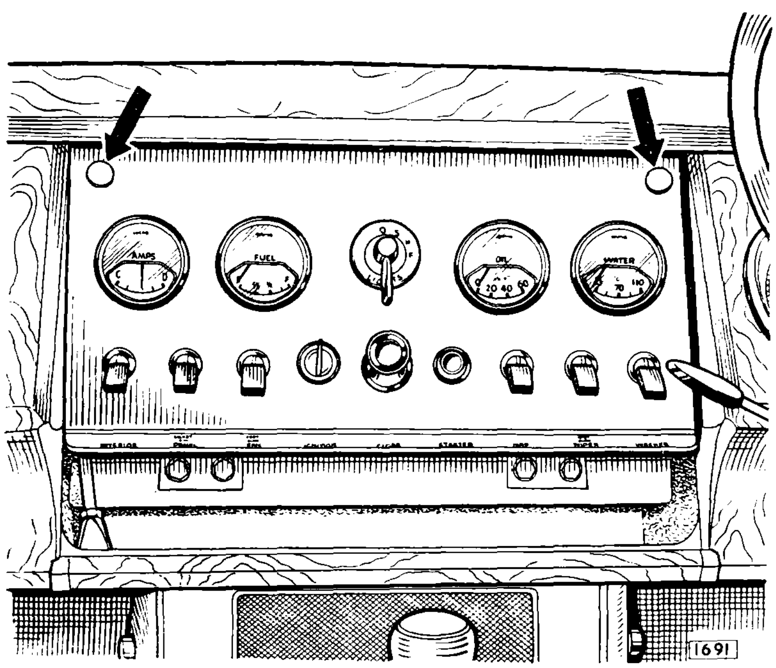


Fig. 43. The instrument panel, the two arrows indicate the securing screws.

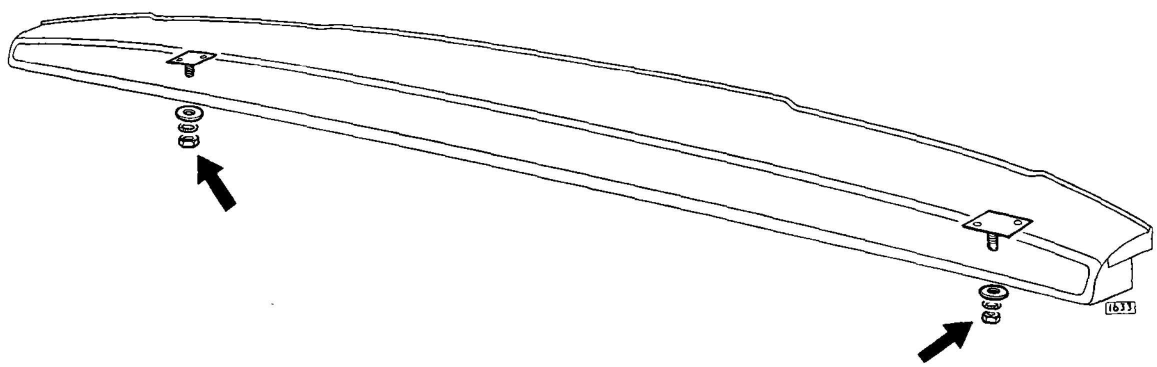


Fig. 44. The screen rail, the two arrows indicate the two sets of attachment details.

THE SCREEN RAIL AND MAP LIGHT

Renewing the Bulb

Remove the bulb from the map lamp unit by rotating its head in either direction until the bayonet cap becomes free and the bulb can be withdrawn outward.

Replace the bulb by offering it up to the lamp unit, rotating the head until the bayonet cap lugs sink into the holder, then while applying slight pressure give the head a 90° rotation in either direction.

Removal

Identify and withdraw the leads from the map lamp situated on the underside in the centre of the screen rail. Remove the screen rail from the base of the windscreen by detaching two nuts, one adjacent to each end. Detach the map lamp unit from beneath the centre of the screen rail by withdrawing two screws.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points.

i. That the map lamp unit is attached to the underside centre of the screen rail before it is offered up to the windscreen.

ii. That one snap connector has two black leads fitted.

THE SIDE FACIA PANEL

Removal

Detach the earthing lead from the battery. Remove the dash casing from beneath the steering column by withdrawing four screws and the two screwed bezels of the flexible odometer and clock setting drives ; detach the angles tie plate from the bottom hidden face of the facia board by removing two nuts. Fold the instrument panel downward by withdrawing the ignition key and cigar light unit and two thumb screws. In the instance of automatic transmission, remove the short control rod from the ball pin on the lever at the right-hand side of the steering column by unscrewing the end piece in one ball joint socket. Remove the upper switch cover from the top of the steering column by withdrawing the two most sunken screws from below. Identify and withdraw the trafficator warning light harness through the loop bracket attached to the hidden face of the facia board by disconnecting the six snap connectors.

Detach the steering column assembly from the body bracket beneath the side facia by removing two nuts and allow the rim of the steering wheel to lay on the driver's seat cushion. Detach the side facia panel from the front of the saloon by withdrawing one screw in the steady bracket beneath, by removing two nuts from a stud bracket situated behind the side facia panel adjacent to the outside of the saloon, withdrawing two screws, the heads of which are located in the instrument panel aperture. Detach the speedometer drive, all warning lights and electrical leads from the instruments and in the instance of the 2.4 litre cars, detach the flexible control cable from the carburetter mixture lever quadrant by slackening the trunnion screw.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points.

i. That the rubber seal beneath the angle bracket adjacent to the instrument panel is in good condition and has the straight edge outward.

ii. That the leads are refitted in accordance to their colour coding, utilizing the wiring diagram as a reference.

THE SPEEDOMETER

Removal

Detach the earth lead from the battery and raise the steering wheel to the highest position. Remove the dash casing from beneath the side facia panel by withdrawing four screws and the two screwed bezels from the flexible odometer and clock setting drives. Detach the speedometer from the facia board by removing two knurled nuts, earth lead and two retaining pieces, then withdraw the flexible drive from the centre of the instrument by slackening the knurled sleeve. Withdraw the speedometer from the facia board, identifying and removing the three warning lamps and two instrument illumination lamps from the hidden face of the instrument. Remove the flexible trip odometer setting drive from the hidden face of the speedometer by slackening the knurled sleeve.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points.

i. That the two warning lamps are inserted in the apertures at the side of the instrument.
ii. That the headlamp warning lamp is inserted in the aperture at the top of the instrument.
iii. That the fuel warning lamp is inserted in the right-hand bottom aperture.
iv. That the ignition warning lamp is inserted in the left-hand bottom aperture.

THE REVOLUTION COUNTER AND CLOCK

The revolution counter and clock are of the electrical type and the electrical leads to both are included in the car harness. The clock is mounted in the bottom of the revolution counter indicator head and to effect its removal it is necessary to remove both speedometer and revolution counter from the side facia panel. The revolution counter consists of an A.C. generator fitted to the rear end of the camshaft with an indicator head mounted in the side facia panel, both units have Lucar tags of equal size.

Removal

Remove the speedometer from the side facia panel as previously detailed, this will give the necessary working clearance. Detach the revolution counter from the facia board by removing two knurled nuts, earth lead and retaining pieces, then withdraw the revolution counter by removing the two centre leads and two instrument illumination lamps from the hidden face of the instrument and from the clock at the snap connector. Detach the flexible clock setting drive by slackening the knurled sleeve and the clock from the revolution counter by removing two nuts.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following point:

That the leads are refitted in accordance to their colour coding, utilizing the wiring diagram as a reference.

TESTING OPERATION OF REVOLUTION COUNTER

Utilizing an A.C. voltmeter, check the current across the terminals of the generator at the rear of the right-hand camshaft while the engine is running ; as a rough guide it can be assumed that there is one volt output per 100 engine r.p.m. When electrical current is evident, check the continuity of the leads to the hidden face of the instrument, when electrical current is evident it can be assumed that the instrument is unserviceable and must be exchanged.

THE GLOVE BOX ASSEMBLY

Removal

Detach the earth lead from the battery. Remove the dash casing from beneath the glove box by withdrawing four screws. Detach the screen rail from the base of the windscreen by withdrawing the leads from the map lamp and removing two screws. Remove the chrome ended wooden finisher strip from the newspaper tray beneath the instrument panel by detaching two nuts situated beneath the finisher. Fold the instrument panel downward by withdrawing the ignition key, cigar lighter unit and the two thumb screws. Detach the glove box assembly from the front of the saloon by withdrawing a screw in the steady bracket beneath, by opening the glove box and detaching the false side wall adjacent to the light switch and removing the nuts from a stud bracket, access to which is gained through the revealed aperture in the glove box side wall and withdrawing the two screws, the heads of which are located in the instrument panel aperture, finally disconnect the glove box light harness at the snap connectors.

Dismantling

The glove box assembly can be dismantled by detaching the glove box lamp from inside the box by removing four nuts and bolts, the switch can be detached from its bracket by removing a nut and the harness fed through the top wall of the box thus allowing the lamp to be removed completely. The glove box can be detached from the hidden face of the facia board by withdrawing ten screws and a retainer. Remove the glove box lid from the facia board by withdrawing two screws each from the quadrant assembly and hinges. Remove the glove box lock from the lid by withdrawing three screws, the key number will be found stamped on the body of the lock.

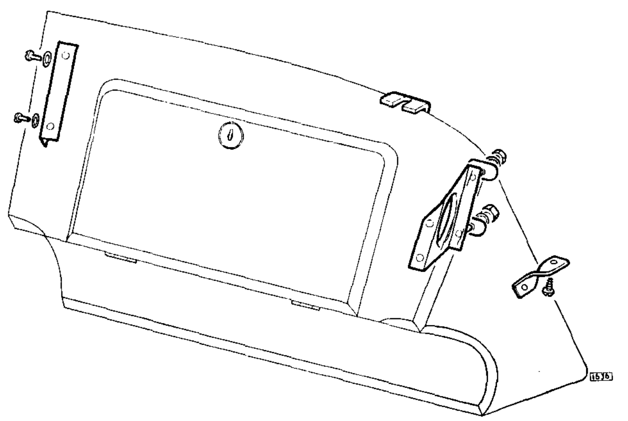


Fig. 45. The glove box, showing the three sets of attachment details, the forked bracket in the top edge secures one side of the screen rail.

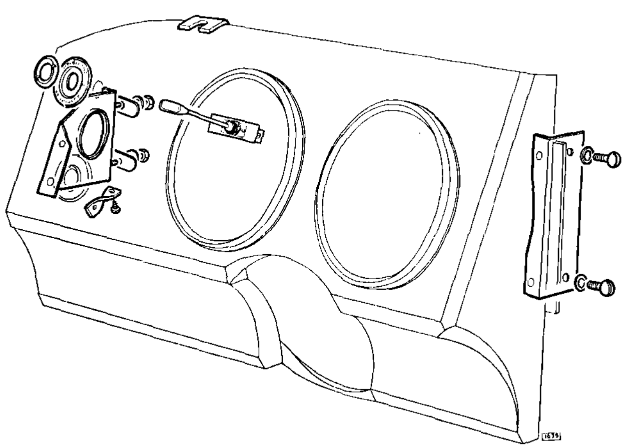


Fig. 46. The side facia panel, showing the three sets of attachment details, the forked bracket in the top edge secures one side of the screen rail.

Assembling and Refitting

Assembling and refitting is the reverse of the removal and dismantling procedures but ensure the rubber seal beneath the angle bracket adjacent to the instrument panel is in good condition and has the straight edges outward.

THE REMOVAL OF THE INSTRUMENT PANEL COMPONENTS

The Ignition Switch

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the ignition switch. Withdraw the ignition switch from the hidden face of the instrument panel after removing the chrome ring. The lock barrel can be withdrawn by inserting a thin rod through a hole in the body of the switch.

Refitting is the reverse of the removal procedure but particular attention should be given to the following points :

i. That the number of the ignition key is stamped on the lock barrel.

ii. That the flat on the thread is positioned toward the right-hand side of the panel.

iii. That the leads are refitted in accordance to their colour coding, utilizing the wiring diagram as a reference.

Renewing The Cigar Lighter Element

Withdraw the cigar lighter unit from the instrument panel and ensure that it is cold. Place the unit into the palm of the hand, knob first, and hold the sleeve downward against the pressure of the spring with the fingers and unscrew the lighter element and fit a replacement. It must be noted that the spring must not be omitted or tampered with for it ejects the lighter unit when it attains its correct temperature.

Cigar Lighter Unit—Removal

Withdraw the cigar lighter unit, detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the cigar lighter housing. Withdraw the cigar lighter housing through the face of the instrument panel by removing a nut and "U" piece from the centre terminal post. It is not wise to dismantle the cigar lighter housing any further, otherwise direct shorting may occur on assembly.

Refitting is the reverse of the removal procedure but particular attention may be given to the following points:

i. That the centre terminal post is firm and tight.

ii. That the insulated washer in the " U " piece is tight and in good condition, a sub-standard fit and/or condition of this washer could cause a direct short.

iii. That the black lead is attached by its Lucar connection to the tag at the top of the instrument panel and the purple lead from the main harness is attached to the centre terminal post.

iv. That the leads are refitted in accordance to their colour coding, utilizing the wiring diagram as a reference.

The Starter Push Switch

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the starter push switch. Withdraw the starter push switch through the face of the instrument panel after removing the nut on the hidden face.

The Head, Side and Fog Light Switch

Remove the light switch control lever from the face of the instrument panel by depressing the plunger in the right-hand side. Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the light switch and detach the light switch from the three posts on the hidden face of the instrument panel by removing three nuts. The designation plate can be removed from the face of the instrument panel by detaching the nut on the hidden face.

Refitting is the reverse of the removal procedure but particular attention must be given to the following points:

i. That the designation plate is mounted on the face of the instrument panel by allowing the " pip " on the hidden face to locate a drilling in the panel and the flat on the threaded barrel to locate a flat in the panel.

ii. That the control rod is rotated fully anti-clockwise so the control lever retaining plunger is on the right-hand side.

iii. That the control lever is pressed on the rod of the switch protruding through the face of instrument panel so the control rod plunger locates a drilling in the hub of the lever, a smear of vaseline on the plunger greatly facilitates this operation.

The Tumbler Type Switches

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the Lucar tags on the body of the desired switches and withdraw the tumbler switch from the hidden face of the instrument panel by holding the switch lever in a horizontal position and removing the screwed chromium ring from the face of the instrument panel.

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :

i. That the switch is fitted to the instrument panel so that flat face of the switch lever is downward.

ii. That the leads are refitted in accordance to their colour coding and utilizing the wiring diagram as a reference.

Renewing Illumination bulbs

Detach the earth lead from the battery and hinge the instrument panel downward. Remove the instrument illumination bulb holder from the hidden face of the instrument and withdraw the bulb by rotating it anti-clockwise. Fit a replacement bulb. Replace the bulb and holder into the hidden face of the instrument by reversing the removal procedure.

The Ammeter and Oil Pressure Gauge

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the instrument illumination lamps and leads from one or both instruments. Withdraw the instrument through the front face of the instrument panel by removing the two knurled nuts and a " U " piece from the hidden face of the instrument.

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :

i. That the " U " piece is fitted so it will not foul any terminal or bulb holder, one side face is cut away for this purpose.

ii. That the leads are refitted in accordance to the colour coding, utilizing the wiring diagram as a reference.

The Fuel and Water Temperature Gauges

These instruments are removed and refitted in a similar manner to the ammeter and oil pressure gauges but in this instance only one knurled nut secures the " U " piece.

The removal and replacement of the fuel gauge tank unit and the water temperature transmitter unit are detailed in the Fuel System and Cooling System sections respectively.

The Voltage Regulator (Fuel and Water Temperature Gauges)

Detach the earth lead from the battery and hinge the instrument panel downward. Identify and remove the leads from the voltage regulator situated at the top right-hand side of the hidden face of the instrument panel. Detach the voltage regulator from the panel by removing one nut.

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :

i. That a good earth is made between instrument and the panel.

ii. That the leads are refitted in accordance to the colour coding, utilizing the wiring diagram as a reference.

Renewing the Switch Indicator Strip Bulbs

Detach the earth lead from the battery and fold the instrument panel downward. Withdraw the switch indicator strip illumination bulb from any of the three lamps situated one in each bottom corner and a third in the centre. Remove the bulb from the holder by applying inward pressure and rotating it 90° in either direction. The bulb is replaced by inserting the cap into the bulb holder and rotating it 90° until the notches inside the bulb holder are located. The bulb holder and upper switch cover are refitted by reversing the removal procedure.

Remove the indicator strip, chrome finisher and light filter from the bottom edge of the instrument panel by withdrawing four screws.

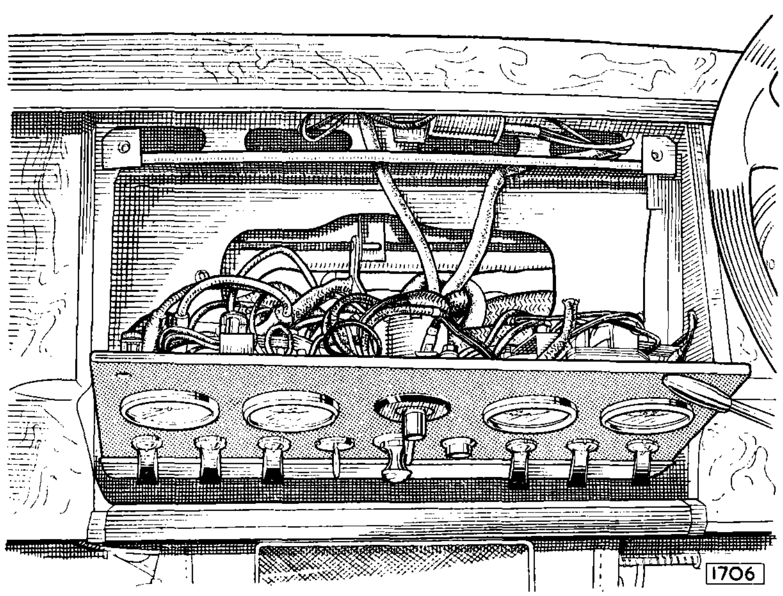


Fig. 47. The instrument panel in the hinged down position.

THE BIMETAL RESISTANCE INSTRUMENTATION

Engine Temperature, Fuel Tank contents and Oil Pressure Gauges

DESCRIPTION

The Bimetal Resistance Instrumentation for engine temperature, petrol tank contents and engine oil pressure consists of a gauge unit fitted in the instrument panel, a transmitter unit fitted in the engine unit or petrol tank and connected together to the battery, the oil pressure gauge being an exception, through a common voltage regulator. The purpose of the latter is to ensure a constant power supply at a predetermined voltage thus avoiding errors due to a low battery voltage; in the instance of the oil pressure gauge this is not quite so critical to supply voltage.

In all systems the gauge unit operates on the thermal principal utilizing a heater winding wound on a bimetal strip, while the transmitter units of the engine temperature and petrol tank contents gauge are of the resistance type but in both instances the system is voltage sensitive. The transmitter unit of the oil pressure gauge is of the thermal pressure principal utilizing a heater winding wound on a bimetal strip having a contact at one end with the second contact mounted on a diaphragm which is sensitive to engine oil pressure.

OPERATION OF THE ENGINE TEMPERATURE GAUGE

The transmitter unit of the engine temperature gauge is fitted in the water outlet pipe of the engine unit and is a variable resistance and consists of a temperature sensitive resistance element contained in a brass bulb. The resistance element is a semi-conductor which has a high negative temperature co-efficient of resistance and its electrical resistance decreases rapidly with an increase in its temperature. As the temperature of the engine unit rises the resistance of the semi-conductor decreases and increases the flow of current through the transmitter, similarly a decrease in engine temperature reduces the flow of current.

The gauge unit fitted in the instrument panel consists of a heater winding, connected at one end to the transmitter unit and at the second end to the " I " terminal of the voltage regulator, is wound on a bimetal strip which is linked to the indicator needle. The heater winding and bimetal strip assembly is sensitive to the changes in voltage received from the transmitter unit causing the heater winding to heat or cool the bimetal strip, resulting in the deflection of the indicator needle over the scale provided. The calibration of the scale is such that the movement of the indicator needle over it is relative to the temperature of the transmitter unit bulb and therefore the temperature of the engine unit.

OPERATION OF PETROL TANK CONTENTS GAUGE

The transmitter unit of the petrol gauge is fitted in the petrol tank and is a variable resistance actuated by a float, the arm of which carries a contact travelling across a resistance housed in the transmitter body. The float arm takes up a position relative to the level of petrol in the tank and thus varies the amount of current passing through the indicator unit.

The gauge unit in the instrument panel consists of a heater winding, connected at one end to the transmitter unit and at the other to the " I " (eye) terminal of the voltage regulator, is wound on a bimetal strip which is linked to the indicator needle. The heater winding and bimetal strip assembly is sensitive to the changes in voltage received from the position of the transmitter float, causing the heater winding to heat or cool the bimetal strip, resulting in the deflection of the indicator needle over the scale provided. The calibration of the scale is such that the movement of the indicator needle over it is relative to the position of the transmitter float actuated by the level of the contents in the petrol tank.

Exaggerated indicator needle movement due to petrol swirl in the tank is considerably reduced as there is a delay before current changes from the transmitter unit can heat or cool the bimetal and heater winding assembly in the indicator unit, which in fact causes the deflection of the needle. Similarly the indicator needle will take a few moments to register the contents of the petrol tank when the ignition is first switched on.

ANALYSIS OF ENGINE TEMPERATURE AND PETROL TANK CONTENTS GAUGES FAULTS

NOTE: THE INSTRUMENT PANEL GAUGES MUST NEVER BE CHECKED BY SHORT CIRCUITING THE TRANSMITTER UNITS TO EARTH

Symptom	Unit Possibly at Fault	Action
Instrument panel gauge showing a " zero " reading	Voltage regulator	Check output voltage at terminal I (eye) is 10 volts.
	Instrument panel gauge	Check for continuity between the gauge terminals with the leads disconnected.
	Transmitter unit in petrol tank or engine unit.	Check for continuity between the terminal and the case with lead disconnected.
	Wiring	Check for continuity between the gauge, the transmitter unit and the voltage regulator. Also that the transmitter unit and voltage regulator are earthed.
Instrument panel gauge showing a high low reading when ignition is switched on	Voltage regulator	Check output voltage at terminal I (eye) is 10 volts.
	Instrument panel gauge	Check by substituting another instrument panel gauge.
	Transmitter unit in petrol tank or engine unit	Check by substituting another transmitter unit in petrol tank or engine unit.
	Wiring	Check for leak to earth.
Instrument panel gauge showing a high reading and overheating	Voltage regulator	Check output voltage at terminal I (eye) is 10 volts.
	Wiring	Check for short circuits on wiring to each transmitter unit.
Instrument panel gauge showing an intermittent reading	Voltage regulator	Check by substituting another voltage regulator.
	Instrument panel gauge	Check by substituting another instrument panel gauge.
	Transmitter unit in petrol tank or engine unit	Check by substituting another transmitter unit in petrol tank or engine unit.
	Wiring	Check terminals for security, earthing and wiring continuity.

OPERATION OF THE OIL PRESSURE GAUGE

The transmitter unit of the oil pressure gauge, fitted in the head of the engine oil filter, is a voltage compensated thermal pressure unit and consists of a diaphragm, a bimetal strip with a heater winding wound thereon, a resistance and a pair of contacts. One contact is attached to the diaphragm while the second is mounted on one end of the bimetal strip, the second end of which is connected through the resistance and the gauge unit to the battery supply ; the heater winding is also connected to the battery supply but not through the resistance. Engine oil pressure will close the contacts causing current to flow through the gauge unit, bimetal strip and contacts to earth resulting in the heating of the heater winding which will, after a time, open the contacts.

The gauge unit fitted in the instrument panel consists of a heater winding, connected at one end to the battery supply and at the second to the transmitter unit, wound on to a bimetal strip which is linked to an indicating needle. The heater winding and bimetal strip assembly is sensitive to the continuity changes received from the thermal pressure unit, fitted in the engine oil filter, causing the heater winding to heat or cool the bimetal strip resulting in the deflection of the indicating needle over the scale provided.

The changes in continuity of current from the transmitter unit will vary according to the amount of oil pressure for, as the latter rises, the outward moving diaphragm contact limits the return travel of the bimetal strip contact thus allowing a longer continuity period. This results in a greater heating of the heater winding in the gauge unit and increased deflection of the indicating needle over the scale showing a greater oil pressure.

The opening and closing of the transmitter unit contacts is continuous thus the temperature of the heater winding in the gauge unit is kept within close limits and the calibration of the scale is such that the movement of the indicating needle over it is relative to the opening of the transmitter unit contacts and therefore the oil pressure of the engine unit is recorded.

ANALYSIS OF ENGINE OIL PRESSURE GAUGE FAULTS

NOTE : THE INSTRUMENT PANEL GAUGE MUST NEVER BE CHECKED BY SHORT CIRCUITING THE TRANSMITTER UNIT TO EARTH.

Symptom	Unit Possibly at Fault	Action
Instrument panel gauge showing a " zero " reading	Wiring	Check for continuity between the gauge and the transmitter unit and that the latter is earthed.
	Instrument panel gauge	Check for continuity between the gauge terminals with leads disconnected. If satisfactory replace the transmitter unit.
Instrument panel gauge showing a reading with ignition switched on but engine not running	Transmitter unit on oil filter head	Check by substituting another transmitter unit.
Instrument panel gauge showing a high reading and overheating	Transmitter unit on oil filter head	Check by substituting another transmitter unit.
Instrument panel gauge showing a below " zero " reading with ignition switched off	Instrument panel gauge	Check by substituting another instrument panel gauge.

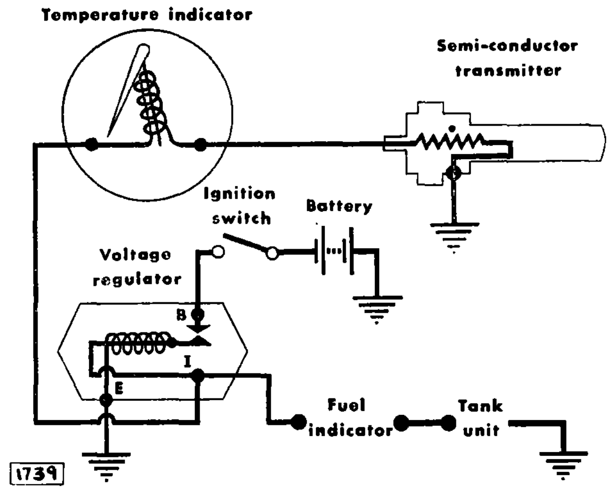


Fig. 48. The combined wiring diagram of the fuel tank contents a water temperature gauges with the voltage regulator.

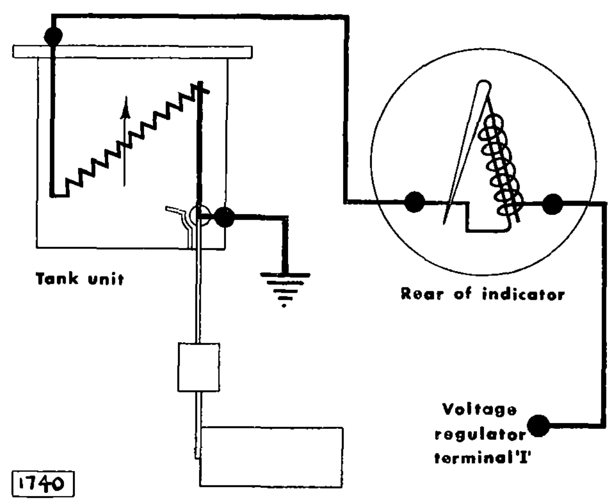


Fig. 49. The fuel tank contents gauge circuit.

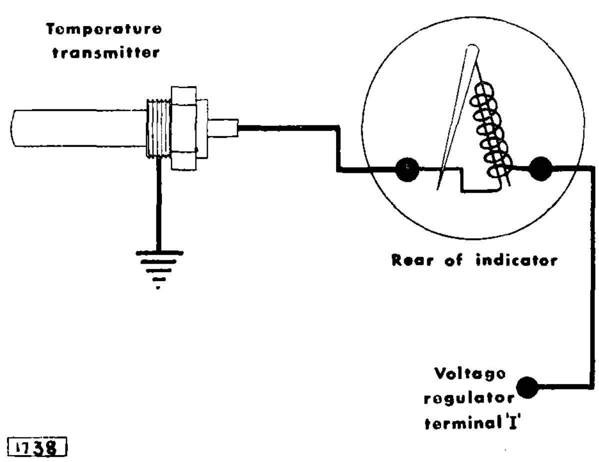


Fig. 50. The water temperature gauge circuit.

THE SPEEDOMETER DRIVE CABLE

Removal

Remove the speedometer from the side facia panel and remove the flexible drive cable as previously detailed. Detach the flexible drive cable from the gearbox, overdrive or automatic transmission and release it from the retaining clips. Push the flexible drive cable grommet through the rear engine bulkhead from inside the car and withdraw the flexible drive cable from the engine compartment.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following points :

i. That the run of the flexible drive cable is without any sharp bends.

ii. That the flexible drive cable securing clips are so shaped that they only hold the cable in position without crushing it.

THE REVOLUTION COUNTER DRIVE

The revolution counter drive takes the form of a small A.C. electrical generator fitted at the rear R.H. end of the cylinder head where its tongued driving spindle engages a slotted adaptor screwed in the rear end of the inlet camshaft. Leads included in the electrical harness of the car connect with the Lucar tabs pointing upward in the body of the generator and with similar tabs at the rear of the instrument lead in the side facia panel. The Lucar tabs are of the same size and the leads can be fitted either way round.

Removal

Open the engine compartment and detach the earth lead from the battery. Remove the electrical harness from the two Lucar tabs on the A.C. generator on the rear R.H. end of the cylinder head. Detach the A.C. generator from the rear R.H. end of the cylinder head by withdrawing three allen screws and a plate washer, remove the generator in a rearward direction and note the position of the tongued driving spindle.

Refitting

Refitting is the reverse of the removal procedure but particular attention must be given to the following point :

That the tongued driving spindle is positioned in the same attitude as it was when it was removed ; whenever difficulty is experienced in engaging the tongued spindle do not apply any force but remove the generator, ascertain the position of the slot in the camshaft with a mirror and set the tongued drive in a similar position.

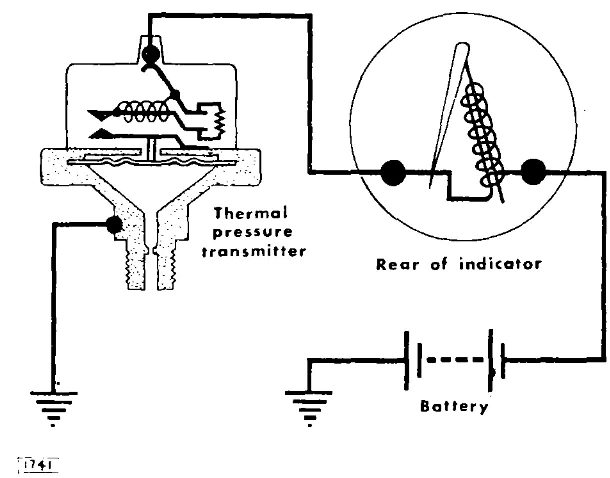


Fig. 51. The engine oil pressure gauge circuit.

SPEEDOMETER CABLE—GENERAL INSTRUCTIONS

Flexible cable condition to a great extent affects performance of speedometers. Poor installation or damage to the flexible drive will show up as apparent faults. It is most important that the flexible drive should be correctly fitted and maintained as illustrated in the following diagrams.

1. **Smooth Run**
   Run of flexible drive must be smooth. Minimum bend radius 6″. No bend within 2″ of connections.

2. **Securing**
   Avoid sharp bends at clips. If necessary change their position. Do not allow flexible drive to flap freely. Clip at suitable points.

3. **Securing**
   Avoid crushing flexible drive by over-tightening clip.

4. **Connection**
   Ensure tightness of outer flex connections. They should be finger tight only. It may be necessary to clean thoroughly the point of drive before the connection can be screwed completely home.

5. **Connection of Inner Flexible Shaft**

Where possible slightly withdraw inner flex and connect outer first. Then slide inner into engagement.

6. **Removal of Inner Shaft**

Most inner flexes can be removed by disconnecting instrument end and pulling out flex. Broken inner flex will have to be withdrawn from both ends.

7. **Examination of Inner Flexible Shaft**

Check for kinked inner flexible shaft by rolling on clean flat surface. Kinks will be seen and felt.

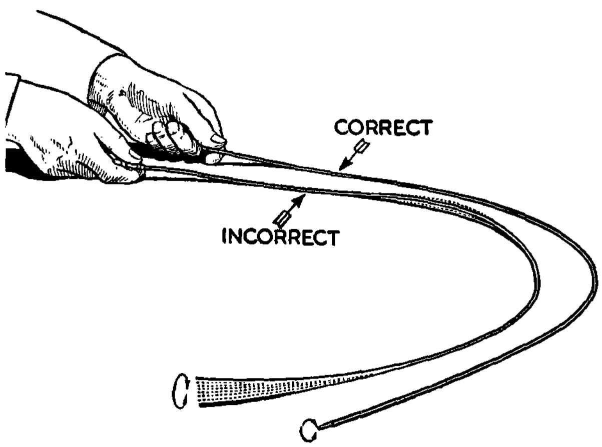


Fig. 52. Checking inner flex for kinks.

8. **Lubrication Every 10,000 Miles**

Withdraw inner flexible drive (see paragraph 6). Place blob of grease on end of outer cable and insert flex through it, carrying grease inside. Use Esso T.S.D.119 or equivalent. Do NOT use oil.

9. **Excessive Lubrication**

Avoid excessive lubrication. If oil appears in flexible drive, suspect faulty oil-seal at point of drive.

10. **Inner Shaft Projection**

Check $\frac{3}{8}''$ projection of inner flex beyond outer casing at instrument end. This ensures correct engagement in instrument and point of drive.

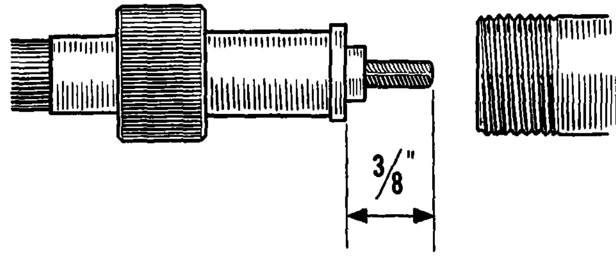


Fig. 53. Showing the amount the inner flex must protrude from outer cable.

11. **Concentric Rotation**

Check that inner flex rotates in centre of outer cable.

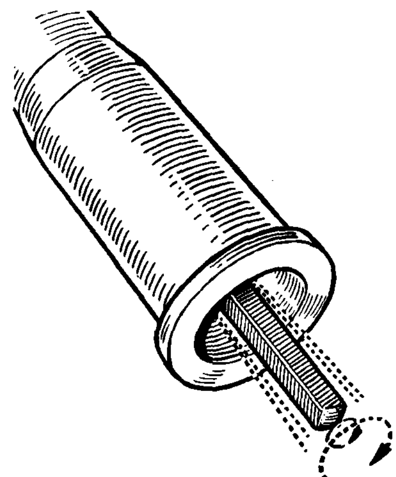


Fig. 54. Checking inner flex for "run out."

12. **Damaged Inner Shaft**

Examine inner flex ends for wear or other damage. Before fitting new flex, ensure instrument main spindle is free.

13. **Damaged Drive End Connections**

Examine point of drive for damage or slip on gears in gearbox.

14. **Ensuring Correct Drive Fitted**

When ordering, state Make, Year and Model of vehicle. State also length of drive required when alternatives are shown.

SPEEDOMETERS—GENERAL INSTRUCTIONS

Speedometer performance is dependent on the flexible drive, and apparent faults in the instrument may be due to some failure of the drive. Before returning a speedometer for service, the flexible drive should be checked, as described in the previous paragraphs. The following diagrams show you how to check the instrument performance.

15. **Instrument Not Operating**

Flexible drive not properly connected (see paragraph 5). Broken or damaged inner flexible shaft or fault at point of drive (see paragraphs 12 and 13), in which case remove and replace flex (see paragraphs 6 and 8) or rectify point of drive fault. Insufficient engagement of inner shaft (see paragraph 10). Defective instrument—return for service.

16. **Instrument Inaccurate**

Incorrect speedometer or revolution counter fitted. Check code number.

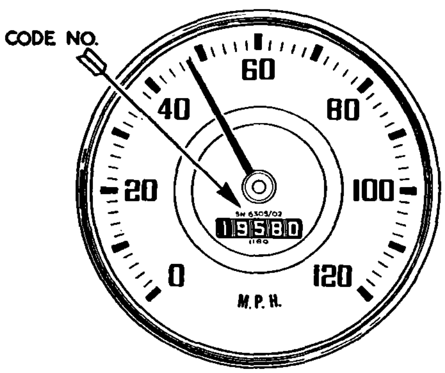


Fig. 55. Showing the code number on face of instrument.

17. **Speedometer Inaccurate**

Check tyre pressures. Inaccuracy can be caused by badly worn tyres. Non-standard tyres fitted. Apply to Smiths for specially calibrated instrument.

18. **Speedometer Inaccurate**

Rear-axle ratio non-standard. Drive ratio in vehicle gearbox non-standard. A rapid and simple check is obtained by entering in the formula the figures found in the test (see paragraph 19).

$$\frac{1680\ N}{R} = \text{T.P.M. No.}$$

Where N = Number of turns made by the inner shaft for 6 turns of rear wheel and R = Radius of rear wheel in inches measured from centre of hub to ground.

Example

Cardboard pointer on inner shaft (see 19) rotates $9\frac{1}{8}$ times as vehicle is pushed forward 6 turns of rear wheel. Rear wheel radius $12\frac{1}{4}''$.

Flex turns per mile :

$$\frac{1680 \times 9\frac{1}{8}}{12\frac{1}{4}} = \frac{15330}{12\frac{1}{4}} = 1251 = \text{T.P.M. No.}$$

19. **Gearing Test**

Disconnect flexible drive from Speedometer. With the gears in neutral, count the number of turns of the inner shaft for six turns of the rear wheels when the vehicle is pushed forward in a straight line. Measure rolling radius of rear wheels —centre of hub to ground. Apply figures in formula (see paragraph 18).

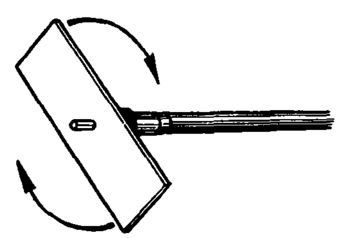


Fig. 56 Cardboard pointer on inner flex for checking the number of turns.

20. **Correct Speedometer**

Number illustrated should correspond within 25 either way with the number obtained from paragraphs 18 and 19. If it does not, apply to Smiths for specially calibrated instrument, giving details of test and vehicle.

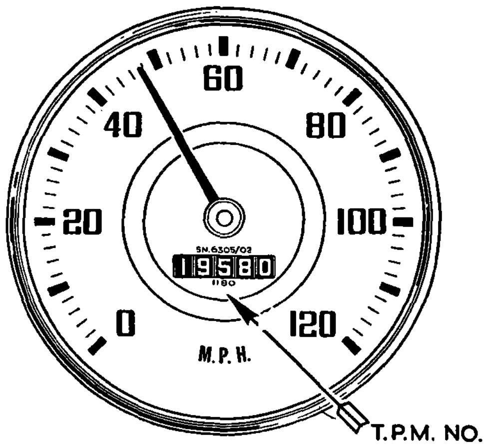


Fig. 57. Showing the turns per mile on face of instrument.

21. **Pointer Waver**

    Oiled up instrument. Replace oil seal if necessary, clean and lubricate flexible drive (see paragraph 8). Return instrument for replacement.

22. **Pointer Waver**

    Inner flexible shaft not engaging fully. Check 10, then try 4. Also check 12.

23. **Pointer Waver**

    Kinked or crushed flexible drive. Check 7 and 3. For withdrawal of inner shaft see paragraph 6. Bends of too small radius in flexible drive, check 1.

24. **Pointer Waver**

    If 21, 22 and 23 show no sign of trouble, instrument is probably defective. Return for replacement.

25. **Noisy Installation**

    Tapping noises. Check 5 and 2. Flexible drive damaged. Check 7 and 12 (also see paragraph 6), check lubrication is sufficient. Check 10 and 11.

26. **Noisy Installation**

    General high noise level. Withdraw inner shaft (see paragraph 6) and reconnect outer flex. If noise continues at lower level then source of noise is in vehicle point of drive. Fitting new P.V.C. covered flexible drive with nylon bush on inner shaft and instrument with rubber mounted movement should overcome this trouble.

27. **Noisy Installation**

    Regular ticking in time with speedometer decimal distance counter. Return speedometer for replacement.

28. **Noisy Installation**

    Loud screeching noise more prevalent in cold weather. Return instrument for replacement.

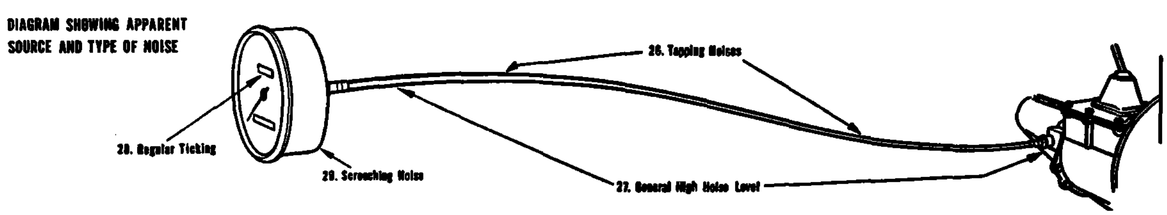


Fig. 58.

SUPPLEMENTARY INFORMATION
TO
SECTION P "ELECTRICAL AND INSTRUMENTS"

HORN MOUNTINGS AND ADJUSTMENTS

Reference Page : P.23

It is important to keep the horn mounting bolts tight and also the mountings of any units fitted near the horns. Electrical connections and cabling should be checked occasionally and rectified as required.

Ensure that the horn does not foul the body or chassis at any point. Do not bend the spring steel mounting bracket attached to the horn to maintain clearance.

ADJUSTMENT

On early cars Lucas HF.1748 horns were fitted as standard equipment and adjustment is by means of an adjuster screw located at the rear of the horn adjacent to the terminal cover.

A horn in correct adjustment will pass 3.5—4.0 amperes at 12 volts. Adjustment does not alter the tone but serves to adjust wear of the moving parts which if not corrected will result in loss of power and roughness of tone.

When adjusting, use a first grade 0—10 moving coil ammeter connected in series with the horn and turn the adjustment screw clockwise to increase the current or anti-clockwise to decrease the current.

On later cars Lucas WT618U horns are fitted. Adjustment is effected after removal of the domed cover by means of the fixed contact screw.

Connect a first grade 0—10 moving coil ammeter as mentioned in a previous paragraph.

Release the contact locknut and adjust contact until the horn will pass 13—15 amperes at 12 volts. Re-tighten the locknut and check.

Note : It is impossible to obtain a true adjustment and tone unless the horn is held firmly. Remove the horn from the car and clamp the mounting bracket in a vice before carrying out any adjustment. When replacing a horn always ensure that a correct replacement unit is fitted. The letters " H " or " L " on the horn denotes " high " or " low " notes.

DISTRIBUTOR (22 D 6)

Lucas 22D6 distributors, replacing the DMBZ6A distributors previously fitted, have the same Test Data figures as those stated on Page P.14.

The method of adjusting the contact breaker points however, is as follows :—

Remove the distributor cap and the water proof cover (if fitted).

Slacken (very slightly) the contact plate securing screw ("A" Fig. 59) and adjust the gap by turning a screwdriver in the nick in the counter plate and the slot in the base plate ("B" Fig. 59) clockwise to decrease the gap and anti-clockwise to increase the gap.

Tighten the screw and re-check the gap.

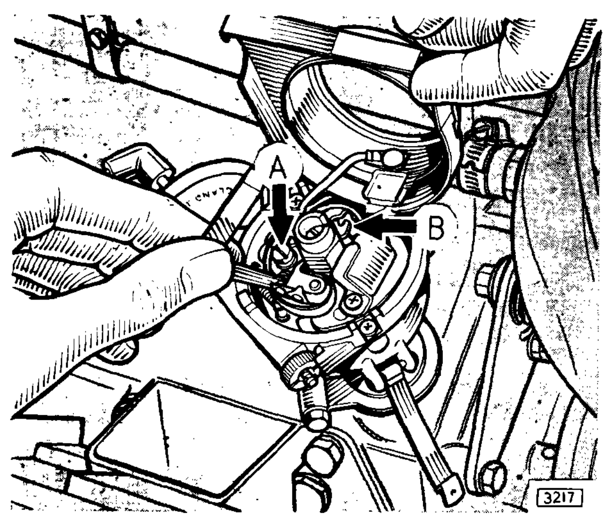


Fig. 59.

D.C. GENERATOR—TYPE C40L

Fitted to 2.4 Litre Models (From Engine No. BH9010)

The C40L D.C. Generator is similar in construction to the C.45 PV-6 unit detailed on Page P.17 with the exception of cable termination which is now "Lucar" replacing the terminal posts and nuts previously fitted.

The performance data figures for the C40L Generator are as shown in the table below :

PERFORMANCE DATA

Cutting-in Speed	1,250 (max.) r.p.m. at 13.0 generator volts
Maximum Output	25 Amperes at 2,400 max. r.p.m. at 13.5 generator volts and a resistance load of 0.54 ohm's.
Field Resistance	6 0 ohms.

SERVICING

The servicing details remain unaltered from those stated on Page P.17.

D.C. GENERATOR—TYPE C42

Fitted to

—3.4 Litre Models (From Engine No. KH8317)

—3.8 Litre Models (From Engine No. LC5345)

—2.4 Litre Models (From Engine No. BH.9010— Special Order only)

The C42 D.C. Generator is similar in construction to the C45-PV-6 unit detailed on Page P.17 with the exception of the cable termination which is now "Lucar" replacing the termination posts and nuts previously fitted.

The performance data figures for the C42 Generator are as shown in the following table :—

PERFORMANCE DATA

Cutting-in Speed	1,250 r.p.m. (max.) at 13.0 generator volts
Maximum Output	30 Amperes at 2,200 r.p.m. (max.) at 13.5 generator volts.
Field Resistance	6.0 ohms

SERVICING

The servicing details remain unaltered from those stated on page P.17.

D.C. GENERATOR—TYPE C48

Fitted to

—3.4 Litre Models (from Engine No. KH8957— Special order only)

—3.8 Litre Models (from Engine No. LC5787— Special order only)

Model C48 Generators fitted to engine prior to the above Serial Number (as special equipment) will have terminal posts and nuts: from the above numbers the termination is "Lucar". All other details remain the same for both units.

The C48 D.C. Generator is similar in construction to the C45-PVS-6 unit detailed on Page P.22.

The performance data figures for the C48 generator are as shown in the table below :—

PERFORMANCE DATA

Cutting-in Speed	850 Max. r.p.m. at 13 generator volts
Maximum Output	35 amperes at 1,650 (max.) r.p.m. at 13.5 generator volts (on resistance load of 0.385 ohms).
Field Resistance	6.0 ohms.

THE CURRENT VOLTAGE REGULATOR

(MODELS RB310 and RB340)

Dependent on the type of generator fitted, current and voltage regulation is by means of the Lucas RB310 or RB340 Control Boxes.

Units are readily identified by means of the cover. This is an aluminium pressing for the RB310 unit and a moulded black plastic cover for the RB.340 control box.

The Lucas serial number is stamped on the base plate of the unit.

The procedure for regulator adjustment of the RB340 control box is as stated below. The RB310 regulator adjustment remains as stated on Page P.28.

CURRENT VOLTAGE REGULATOR—MODEL RB 340

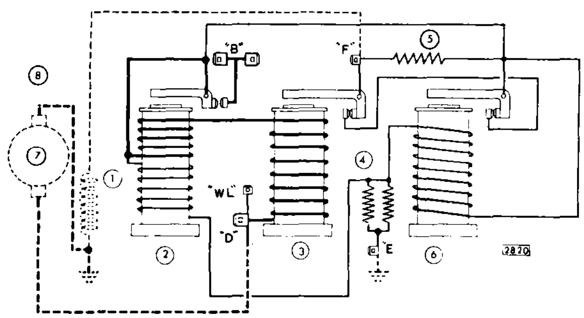


Fig. 60. Circuit diagram of the R.B.340 control box.

1. Field
2. Cut-out relay
3. Current regulator
4. Swamp resistor
5. Field resistor
6. Voltage regulator
7. Armature
8. Generator

GENERAL

Preliminary Checking of Charging Circuit

Before disturbing any electrical adjustments, examine as described below to ensure that the fault does not lie outside the control box :

(i) Check the battery by substitution or with an hydrometer and a heavy discharge (150—160A) tester.

(ii) Inspect the generator driving belt. This should just be taut enough to drive without slipping.

(iii) Check the generator by substitution or by withdrawing the cables from the generator terminals and, using a suitable "jumper lead", linking large generator terminal "D" to small terminal "F" and connecting a voltmeter between this link and earth and then running the generator up to about 1,000 r.p.m. (600 engine r.p.m.), when a rising voltage should be shown.

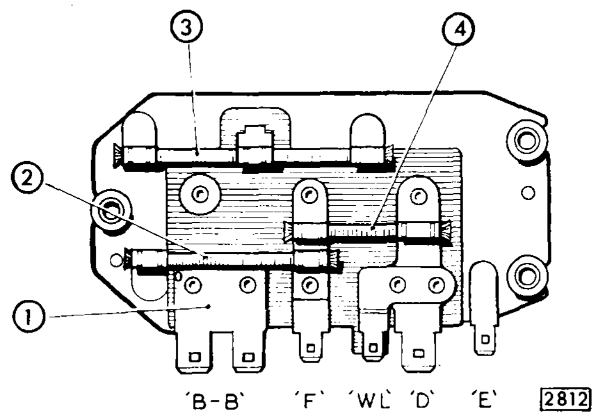
(iv) Inspect the wiring of the charging circuit and carry out continuity tests between the generator, control box and the ammeter.

(v) Check earth connections, particularly that of the control box.

(vi) In the event of reported undercharging, ascertain that this is not due to low mileage.

(vii) The control box terminals are protected with a plastic cover which is a sliding fit over the unit and must be removed before any adjustments can be made.
To ensure the impossibility of making incorrect connections the field cable terminal is insulated with a black plastic sleeve which differs in form and colour from all other terminal insula ors.

Note : Should the control box fail to respond correctly to any adjustment given in the following instructions, it should be examined at a Lucas Service Depot or by an official I uca A. nt



1. Battery main terminal
2. Swamp resistor
3. Ballast resistors
4. Field resistors

Fig. 61. View of underside of R.B.340 control box.

VOLTAGE REGULATOR

Open Circuit Settings

	Ambient Temperature	Voltage
C.40—C.42 Generator	10°C. (50°F.)	14.9—15.5
	20°C. (68°F.)	14.7—15.3
	30°C. (86°F.)	14.5—15.1
	40°C. (104°F.)	14.3—14.9
C.48 Generator	10°C. (50°F.)	15.0—15.6
	20°C. (68°F.)	14.8—15.4
	30°C. (86°F.)	14.6—15.2
	40°C. (104°F.)	14.4—15.0

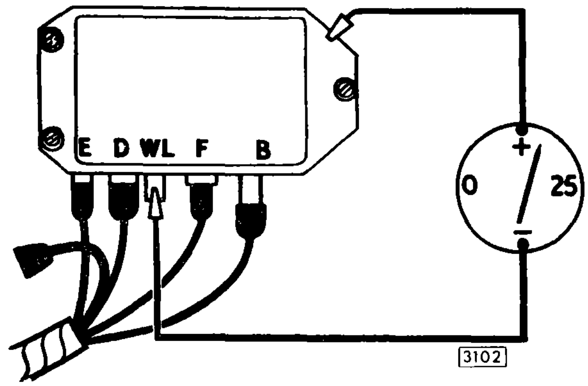


Fig. 62. Checking open circuit setting.

Method of Adjustment

Checking and adjusting should be completed as rapidly as possible to avoid errors due to heating of the operating coil.

(i) Withdraw the cable from control box terminal blades "B".

(ii) Connect a first grade 0—20 moving coil voltmeter between control box terminal "D" and a good earthing point.

Note: A convenient method of making this connection is to withdraw the ignition warning light feed from control box terminal "WL" and to clip the voltmeter lead of appropriate polarity to the small terminal blade thus exposed—this terminal being electrically common with terminal "D".

(iii) Start the engine and run the generator at 3,000 r.p.m. (1,800 engine r.p.m.) C40L and C.48 generators, 4,500 r.p.m. (2,700 engine r.p.m.) C.42 generator.

(iv) Observe the voltmeter pointer.
The voltmeter reading should be steady and lie between the appropriate limits (see "Open Circuit Settings"), according to the temperature. An unsteady reading may be due to unclean contacts. If the reading is steady but occurs outside the appropriate limits, an adjustment must be made. In this event, continue as follows :

(v) Stop the engine and remove the control box cover.

(vi) Re-start the engine and run the generator at 3,000 r.p.m. (1,800 engine r.p.m.) C.40L and C.48 generators, 4,500 r.p.m. (2,700 engine r.p.m.) C.42 generator.

(vii) Using a suitable tool, turn the voltage adjustment cam until the correct setting is obtained—turning the tool clockwise to raise the setting or anti-clockwise to lower it.

(viii) Check the setting by stopping the engine and then again raising the generator speed to 3,000 r.p.m. (1,800 engine r.p.m.) or 4,500 r.p.m. (2,700 engine r.p.m.)

(ix) Restore the original connections and refit the cover.

CURRENT REGULATOR

On-Load Setting

The current regulator on-load setting is equal to the maximum rated output of the generator, which is 30 amperes (C.42), 35 amperes (C.48), 25 amperes (C.40L).

Method of Adjustment

The generator must be made to develop its maximum rated output, whatever the state of charge of the battery might be at the time of setting. The voltage regulator must therefore be rendered inoperative, and this is the function of the bulldog clip used in (ii) below in keeping the voltage regulator contacts together.

(i) Remove the control box cover.

(ii) Using a bulldog clip, short out the contacts of the voltage regulator. (See Fig. 64).

(iii) Withdraw the cable from control box terminal blades "B".

(iv) Using a suitable "jumper lead", connect the cables removed in (iii) to the load side of a first-grade 0-40A moving coil ammeter.

(v) Connect the other side of the ammeter to one of the control box terminal blades "B".

Note: It is important to ensure that terminal "B" carries only this one connection. All other load connections (including the ignition coil feed) must be made to the battery side of the ammeter.

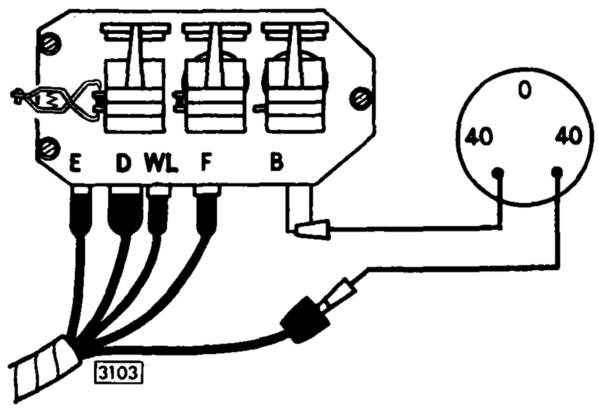
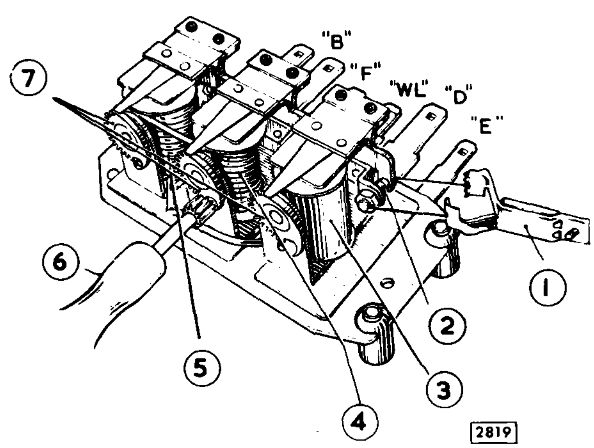


Fig. 63. Checking the current regulator on load setting.

(vi) Switch on all lights, to ensure that the generator develops its full rated output.

(vii) Start the engine and run the generator at 4,500 r.p.m. (2,700 engine r.p.m.), C.42 generator, 3,000 r.p.m. (1,800 engine r.p.m.), C.40L—C.48 generators.



1. "Bulldog clip
2. V.R. Contacts
3. Voltage regulator
4. Current regulator
5. Cut-out Relay
6. Setting tool
7. Adjustment cams

Fig. 64. The cam adjuster on the R.B.340 control box. Note the bulldog clip closing the voltage regulator contacts.

(viii) Observe the ammeter pointer.
The ammeter pointer should be steady and indicate a current equal to the maximum rated output of the generator. An unsteady reading (one fluctuating more than $\pm$ 1 ampere) may be due to unclean contacts. If the reading is too high or too low an adjustment must be made. In this event proceed as follows :

(ix) Using a suitable tool, turn the current adjustment cam until the correct setting is obtained—turning the tool clockwise to raise the setting or anti-clockwise to lower it.

(x) Switch off the engine and restore the original connections.

(xi) Refit the control box cover.

CUT-OUT RELAY

Electrical Settings

(i) Cut-in Voltage 12.6—13.4
(ii) Drop-off Voltage 9.3—11.2

Method of Cut-in Adjustment

Checking and adjusting should be completed as rapidly as possible to avoid errors due to heating of the operating coil.

(i) Connect a first-grade 0—20 moving-coil voltmeter between control box terminal "D" and a good earthing point, referring to the note in "Voltage Regulator—Method of Adjustment".

(ii) Switch on an electrical load, such as the headlamps.

(iii) Start the engine and slowly increase its speed.

(iv) Observe the voltmeter pointer.
The voltage should rise steadily and then drop slightly at the instant of contact closure. The

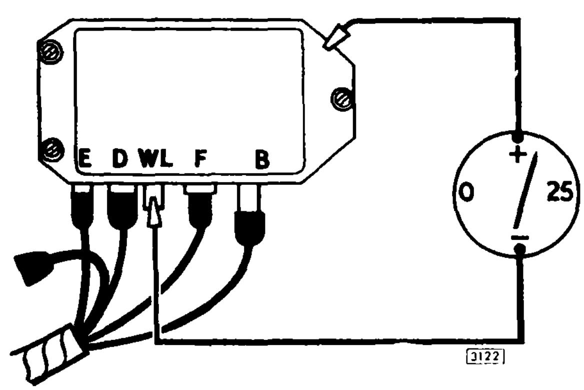


Fig. 65. Checking cut-in voltage.

cut-in voltage is that which is indicated immediately before the pointer drops back. It should occur between the limits given in "Electrical Settings" (i) above. If the cut-in occurs outside those limits, an adjustment must be made. In this event, reduce generator speed to below cut-in value and continue as follows:

(v) Remove the control box cover.

(vi) Using a suitable tool, turn the cut-out relay adjustment cam a small amount in the appropriate direction—turning the tool clockwise to raise the setting or anti-clockwise to lower it.

(vii) Repeat the above checking procedure until the correct setting is obtained.

(viii) Switch off the engine, restore the original connections and refit the cover.

Method of Drop-off Adjustment

(i) Withdraw the cables from control box terminal blades "B".

(ii) Connect a first-grade 0—20 moving-coil voltmeter between control box terminal "B" and earth.

(iii) Start the engine and run up to approximately 3,000 generator r.p.m. (1,800 engine r.p.m.).

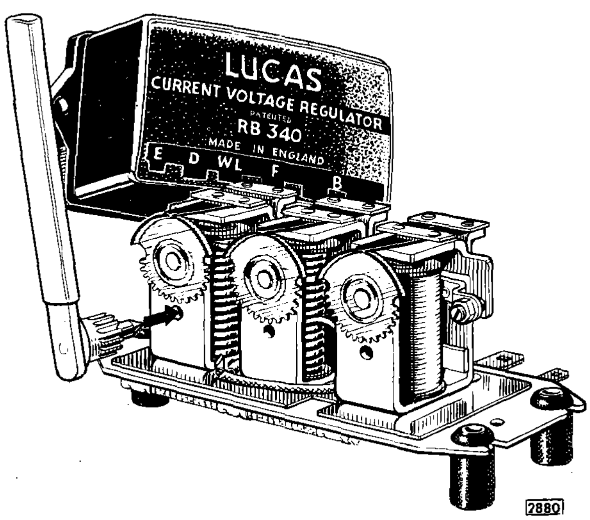


Fig. 66. Adjusting the cut-out.

(iv) Slowly decelerate and observe the voltmeter pointer.
Opening of the contacts, indicated by the voltmeter pointer dropping to zero, should occur between the limits given in "Electrical Settings".

If the drop-off occurs outside these limits, an adjustment must be made. In this event, continue as follows :

(v) Stop the engine and remove the control box cover.

(vi) Adjust the drop-off voltage by carefully bending the fixed contact bracket. Reducing the contact gap will raise the drop-off voltage; increasing the gap will lower the drop-off voltage. Retest and if necessary, re-adjust until the correct drop of setting is obtained.

Note: This should result in a contact "follow through" or blade deflection of 0.010″—0.035″ (0.25—0.80 mm.).

Refit the connections and cover.

(vii) Retest and, if necessary, readjust until the correct drop-off setting is obtained.
Note: This should result in a contact "follow through" or blade deflection of 0.010″—0.020″ (.25—.5 mm.).

(viii) Restore the original connections and refit the cover.

ADJUSTMENT OF AIR GAP SETTINGS

Air gap settings are accurately adjusted during production of the control box and should require no further attention. If the original adjustments have been disturbed, it will be necessary to reset as described below.

Armature-to-Bobbin Core Gaps of Voltage and Current Regulators

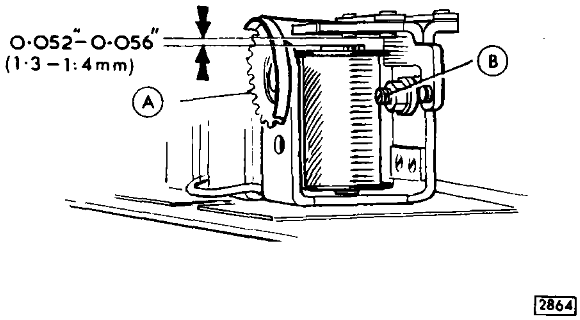
(i) Using a suitable tool, turn the adjustment cam to the point giving maximum lift to the armature tensioning spring, i.e. by turning the tool to the fullest extent anti-clockwise.

(ii) Slacken the adjustable contact locking nut and screw back the adjustment contact.

(iii) Insert a flat feeler gauge of 0.045″ (1.04 mm.) thickness between the armature and the copper separation on the core face, taking care not to turn up or damage the copper shim. The gauge should be inserted as far back as the two rivet heads on the underside of the armature.

(iv) Retaining the gauge in position and pressing squarely down on the armature, screw in the adjustable contact until it just touches the armature contact.

(v) Retighten the locking nut and withdraw the gauge.
(vi) Carry out the electrical setting procedure.

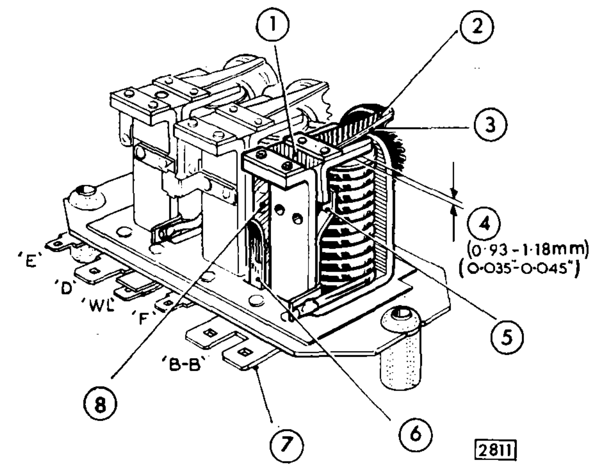


A. Turn cam to minimum lift. B. Slacken contact screw

Fig. 67. Voltage regulator gap setting.

Contact "follow-through" and Armature-to-Bobbon Core Gap of Cut-out Relay

(i) Press the armature squarely down against the copper separation on the core face.
(ii) Adjust the fixed contact bracket to give a "follow-through" or blade deflection of the moving contact of 0.010″—0.035″ (0.25—0.89 mm.).
(iii) Release the armature.
(iv) Adjust the armature back stop to give a core gap of 0.035″—0.045″ (.89—1.13 mm.).
(v) Check the cut-in and drop-off voltage settings.



1. Hinge spring
2. Armature
3. Bi-metal backing spring
4. Armature to bobbin core gap
5. Armature back stop
6. Fixed contact bracket
7. 'B-B' terminal plate
8. Moving contact blade

Fig. 68. Cut-out air gap setting.

CLEANING CONTACTS

Regulator Contacts

To clean the voltage or current regulator contacts, use fine carborundum stone or silicon carbide paper followed by methylated spirits (denatured alcohol).

Cut-out Relay Contacts

To clean the cut-out relay contacts, use a strip of fine glass paper—never carborundum stone or emery cloth.

HORNS

(MODEL WT 618U)

Fitted to		R.H.D. From Chassis Numbers	L.H.D.
—2.4 Litre Models	..	104221	125798
—3.4 Litre Models	..	152649	176175
—3.8 Litre Models	..	202055	214549

The horns are situated at the front and on either side of the engine compartment immediately below the radiator.

Removal

Remove the battery earth terminal.

Pull off the two "Lucar" cable connections at the horn terminals.

Remove the two mounting bolts, nuts, washers and earth wire from each horn.

Withdraw the horns.

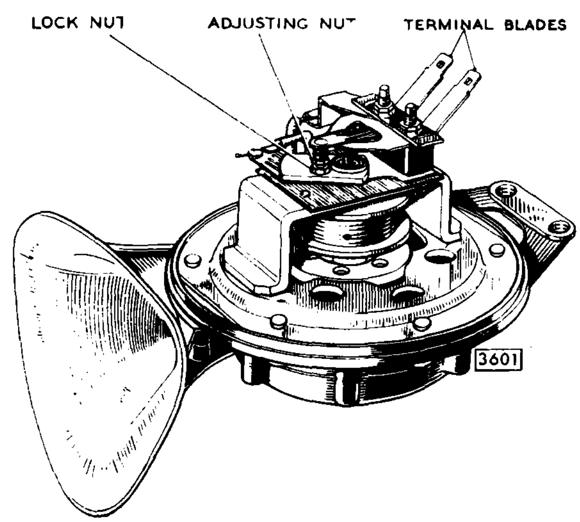


Fig. 69. W.T. 618U horn with the cover removed.

Adjustment

Adjustment is effected after removal of the domed cover by means of a fixed contact screw.

Connect an 0-20 first grade moving coil ammeter in series with a horn. Release the contact locknut and adjust the contact until the horn will pass $13\frac{1}{2}$-$15\frac{1}{2}$ amperes at 12 volts. Retighten the locknut and check.

Refit the domed cover.

Refitting

Refitting is the reverse of the removal procedure. Care should be taken in ensuring a good contact between the earth strap and horn bracket on the left-hand horn.

Note: It is important to keep the horn mounting bolts tight and to maintain rigid the mountings of any units fitted near the horns. Electrical connections and cable should be checked occasionally and rectified as necessary.

HORNS—MODEL 9H

		R.H.D.	L.H.D.
Fitted to		**From Chassis Numbers**	
—2.4 Litre Models	..	119432	127886
—3.4 Litre Models	..	169762	180276
—3.8 Litre Models	..	234499	224234

Description

The Lucas 9H horns are mounted at the front end on either side of the engine compartment immediately below the radiator. The horn circuit operates through a Lucas 6 RA relay, the contacts C1 and C2 closing when the relay coil is energised by depressing the semi-circular ring attached to the steering wheel, or, by pressing the centre button.

Maintenance

In the event of the horn(s) failing to sound or performance becoming uncertain, check that the fault is not due to external causes before any adjustments are made.

Check as follows and rectify as necessary :

(i) Battery condition.

(ii) Loose or broken connections in the horn circuit. Test with voltmeter at cable terminals.

(iii) Loose fixing bolts. It is important to keep the horn mountings tight and to maintain rigid the mountings of any units fitted near the horns.

(iv) Faulty relay. Check by substitution after verifying that current is available at terminal C2 (cable colour—brown and blue) and terminal W (green).

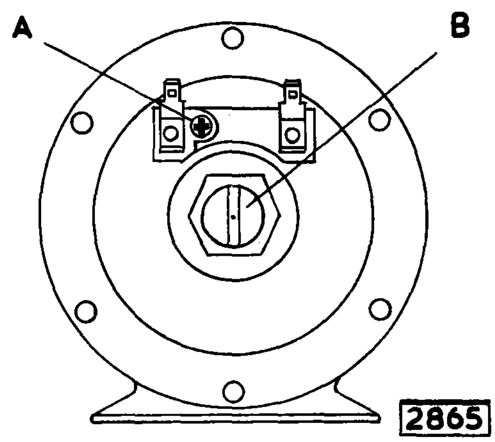
(v) Check that fuse 3 (35 amperes) and fuse 5 (50 amperes) have not blown.

Note: Horns will not operate until the ignition is switched on.

Adjustment

The horns cannot be conveniently adjusted in position. Remove and securely mount on the test fixture.

A small serrated adjusting screw is provided to take up wear of moving parts only in the horn and it is located adjacent to the horn terminals. Turning this screw does not alter the pitch of the note.



A. Contact breaker adjustment screw
B. Slotted centre core (do not disturb)

Fig. 70. The Lucas 9H horn.

Connect an 0—25 moving coil ammeter in series with the horn supply feed. The ammeter should be protected from overload by connecting an ON-OFF switch in parallel with its terminals.

Keep this switch ON except while taking readings, that is, when the horn is sounding.

Turn the adjustment screw anti-clockwise until the horn just fails to sound.

Turn the screw clockwise until the horn operates within the specified current limits of 6.5—7.0 amperes.

Service Replacements

When fitting replacement horns it is essential that the following procedure be carried out.

(i) Refit the lockwashers in their correct positions, one on each side of the mounting bracket centre fixing.

(ii) Ensure after positioning the horn, that the $\frac{5}{16}$" centre fixing bolt is secure but not over-tightened. Over-tightening of this bolt will damage the horn.

(iii) Ensure that, when a centre fixing bolt or washers other than the originals are used, the bolt is not screwed into the horn to a depth greater than $\frac{11}{16}$" (17.5 mm.).

Horn Relay—Checking

If the horn relay is suspected, check for the fault by substitution or by the following method :

(i) Check that fuses No. 3 and No. 5 have not blown. Replace if necessary.

(ii) Check with a test lamp that current is present at relay terminals W1 (green) and C2 (brown and purple). Switch on ignition before checking terminal W1.

(iii) Remove cable from terminal W2 (purple and black) and earth the terminal to a clean part of the frame. Relay coil should now operate and close contacts. Reconnect cable.

(iv) Remove cables from terminal C2 (brown and purple). Check for continuity by means of an earthed test lamp when horn button or ring is depressed with the ignition ON. Replace relay if faulty.

The horn relay is mounted on the left hand wing valance adjacent to the fuse block.

INTRODUCTION OF SEALED BEAM HEADLAMPS

		Commencing Chassis Numbers R H Drive
2.4 Litre Mark 2	..	112995
3.4 Litre Mark 2	..	160201
3.8 Litre Mark 2	..	208535

Commencing at the above chassis numbers, all R.H. drive Mark 2 models are fitted with a complete sealed beam unit. The unit consists of the reflector, glass and filament. If failure of the lamp is experienced, the complete unit must be changed.

The new headlamps are interchangeable, provided they are fitted in pairs, with those they replace.

Replacement

Remove the retaining screw at the bottom of the headlamp rim and carefully prise off the rim. Remove the three cross-headed screws and the headlight unit retaining rim. Withdraw the headlight and unplug the adaptor from the rear of the unit. The headlight can now be replaced with a sealed beam unit of the correct type.

Note: Do not turn the two slotted screws or the setting of the headlight will be upset.

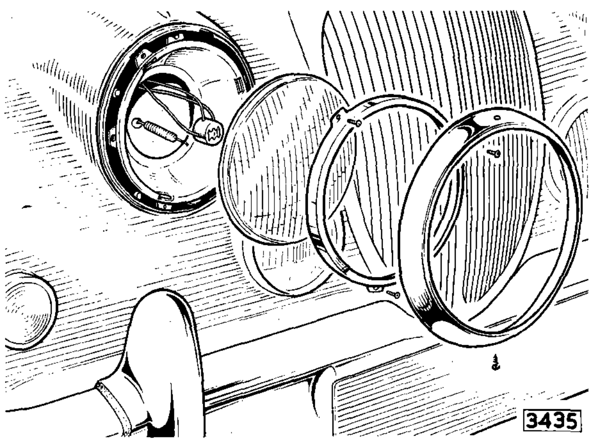


Fig. 78. Sealed beam unit removal.

Lamp	Lucas Bulb No	Volts	Watts	Application
HEAD	Sealed Beam Unit	12 12	75/45 50/40	Home and Export, Middle East, S. America
	410	12	45/40	Canada
	411	12	45/40 (Yellow)	Belgium, Holland, Sweden, Austria, Italy, France
Electrically Heated Backlight	987	12	2.2	
Traffic Warning device	987	12	2.2	(Optional Extra)

TRAFFIC HAZARD WARNING DEVICE

(Optional Extra)

This system operates in conjunction with the four flashing turn indicators on the car and the operation of a toggle switch on a sub-panel will cause these four lamps to flash simultaneously.

A red warning lamp is incorporated in the circuit to indicate that the hazard warning system is in operation. A 25 amp. in-line fuse (14 amp. American rating) is incorporated in the sub-panel circuit.

The flasher unit is located behind the instrument sub-panel and is of the plug-in type. The unit is similar in appearance to the one used for the flashing turn indicators but has a different internal circuit.

A correct replacement unit must be fitted in the event of failure.

The pilot lamp bulb is accessible after removing the chrome bezel and detaching the bulb holder.

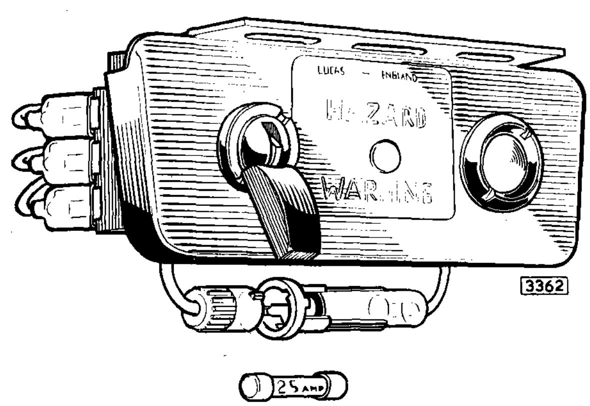
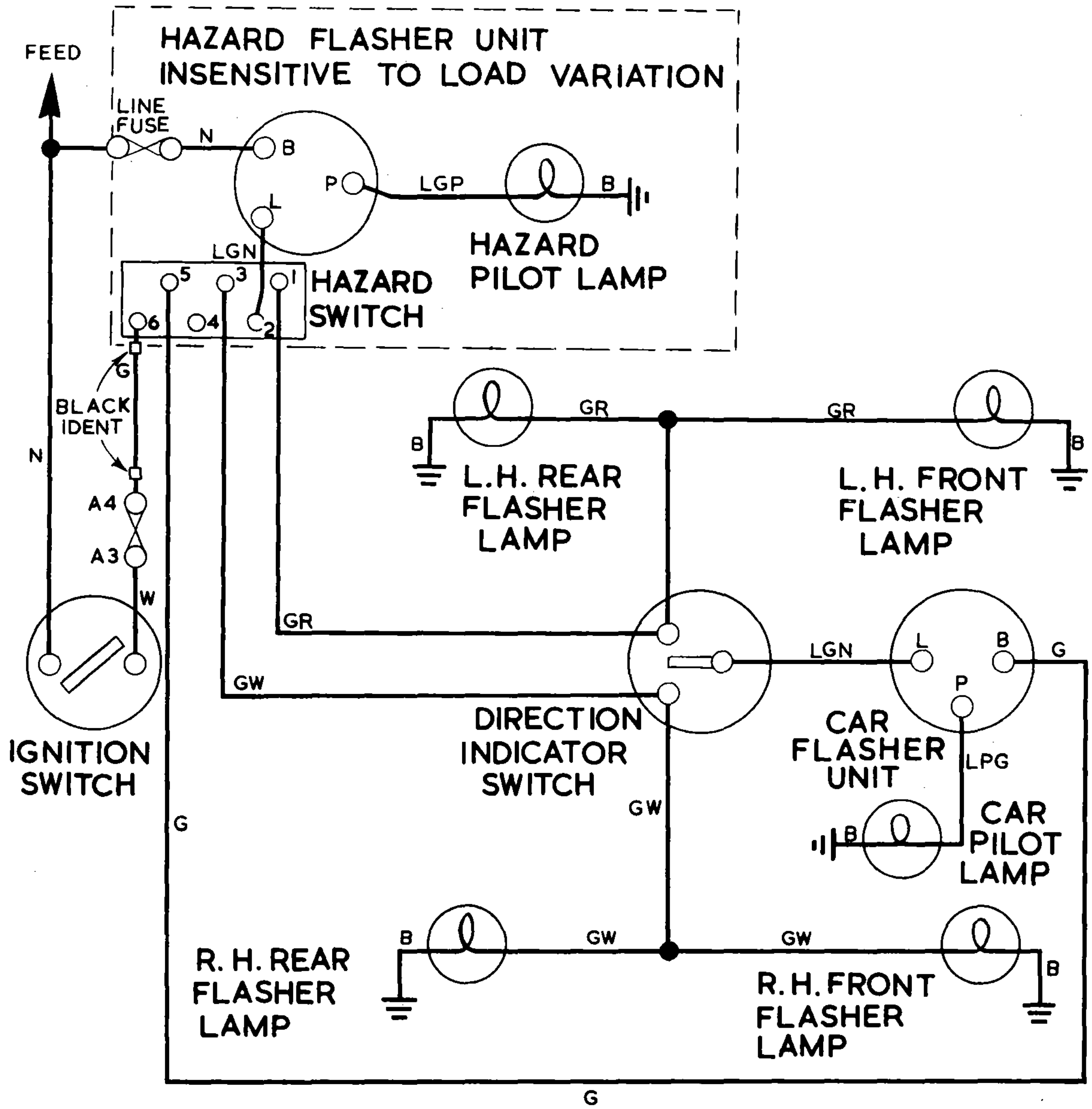


Fig. 79. Traffic hazard warning system sub-panel.



B	BLACK	LGN	LIGHT GREEN\BROWN
G	GREEN	LGP	LIGHT GREEN\PURPLE
GR	GREEN\RED	N	BROWN
GW	GREEN\WHITE	W	WHITE

3361

Fig. 80. Wiring diagram of the traffic hazard warning system.

ELECTRICALLY HEATED BACKLIGHT

An electrically heated backlight to provide demisting and defrosting of the rear window is fitted as an optional extra.

The heating element, consisting of a fine wire mesh between the laminations of glass, is connected to the main wiring harness and will come into operation when the ignition is switched on.

The current consumption is 5 amps. and a 15 amp. fuse, contained in a plastic holder, is located behind the instrument panel.

	Commencing Chassis Numbers	
	R.H. Drive	L.H. Drive
2.4 Litre Mark 2 ..	119902	127998
3.4 Litre Mark 2 ..	170565	180398
3.8 Litre Mark 2 ..	235046	224417

Commencing at the above chassis numbers the heated backlight has a control switch, warning light and relay with resistance included in the electrical circuit.

The warning light, operating through the resistance, is automatically dimmed when the side lights are switched on.

The circuit remains ignition controlled and there is no change in the fuse rating, fuse location and the current consumption.

The control switch is mounted on the facia panel and the relay is located on the back face of the panel above the switch terminals.

Fault Diagnosis

Check that the fuse has not blown. Replace if necessary by one of the correct value.

Check the rear light element by disconnecting the cable connectors in the luggage compartment and reconnecting the backlight cables to a 12 volt battery with a 0-20 moving coil ammeter in series.

If no reading is shown on the meter, replace the backlight glass as detailed on Page N.15.

If a reading is shown on the meter, check the feed cable connectors in the luggage compartment for continuity with a volt meter. Insert the fuse and switch on the ignition before checking.

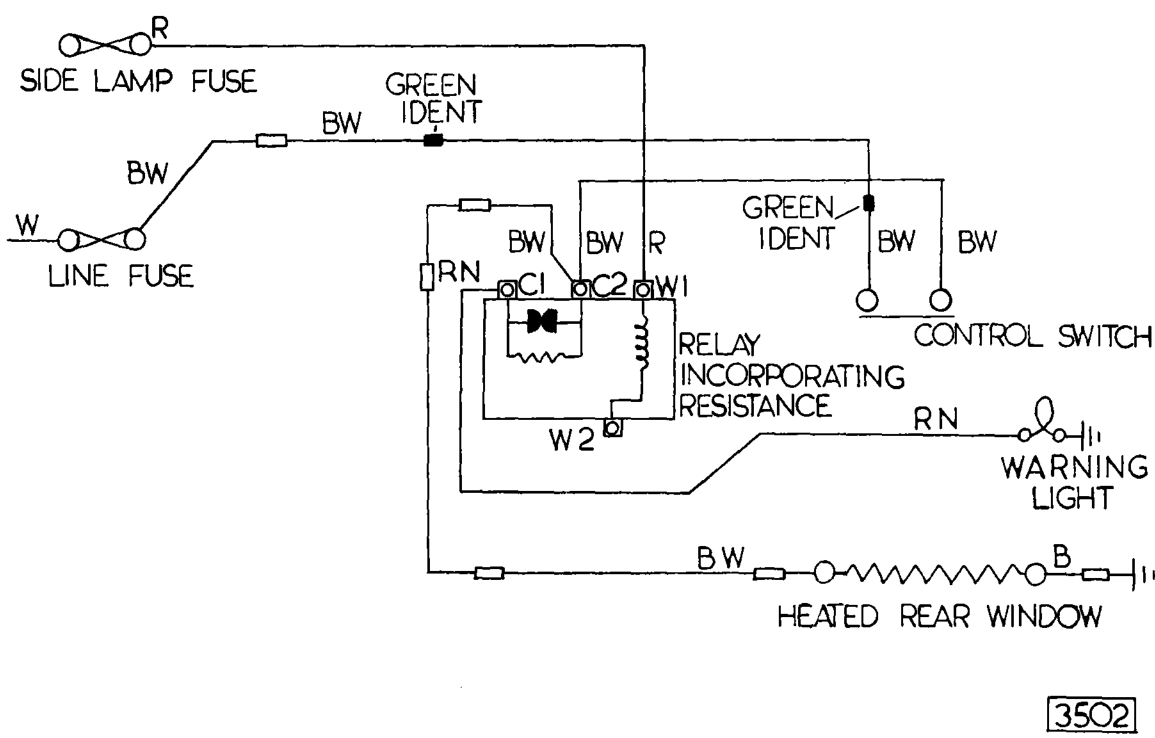


Fig. 81. Wiring diagram (Incorporating switch, relay and resistance).

ELECTRIC TIME CLOCK

	Commencing Chassis Numbers	
	R.H. Drive	**L.H Drive**
2.4 Litre Mark 2 ..	115205	127141
3.4 Litre Mark 2 ..	163007	179136
3.8 Litre Mark 2 ..	230516	222555

Commencing at the above chassis numbers, the electric time clock fitted to the revolution counter dial, incorporates a rectifier. This is to reduce fouling of the contact points in the clock.

If at any time the clock is removed for servicing and subsequent testing on the bench, IT IS MOST IMPORTANT that the feed terminal on the back of the clock is connected to the negative side of the battery and that the outer casing of the clock is positively earthed. Incorrect connection of a rectified clock to the battery will **instantly destroy the rectifier**

JAGUAR SERVICE BULLETIN

Number	A.1.
Section	General Information
Sheet	1 (of 1)
Date	January, 1960

PRELIMINARY INFORMATION
(Mark 2 Models)

The following is the general data for the above models. It can be assumed that any items of data not listed are the same as for the previous models; in the case of the 3.8 litre Mark 2 the remaining data is the same as that for the 3.4 litre model.

DATA

	2.4 litre Mark 2	3.4 litre Mark 2	3.8 litre Mark 2
ENGINE			
Cylinder head type	'B' type	'B' type	'B' type
Cam lift	5/16"	3/8"	3/8"
Bore	3.2677"(83 mm)	3.2677"(83 mm)	3.425"(87 mm)
Sparking plug type			
7:1 comp. ratio	Champion L.7	Champion L.7	Champion N.5
8:1 comp. ratio	Champion N.5	Champion N.5	Champion N.5
9:1 comp. ratio	-	Champion N.5	Champion N.5
Sparking plug gap	.025"	.025"	.025"
Ignition timing			
7:1 comp. ratio	6° B.T.D.C.	T.D.C.	T.D.C.
8:1 comp. ratio	8° B.T.D.C.	2° B.T.D.C.	4° B.T.D.C.
9:1 comp. ratio	-	T.D.C.	5° B.T.D.C.
Valve seat angle			
Inlet and exhaust	45°	45°	45°
Carburetter needles			
7:1 comp. ratio	-	S.C.	T.X.
8:1 comp. ratio	-	S.C.	S.C.
9:1 comp. ratio	-	S.C.	S.C.

Continued

	2.4 litre Mark 2	3.4 litre Mark 2	3.8 litre Mark 2
STEERING			
Castor angle	$0^\circ \pm \frac{1}{4}^\circ$	$0^\circ \pm \frac{1}{4}^\circ$	$0^\circ \pm \frac{1}{4}^\circ$
Camber angle	$\frac{3}{4}^\circ \pm \frac{1}{4}^\circ$ pos	$\frac{3}{4}^\circ \pm \frac{1}{4}^\circ$ pos	$\frac{3}{4}^\circ \pm \frac{1}{4}^\circ$ pos
TRACK			
Disc wheels - front	4' 7"	4' 7"	4' 7"
- rear	4' $5\frac{3}{8}$"	4' $5\frac{3}{8}$"	4' $5\frac{3}{8}$"
Wire wheels - front	4' $7\frac{1}{2}$"	4' $7\frac{1}{2}$"	4' $7\frac{1}{2}$"
- rear	4' $6\frac{1}{8}$"	4' $6\frac{1}{8}$"	4' $6\frac{1}{8}$"

Number	A.2
Section	General Information
Sheet	1 (of 1)
Date	March, 1960

"PERIODIC MAINTENANCE VOUCHER BOOKLET"

(All Models)

A copy of the above booklet is being included in the literature wallet issued with each new car.

The reason for the introduction of this Maintenance Voucher scheme is to provide a record of the maintenance services carried out and to encourage owners to have their cars regularly serviced. The record of service will be of value to a dealer who is undertaking work on a car for the first time in that he will be aware of the services that have been previously carried out. In addition, the completed vouchers will provide proof to a prospective purchaser that the maintenance operations have been carried out as recommended.

The existing form of 500 miles (800 km) Free Service Voucher is discontinued and will instead be included in the Voucher booklet.

JAGUAR SERVICE BULLETIN

Number A.3
Section General Information

Sheet 1 (of 1)
Date March, 1960

SPECIAL SERVICE TOOLS FOR JAGUAR CARS

In order to assist Distributors and Dealers in reducing labour costs and improving efficiency in their service organisations, a range of Special Purpose Tools have been designed and approved. Such tools are to be marketed by Messrs. V.L. Churchill & Co. Ltd., and the following procedure should be adopted.

(1) Home Distributors and Dealers:-

Order direct from V.L. Churchill & Co. Ltd.,
Great South West Road,
Bedfont, Feltham,
Middlesex.

(2) Overseas Distributors:-

Order on Jaguar Cars Ltd.,
(Overseas Dealers order on their Distributors)

The following Special Purpose Tools may now be ordered:

Ref. No.	Description	Price (Trade) £.	s.	d.
J.1 (A)	Hub puller (5 stud hub)	7.	6.	0 (already advised)
J.2	Top timing chain adjusting tool	1.	16.	6
J.3	Overdrive Drain Plug Spanner	1.	3.	9
J.4	Mark Vll, Vlll, lX Gearbox rear oil seal removing adaptor	1.	14.	0
J.5	2.4/3.4 litre and Mark 2 gearbox rear oil seal removing adaptor	1.	13.	0
	Note: Applicable to standard gearbox only and used in conjunction with 7657 oil seal removing tool.			
J.6	Front suspension coil spring compressor	6.	10.	0
J.7	Hub puller (Centre lock wire wheel type)	8.	7.	6
J.8	Engine lifting plate	5.	0.	9
J.6118	Valve spring compressor	2.	9.	3
7657	Oilseal remover (for use with J.4 & J.5)	1.	17.	6

/Cont'd...

Your attention is drawn to the range of Special Purpose tools available for servicing Laycock Overdrive Units and Salisbury Rear Axles already advised in Service Bulletin No.151.

Automatic Transmission Service Tools

The following Special tools for servicing the automatic transmission are also being marketed by Messrs. V.L. Churchill & Co. Ltd.,

Description	Original No.	Churchill No.	Price £.	s.	d.
ø Pressure gauge rig	J.4270	BW.1	5.	19.	6.
ø Band Adjuster	J.4285	BWA 2B	1.	16.	9.
ø Spline Adjustment fixture	J.4283	BW.5	15.	13.	0.
ø Converter Alignment flange	J.4286	BW.3	5.	1.	0.
Universal puller	HM.925	BW.55	3.	15.	0.
Puller Plate Rear Bearing)	J.12986	BW.55-1	4.	16.	5.
Adaptor rings " ")					
Mainshaft end float gauge	-	BW.13	6.	11.	0.
Ring gear retaining clip	-	BW.14		1.	9.
Transmission Pilot Studs	-	BW.4		7.	9.
Mainshaft Bearing replacer	-	BW.7	1.	1.	0.
Spring retainer remover	-	BW.8 (set)		15.	6.
Governor shaft Setscrew wrench	-	BW.9		5.	3.
Piston installing pins	-	BW.10		15.	10.
Clutch Assembly Tool	-	BW.11		16.	3.
Lubrication Valve Test Rod	-	BW.12		6.	5.
Bench cradle	-	BW.15	2.	4.	3.
Drive flange oil seal replacer (use with 550 handle)		BW.16		13.	9.
" " Remover (use with 55 puller)		BW.55/2	1.	4.	0.
Circlip pliers	-	7065		19.	9.
Oil seal driver handle	-	550		18.	0.

Those marked ø are the minimum requirement for diagnosis or removal and refitting of Transmission and converter.

Number A.3 (2nd issue)
Section General Information

Sheet 1 (of 1)
Date February, 1961

SPECIAL SERVICE TOOLS FOR JAGUAR CARS

(This bulletin supersedes A.3 of March, 1960)

In order to assist Distributors and Dealers in reducing labour costs and improving efficiency in their service organisations, a range of Special Purpose Tools have now been designed and approved. Such tools are to be marketed by Messrs. V.L. Churchill & Co. Ltd., and the following procedure should be adopted.

1. Home Distributors and Dealers:-

Order direct from V.L. Churchill & Co. Ltd.,
Great South West Road,
Bedfont, Feltham,
Middlesex.

2. Overseas Distributors:-

Order on Jaguar Cars Ltd.,
(Overseas Dealers order on their Distributors)

The following Special Purpose Tools may now be ordered:

	Description	Ref.No.
ABC	Hub Puller (5 stud hub)	J.1 (A)
ABC	Top timing chain adjusting tool	J.2
ABC	Overdrive Drain Plug Spanner	J.3
AB	Mark VII, VIII, IX Gearbox rear oil seal removing adaptor.	J.4
AB	2.4/3.4 litre and Mark 2 Gearbox rear oil seal removing adaptor	J.5
	Note: Applicable to standard gearbox only and used in conjunction with 7657 oil seal removing tool.	
AB	Front suspension coil spring compressor	J.6
ABC	Hub puller (Centre lock wire wheel type)	J.7
AB	Engine lifting plate	J.8
ABC	Valve spring compressor	J.6118
AB	Oil seal remover (for use with J.4 & J.5)	7657

/Continued...

Your attention is drawn to the range of Special Purpose Tools available for servicing Laycock Overdrive Units and Salisbury Rear Axles already advised in Service Bulletin No. 151.

Automatic Transmission Service Tools

The following Special tools for servicing the automatic transmission are also being marketed by Messrs. V.L. Churchill & Co. Ltd.,

		Description	Original No.	Churchill No.
ABC	ø	Pressure gauge rig	J.4270	BW.1
ABC	ø	Band Adjuster	J.4285	BWA 2B
AB	ø	Spline adjustment fixture	J.4283	BW.5
AB	ø	Converter Alignment flange	J.4286	BW.3
A		Universal Pulley Puller	–	6312A
A		Mainshaft bearing adaptors	–	BW.6312A – 1
A		Mainshaft end float gauge	–	BW.13
A		Ring gear retaining clip	–	BW.14
A		Transmission Pilot Studs	–	BW.4
A		Mainshaft Bearing replacer	–	BW.7
A		Spring retainer remover	–	BW.8 (set)
A		Governor shaft setscrew wrench	–	BW.9
A		Piston installing pins	–	BW.10
A		Clutch Assembly Tool	–	BW.11
A		Lubrication Valve Test Rod	–	BW.12
A		Bench Cradle	–	BW.15
A		Drive flange oil seal replacer use (use with 550 handle)	–	BW.16
A		Circlip pliers	–	7065
A		Oil seal driver handle	–	550

Those marked ø are the minimum requirement for diagnosis or removal and refitting of Transmission and Converter.

Rear Axle Service Tools

ABC Axle shaft extractor – SL.13A

Overdrive Service Tools

ABC Rig for testing hydraulic pressure – L.188

The notation A, B or C against each tool indicates the minimum requirements for distributors, district distributors, area dealers, retail and sub-retail dealers.

A – Distributors
B – District Distributors and area dealers
C – Retail and sub-retail dealers

JAGUAR SERVICE BULLETIN

Number	A.4
Section	General Information
Sheet	1 (of 1)
Date	May, 1960

"PERIODIC MAINTENANCE VOUCHER BOOKLET"

(All models)

Owing to the demand for the above booklets by owners of cars already in service it should be noted that these booklets can be obtained at a cost of 7/6d. each by placing an order on Jaguar Spares Department.

STEERING COLUMN CONTROLS

(2.4, 3.4 and 3.8 litre Mark 2 models)

Models affected	Commencing chassis numbers	
	R.H. Drive	L.H. Drive
2.4 litre	102242	125520
3.4 litre	151466	175683
3.8 litre	201087	212640

On cars with the above chassis numbers and onwards the overdrive or automatic transmission control and the flashing indicator control are changed over side for side on both right and left hand drive cars. The location and operation of the controls is now as follows:-

Automatic Transmission Selector Control

On the right-hand side of the steering column.

The selector lever must be raised when selecting P, L or R and when moving from P to any other position.

Overdrive Control

On the right-hand side of the steering column.

Operate the lever clockwise to engage overdrive and anti-clockwise to bring the drive into top (4th) gear.

Continued...

Flashing Direction Indicators

On the left-hand side of the steering column.

Move the lever clockwise to operate the flashing direction indicators on the right-hand side of the car and anti-clockwise to operate the left-hand indicators.

Number A.5
Section General Information

Sheet 1 (of 1)
Date September, 1960

MANUFACTURERS WARRANTY

(All models)

To simplify the procedure covering the issue of a new car guarantee to the purchaser of a Jaguar car and eliminate the need for an individual "Owners Identification Card" a new form of "Manufacturers Warranty" card, which replaces the existing guarantee form and owners identification card, will, in the near future, be included in the literature envelope issued with each new car leaving our works.

Distributors and Dealers when handing over a new car to the purchaser must adopt the following procedure or in the case of cars sold through traders who are not Jaguar dealers ensure that this procedure is carried out with the new type Manufacturers Warranty form.

1. Inside Warranty Card and below statement of Warranty

Type the details of chassis number, delivery date, purchaser's name and address. Apply dealers stamp or type in name and address of dealer and append signature on behalf of dealer. Ensure that this section of warranty card which serves as an Owners Identification Card is signed by the purchaser.

2. Registration of Ownership Card attached to Warranty Card

Type in all details called for on "Registration of Ownership" card.

Ensure that this card is signed by the purchaser, detach from warranty card and place in mail.

3. On rear of Warranty Card

Type in details called for under the heading "Details for the Purchaser".

4. Ensure that the completed warranty card is handed to the purchaser. Advise him to keep it in the car and to show it to the Jaguar dealer on whom he may call if warranty service should be required during the warranty period.

JAGUAR SERVICE BULLETIN

Number A.6.
Section General Information

Sheet 1 (of 1)
Date November, 1960

USE OF OIL ADDITIVES

In view of the large number of anti-friction additives now on the market we would remind you that we do not recommend the use of any oil additives.

It is emphasized that this is particularly important in so far as the rear axle, automatic transmission and gearbox/overdrive units are concerned in view of the special purpose oils used therein.

Number A.7
Section General Information

Sheet 1 (of 1)
Date February, 1961

RECOMMENDED LUBRICANTS - ADDITIONAL BRAND

(All Models)

The following lubricants manufactured by the Regent Oil Co. Ltd., are now added to our list of recommendations.

Engine - Summer	32° - 90° F	Advanced Havoline 30
Winter	Below 32° F	Advanced Havoline 20W
Tropical	Above 90° F	Advanced Havoline 40
U.C.L.		Regent U.C.L.
Gearbox Carburettor hydraulic piston dampers Distributor oil can points Oil can Lubrication		Advanced Havoline 30
Rear Axle		Universal Thuban 90
Steering Box		Universal Thuban 140
Rack and pinion steering Prop. shaft Wheel bearings Steering track rod Steering tie-rods Wheel swivels Handbrake cable Clutch and brake pedals		Marfak Multi-purpose 2
Automatic Transmission Power-assisted steering		3528 Texamatic Fluid
Multigrade Engine oil		Advanced Havoline Special 10W/30

Adjust at relief valve to give pressure between 2 lbs/sq.in ($.14\ kg/cm^2$) to $2\frac{1}{2}$ lbs/sq.in ($.17\ kg/cm^2$) maximum.

(iii) Remove fuel pump from tank to set relief valve. Adjustment is by setting screw and locknut on pump cover plate. To reduce the pressure turn setting screw in an anti-clockwise direction, and fully tighten locknut when completed.

(iv) Bench test unit with pump submerged in clean paraffin (kerosene).

Important: When testing the fuel pump the black cable must always be connected to the positive battery terminal.

(v) When refitting pump to tank always renew joint.

CLUTCH

Make and type	Borg and Beck 10" single dry plate
Colour of thrust springs	Violet
Operation	Hydraulic
Fluid	Castrol Crimson Hydraulic Brake Fluid

GEARBOX

Type	Four speed, synchromesh on 2nd, 3rd and Top gears.
Prefix letters	EB
Suffix letters	JS

Gearbox Removal and Refitting

Proceed as for engine removal.

REAR AXLE

Make and type	Salisbury - 4 H.U.
Ratio	Standard 3.31 to 1
Alternatives	3.54 to 1, 3.07 to 1, 2.93 to 1

REAR SUSPENSION

Type	Independent, coil spring
Rear camber angle	$\frac{3}{4}^{o} \pm \frac{1}{4}^{o}$ negative

/Continued...

Rear Axle and Suspension Unit - Removal and Refitting

Removal

Jack up car under rear axle and place stands under the frame members forward of the radius arm mountings. Remove the road wheels and release the handbrake.

Disconnect the feed pipe from the brake hose connection at the three way junction and blank off open connections to prevent ingress of dirt.

Disconnect the handbrake cable from the compensator assembly by removing the split pin and clevis pin from fork joint and unscrewing conduit from the abutment block.

Remove rear silencer and tail pipe assembly after disconnecting clamp from joint. Disconnect the two radius arms from the body at the forward mounting points by removing the two setscrews and lock washers. Remove anti-roll bar lower pivot pin bolts and disconnect propeller shaft.

With the jack in position under the rear axle assembly remove the eight bolts from the "Vee" mounting brackets, lower assembly and remove from the car.

Refitting

Refitting is the reverse of the removal procedure. It will be necessary to re-adjust the handbrake and re-bleed the rear brake hydraulic system. It is advisable to complete these operations before refitting the road wheels.

FRONT SUSPENSION AND STEERING

Type of steering	Rack and pinion
Castor angle	$1\frac{3}{4}^{\circ} \pm \frac{1}{4}^{\circ}$ positive
Camber angle - front	$\frac{1}{4}^{\circ} \pm \frac{1}{4}^{\circ}$ positive
Front wheel alignment	1/16" to $\frac{1}{8}$" (1.59 mm to 3.18 mm) toe-in
Number of turns lock to lock	$2\frac{1}{2}$

BRAKES

Make and type	Dunlop disc, self adjusting at both front and rear. Rear brakes are fitted inboard adjacent to differential unit.
Servo	Bellows type acting directly onto the brake pedal.

Continued....

Pedal Operation	Pedal operates twin master cylinders one for the front brakes and one for the rear through a compensating linkage. An independent reservoir is provided for each system.
Handbrake/brake fluid warning light	Provided on both hydraulic systems

Removal of Rear Brake Calipers

It is necessary to remove the rear axle and suspension unit completely from the car before the brake calipers can be detached.

WHEELS AND TYRES

Wheel type	5 K rims 72 spoke	
Tyre type	Dunlop 6.40 x 15 (Road speed RS5)	
Tyre pressures	Front	Rear
Normal use up to maximum speeds of 130 m.p.h. (210 kph)	23 lbs/sq.in ($1.62 kg/cm^2$)	25 lbs/sq.in. ($1.76 kg/cm^2$)
For sustained high speeds and maximum performance	30 lbs/sq.in. ($2.11 kg/cm^2$)	35 lbs/sq.in. ($2.46 kg/cm^2$)

DIMENSIONS

Wheel base	8' 0" "2.44 m)
Track - front and rear	4' 2" (1.27 m)
Overall length	14' 7.5/16" (4.45 m)
Overall width	5' 5¼" (1.66m)
Overall height	
Fixed Head Coupe	4' 0⅛" (1.22 m)
Open 2-seater	3' 10½" (1.18 m)
Ground clearance	5½" (140 mm)
Turning circle	37' 0" (11.27 m)
Weight (dry approximate)	
Fixed head Coupe	22½ cwt (1123 kg)
Open 2-seater	22cwt (1098 kg)

CONTINENTAL TOURING KITS

With the large volume of Jaguar owners who now make continental tours and the improved service facilities in Continental Europe, we consider it no longer practicable or necessary to issue comprehensive Continental Touring Kits on a sale or return basis.

We are, however, making available small, low priced, First Aid Kits which some owners may wish to purchase to carry in their car when touring abroad or at home.

Note: THESE KITS ARE SUPPLIED ONLY ON AN OUTRIGHT SALE BASIS.

Distributors and Dealers will no doubt be pleased to supply to the owner on a sale or return basis any additional parts they may wish to carry with them on a particular tour.

The First Aid Kits now being made available consist of the following parts:

1	Fan Belt
2	Fuses (50 amp)
1 set	Distributor Contacts
1	Distributor Condenser
1	Distributor Rotor
1	Brake Master Cylinder Repair Kit
1	Clutch Master Cylinder Repair Kit
1	Cylinder Head Gasket
1	Inlet Manifold Gasket
2	Exhaust Manifold Gaskets
2	Camshaft Cover Gaskets
4	Oil Pipe Washers

Note: In some of the kits for the earlier models an additional camshaft cover gasket has been included for use where an electric rev-counter is incorporated.

Note that to ensure that the correct kit is obtained for a particular car it is necessary to know the engine number and in some cases whether the car has drum or disc brakes.

Details of the First Aid Kits are given in Spares Bulletin A.48

JAGUAR SERVICE BULLETIN

Number A.11. (4th issue)
Section General Information.

Sheet 1 (of 1)
Date December, 1962.

This Service Bulletin supersedes the 3rd issue of November, 1962 which should be destroyed.

ADDITIONAL SERVICE TOOLS.

The following service tools are now available in addition to those listed in Service Bulletin A.3. which bulletin also gives the procedure for obtaining these tools.

OVERDRIVE TOOLS

Applicable to:		Churchill Tool No.
Mark 1X)	Accumulator Piston Housing Remover - for 1½" piston	L.216
3.8 litre Mark 2)	Accumulator Piston (1½" diameter) 'O' Ring Replacer	L.217
3.8 litre XK.150)	Accumulator Piston Ring Compressor (1½" diameter)	L.218
Mark 10	Operating Piston Remover	L.300
Mark 10	Hydraulic Pressure Testing Equipment	L.301+

POWER - ASSISTED STEERING TOOLS

Mark 2 models	Power steering piston assembly sleeve	L.9
Mark 10	Power steering piston assembly sleeve	J.19
Mark 1X)	*Hydraulic pressure gauge set	J.10
Mark 10)	comprises:-	
Mark 2 models)	Gauge	J.10/2
	T. Adaptor	J.10/1
	Pipe	J.10/3

* See Service Bulletin No.II.5

+ Consists of BW 1A and adaptor BW 38.

/cont'd.....

GENERAL TOOLS

5 stud hubs	∅Hub Puller	J.1.C.
'E' Type Mark 10	Hydraulic damper/Rear spring dismantling adaptor	J.11.A.(use with SL.14).
'E' Type Mark 10	Servo Vacuum Gauge	J.12
'E' Type	Servo Vacuum gauge adaptor	J.12-1(early cars)
Mark 10	Servo Vacuum gauge adaptor	J.12-2
'E' Type	Servo Vacuum gauge adaptor	J.12-3(Later cars)
'E' Type Mark 10	Rear Hub end float gauge (dial indicator)	J.13
'E' Type Mark 10	Rear Wishbone pivot dummy shafts (2 off per set)	J.14
'E' Type Mark 10	Rear Hub Master Spacer and Bearing replacer	J.15
'E' Type Mark 10	Rear Hub outer bearing cone remover and replacer	J.16A (use with SL.14).
Engines with latest rear cover - see Service Bulletin B.13.	Crankshaft rear oil seal sizing tool	J.17
All O.H.C. engines	Valve guide reamer	J.18
'E' Type Mark 10	Rear Hub Inner and Outer Bearing Cup Remover and Replacer	J.20.(use with SL.12).

∅Same as J.1.B. except for longer centre screw (J1C/3) and thread protector (J1C/7)

Note: To the application table of the "Jaguar Service Tools" pamphlet issued with this bulletin make the following additions.

Mark 10 Column

Add an asterisk against Tool numbers J6A, J11A, J16A, and SL14.

Mark 1 and 11 3.8 litre Column

Add an asterisk against Tool numbers J6118 and 7657.

'E' Type Column

Add an asterisk against Tool number J6118.

JAGUAR SERVICE BULLETIN

Number A.18.
Section General Information.

Sheet 1 (of 1)
Date June, 1963.

THE S.U. CARBURETTER SERVICE SCHOOL.

Distributors and Dealers are advised that a Service Course dealing with the correct method of assembly, installation and maintenance, repair procedure and practical tuning of S.U. Carburetters is now in full operation for the benefit of personnel dealing with these carburetters in service.

Full details of this course can be obtained from:-

The Service School,
The S.U. Carburetter Co. Limited,
Wood Lane,
Erdington,
Birmingham. 24.

JAGUAR **SERVICE BULLETIN**

Number A.19.
Section General Information.

Sheet 1 (of 1)
Date September, 1963.

RECONDITIONED EXCHANGE UNITS - OVERSEAS SCHEME.

Many enquiries are being received from overseas distributors concerning the scheme for obtaining reconditioned engine and gearboxes from the factory.

The attention of all Distributors and Dealers is drawn to the letter circulated in January 1963 which gives details and prices of the reconditioned exchange scheme.

JAGUAR SERVICE BULLETIN

Number A.22.
Section General Information.

Sheet 1 (of 1)
Date May, 1964.

LABOUR ALLOWANCE FOR REMOVAL OF REAR HALF-SHAFTS.

Having examined the circumstances surrounding the removal and replacement of rear half-shaft assemblies on Mark 10, 'E' Type and 3.4 'S' and 3.8 'S' Type models, we find that the allowance made in our Repair Labour Schedule Operation H.14 is causing concern amongst a number of distributors and dealers.

A re-assessment has now been made of this operation having regard to all contingencies and we have decided to increase the allowance in this respect to 1½ hours. We would make it quite clear that 1½ hours covers the complete removal and replacement of the half-shaft assembly, but excludes re-adjustment of hub bearings, which would not be disturbed. Will all concerned please ensure that the necessary adjustments are recorded against Operation H.14 of the Repair Labour Schedule and submit guarantee claims in accordance with this revised allowance.

This increased allowance is effective from the 1st June, 1964 and is no way retrospective.

JAGUAR **SERVICE BULLETIN**

Number A.25.
Section General Information

Sheet 1 (of 1)
Date October, 1964.

NEW SERVICE TOOLS.

The following new service tools are now available.

Please note the new address of Messrs. V.L. Churchill & Co. Limited, - London Road, Daventry, Northants.

Tool No.		Models.	Supplier.
JD.23	Weatherstrip fitting tool (For use when fitting windscreen and backlight rubbers).	All	V.L. Churchill.
JD.24	Ball joint separator. (For "breaking" the taper of track rod and tie-rod ball joints).	All	V.L. Churchill.
10416	Brake piston retraction tool (For pushing back the pistons when fitting new friction pads on Series 3 brakes).	3.4/3.8 'S' 4.2 Mark 10	Jaguar Cars Ltd.

Mr N Benton · Smithfield

JAGUAR SERVICE BULLETIN

Number A.~~25~~26
Section General Information

Sheet Sheet 1 (of 1)
Date November, 1965

PROTECTIVE WAX (HOME MARKET)

(All Models)

With effect from 1st October, 1965, all cars sold on the Home Market will be sprayed with a protective wax finish before leaving the factory, which must be removed before delivery to the customer.

The procedure recommended for de-waxing is as follows:

(1) Water wash, using "TERGEZ" or similar detergent agent to remove dirt and dust.

(2) De-wax by hand with S.B.P. white spirit or paraffin, the former being preferable.

(3) Clean glass and chrome.

(4) Final hand polish.

JAGUAR SERVICE BULLETIN

Number A.27
Section General Information

Sheet 1 (of 1)
Date April, 1966

De-Waxing of New Cars

If Distributors and Dealers have sufficient movement of new cars, it may be found that manual de-waxing presents something of a problem in regard to the time factor.

We have investigated the claims made for the Kismet Mini Master Steam Jet Cleaner, with particular reference to the de-waxing operation, using a hot spray with addition of 4% detergent (or paraffin) and find this to be entirely satisfactory equipment for this purpose.

Use of the Mini Master Cleaner under these conditions involves consumption of approximately 1½ gallons of paraffin per car. The operation take 12 to 15 minutes, depending on model, and has the most important advantage that THERE IS NO POSSIBILITY OF PAINTWORK BEING SCRATCHED as does occur with manual de-waxing.

The equipment costs £265 nett trade and it should be remembered that, in addition to hot water de-waxing, the equipment provides full steam-cleaning facilities.

We recommend this equipment but all enquiries should be made to Kismet Limited, Fenlake Works, Fenlake Road, Bedford, England.

JAGUAR **SERVICE BULLETIN**

Number A.28
Section General Information

Date September, 1966

RECOMMENDED LUBRICANTS
(All Models)

Following oil specification changes by certain Oil Manufacturers the RECOMMENDED LUBRICANTS listed have been modified as detailed below:-

		New Oil	Replacing
ENGINE	(Castrol	Castrol XL20W/50	Castrolite or Castrol XL
	(B.P.	Super Visco-Static	Visco-Static
STEERING	Mobil	Mobilube C140	Mobilube 9X140

These new oils are recommended for all current Jaguar models.

It should also be noted that ESSO Extra Motor Oil 5W/20 has now been deleted from the recommended Engine oil specification.

N Benton.

JAGUAR SERVICE BULLETIN

Number A.29
Section General Information

Sheet 1 of 1
Date March, 1967

PETROL GRADING - 'STAR' SYSTEM

For attention of all Jaguar HOME Distributors and Dealers

With reference to the introduction of a 'STAR' grading system to indicate the octane rating of petrol supplied to the Home Market, it is important to ensure that only the correct grade of petrol is used to suit the engine compression ratio.

ALL CARS WITH 8:1 COMPRESSION RATIO REQUIRE '4 STAR' PETROL (97 OCTANE) AND ALL CARS WITH 9:1 RATIO '5 STAR' PETROL (100 OCTANE).

The compression ratio (-8 or -9) is shown as an extension of the engine number stamped on the Commission Plate and on the Engine.

The use of petrol of a lower grading may cause detonation and, in severe cases, resultant piston damage.

Petrol Pump personnel should be notified of these requirements.

JAGUAR SERVICE BULLETIN

Number A.30
Section General Information

Page 1 of 1
Date July, 1968

TO ALL DISTRIBUTORS AND DEALERS

Although the general requirement is laid down in the First (Free) Service at 1,000 miles (1,600 km.) as quoted in the Owner's Handbook and the Service Voucher Booklet, that all bolts, nuts, hydraulic unions, etc., are checked for tightness, it is considered, that in line with the worldwide efforts to achieve greater road safety, more emphasis must be placed on safety-related items.

Will you please instruct all personnel accordingly, and ensure that specific attention is given during the First (Free) Service to such items as:-

(1) Tightness and freedom from leakage of all brake hydraulic and petrol pipe unions.

(2) Tightness of road wheel securing nuts and freedom from damage to tyres.

(3) Tightness of clamp pinch bolts on all steering column universal joints.

(4) Proper functioning of all door locks.

(5) Bonnet release returning to position.

(6) Lights legally required operating correctly.

These remarks apply to any First (Free) Service whether or not you are the vendor of the car and listing of these specific points does not remove the necessity of attention being given as laid down in the Service Schedule.

Number A.32
Section General Information

Page 1 of 1
Date February, 1969

ROUTINE SERVICE VOUCHERS
(Publication No. E.153)
1,000 MILES (1,600 KM.) FREE SERVICE

IMPORTANT: To all Distributors and Dealers

When submitting the FREE Routine Service Voucher for payment, it is essential that the name and address of the SELLING DEALER is quoted in addition to the Servicing Dealer.

This information should be written on the back of the Voucher.

December, 1955.

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO: 178.

ADVANCE SERVICING INFORMATION 2.4 LITRE MODEL

The following information is issued to assist Distributors and Dealers in servicing 2.4 litre models pending the distribution of the Operating, Maintenance and Service Handbook.

Car Number

Stamped on the identification plate attached to the right-hand wing valance.

Prefix "S" indicates a "Special Equipment" model.

Suffix "DN" to the car number indicates that an overdrive unit is fitted.

Engine Number

Stamped on the right-hand side of the cylinder block above the oil filter and at the front of the cylinder head casting.

/7 or /8 following the engine number denotes the compression ratio.

Gearbox Number

Stamped on a shoulder at the left-hand rear corner of the gearbox casing and on the top cover.

Letter "N" at the end of the prefix letters indicates that an overdrive unit is fitted.

Body Number

Stamped on a plate attached to the right-hand side of the scuttle.

GENERAL DATA

ENGINE

Bore	3.2677" (83 mm.)
Stroke	3.0118" (76.5 mm.)
Compression ratio	8 to 1 (7 to 1 alternative)
Distributor contact breaker gap	.014" - .016" (.36 - .41 mm.)
Sparking Plug Type	
7 to 1 comp. ratio	Champion L.10.S.
8 to 1 comp. ratio	Champion N.8B.
Sparking plug gap	.030" (.76 mm.)
Ignition timing	10° B.T.D.C.
Valve clearances (cold) inlet	.004" (.10 mm.)
exhaust	.006" (.15 mm.)

CARBURETTORS

Type: Solex downdraught.

Choke and Jet Sizes.

Choke	25 mm.
Main jet	115
Air correct jet	160

cont'd.....

Emulsion tube	10
Pump jet	55
Pilot jet	60
Pilot air bleed	1.5 mm.
Needle valve	2 mm.
Needle valve washer	1 mm.
Starter petrol jet	GS.105
Starter air jet	GA.4.5

CLUTCH

Type	Borg and Beck 9"
Operation	Hydraulic
Fluid	Genuine Lockheed Hydraulic Brake fluid(to S.A.E.Spec.70R2)

BRAKES

Type	Lockheed - vacuum servo assisted. Self-adjusting at both Front and rear.
Fluid	Genuine Lockheed Hydraulic Brake Fluid(to S.A.E.Spec.70R2)

FRONT SUSPENSION AND STEERING

Castor angle	½° - 1° negative
Camber angle	½° - 1° positive
Front wheel alignment	Parallel to 1/16"(1.59 mm.) toe-in.

REAR AXLE

Type:	3HA
Ratio	4.55:1

TYRES

Type 6.40 x 15 Tubeless

Pressures

	Front	Rear
Normal driving	24lbs./sq.in. (1.69 kg/cm²)	22lbs./sq.in. (1.55 kg/cm²)
Fast touring (that is, long distances at maintained speeds of over 85 m.p.h. (135 k.p.h.)	30lbs./sq.in. (2.11 kg/cm²)	28lbs./sq.in. (1.97 kg/cm²)

CAPACITIES

	Imperial	U.S.	Litres
Engine - total	13 pts.	15½ pts	7½
Gearbox(without overdrive)	2½ "	3 "	1½
Gearbox(with overdrive)	4 "	4¾ "	2¼
Rear Axle	2½ "	3 "	1½
Cooling system(with heater)	20 "	24 "	11¼
Petrol tank	13½ galls.	16¼ galls.	61¼

OIL FILTER - DETAILS

Part Number.

C.11722	Element (FG.2306)
C.11713	Sealing ring,rubber in filter head (137366)

March, 1956.

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO. 182.

VARIOUS SERVICING ITEMS.

DISTRIBUTOR MICROMETER ADJUSTMENT.

Model affected
2.4 litre.

It should be noted that the direction of rotation for the micrometer adjustment of the advance and retard mechanism is opposite to that of the other current production models, that is, anti-clockwise to advance the ignition and clockwise to retard.

The direction of rotation to advance and retard is indicated on the distributor body adjacent to the vacuum advance diaphragm housing.

Index Reference - Sections B and P.

PETROL TANK CAPACITY.

Model affected
2.4 litre.

Note that the petrol tank capacity of the above model is 12 galls ($14\frac{1}{2}$ U.S. galls, $54\frac{1}{2}$ litres) and not $13\frac{1}{2}$ galls ($16\frac{1}{4}$ U.S. galls, $61\frac{1}{4}$ litres), as stated in Service Bulletin No. 178, which should be amended accordingly.

Index Reference - Section A.

STATIC IGNITION TIMING.

Model affected
2.4 litre.

It should be noted that one flywheel tooth equals $3\frac{1}{2}$ crankshaft degrees. Top Dead Centre for No. 1 and 6 pistons is indicated by the alignment of an arrow stamped on the crankcase and an arrow on the edge of the flywheel visible through a hole in the left-hand side of the clutch housing.

Index Reference - Section B.

PARKING PAWL ROD - SPLIT TYPE.

Models affected. Commencing Transmission Number.
Automatic Transmission cars. 5011.

On cars with the above transmission number and onwards a split type of parking pawl rod is fitted which facilitates disengagement of the parking pawl on steep gradients.

If any difficulty is experienced in disengaging the parking pawl on a steep slope with the car facing downhill, the R (Reverse) position should be selected and the lever held in this position until the parking pawl releases and car moves rearward when the 'D' position can be selected and the car driven forward.

Conversely, if the car is on a steep slope facing uphill and it is required to reverse the car, hold the selector lever in the 'D' position until the car moves forward and then select the 'R' position.

Index Reference - Section FF.

DOOR LOCKS - OPERATION.

Model affected
2.4 litre.

Attention is drawn to the following instructions for operating the door locks which vary from the types of locks fitted to previous models.

The front doors may be opened from the outside by pressing the button incorporated in the door handle. The doors are opened from the inside by pulling the interior handles rearward.

Cont'd...

Both front doors can be locked from the inside by pushing the interior handles forward and allowing them to return to their original position; this feature only applies if the doors are fully closed before operating the interior handles.

Both front doors can be locked from the outside by means of the ignition key; the locks are incorporated in the push buttons of the door handles.

To lock the right-hand door insert the key in the lock, rotate anti-clockwise as far as possible and allow the lock to return to its original position - the door is now locked. To unlock the right-hand door turn key clockwise as far as possible and allow the lock to return to its original position.

To lock the left-hand door rotate key clockwise; to unlock, rotate key anti-clockwise.

KEYLESS LOCKING is obtained by first pushing the interior door handle full forward and allowing it to return to its original position. If the door is now closed from the outside with the push button of the handle <u>fully depressed</u> the door will become locked.

<u>WARNING</u> - If the doors are to be locked by this method the ignition key should be removed beforehand (or the spare key kept on the driver's person) as the only means of unlocking the front doors is with this key.

<u>Index Reference</u> - Section N.

<u>DRIVING MIRROR.</u>

Models affected.
XK.140
2.4 litre.

It should be noted that the driving mirror of each of the above models is adjustable for height. To adjust, rotate the knurled sleeve anti-clockwise, slide the mirror stem into the desired position and tighten the sleeve.

<u>Index Reference</u> - Section A.

<u>REAR ROAD SPRING - REMOVAL AND REFITTING.</u>

Model affected
2.4 litre.

Removal.

Jack up under the rear jacking socket until the road wheel is clear of the ground or ramp.

Remove the nut from the eye bolt at the rear of the spring. Remove the mounting plate from the centre of the spring.

Jack up under the front end of the spring and remove the front mounting plate. Lower the jack and remove the eye bolt from the rear of the spring when the spring can be withdrawn.

Refitting.

Enter the spring in the mounting bracket on the axle and fit the eye bolt but do not tighten nut.

Jack up under the front end of the spring and fit the front mounting plate. Remove the jack.

Lower the car gently on to its wheels, ensuring that rubber pad in the centre of the spring aligns with the pan in the underframe longitudinal member, and fit the centre mounting plate. With the weight of the car fully on the road wheels tighten the eye bolt nut at the rear of the spring.

<u>Index Reference</u> - Section K.

March, 1956

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.183.

VARIOUS SERVICING ITEMS.

FRONT ROAD SPRING.

Model affected	Commencing Chassis Numbers. R.H. Drive.	L.H. Drive
2.4 litre	900484	940020

On cars with the above chassis numbers and onwards, Front Road Spring C.8924/1, replaces Front Road Spring C.8924, and Packing Piece C.11874.

Identification.

Front Road Spring C.8924/1 is identified by a yellow splash of paint (irrespective of any other splashes of paint on the spring) on the end of the spring, and is a $\frac{1}{4}$" (6.3 m.m.) longer than Front Spring C.8924.

Interchangeability

(i) Road Spring C.8924/1 can be used to replace Road Spring C.8924 providing the $\frac{1}{4}$" (6.3 m.m.) Packing Piece C.11874 fitted at the top of the spring is dispensed with.

(ii) On and after the above chassis numbers only Front Spring C.8924/1 should be fitted.

Note:- When present stocks of Spring Part number C.8924 are exhausted only Spring Part number C.8924/1 will be supplied.

Index Reference - Section J.

PANHARD ROD.

Model affected	Commencing Chassis Numbers. R.H. Drive.	L.H. Drive.
2.4 litre	940020	900480

On cars with the above chassis numbers and onwards Panhard Rod Part number C.11994, Adjusting end C.11996 and Locknut UNF.256/L are fitted in place of Panhard Rod C.11033

Interchangeability.

The latest type of Panhard Rod assembly comprising the three items given above is interchangeable with the one piece Panhard Rod C.11033. The rubber pads, retaining washers and securing nuts are unchanged.

Index Reference-Section K

REVOLUTION COUNTER DRIVE AND CABLE.

Model affected	Commencing Chassis Numbers. R.H. Drive.	L.H. Drive.
2.4 litre	900532	940020

On cars with the above chassis numbers and onwards modified Rev counter angle drive gearbox Part number C.9914 and Rev counter cable Part number C.11787 (15" - 38.1 cm long) are fitted in place of angle drive gearbox Part number C.9913 and Cable Part number C.9644 (14$\frac{1}{2}$" - 36.8 cm long).

Interchangeability.

The modified Rev counter angle gearbox is interchangeable with the previous type providing that the Rev counter cable is also changed.

Index Reference - Sections B and M

Cont'd...

REVOLUTION COUNTER.

Model affected	Commencing Chassis Numbers. R.H.Drive.	L.H.Drive.
Mark VII	724688	738528

It should be noted that cars on and after the above numbers are fitted with revolution counter Part number C.9183 (danger band 5500 - 6000 r.p.m.) in place of Part number C.4535 (danger band 5200-5500 r.p.m).

Index Reference - Section P.

OIL PRESSURE AND WATER TEMPERATURE GAUGE.

Model affected	Commencing Chassis Numbers. R.H.Drive.	L.H.Drive.
Mark VII	725264	738706

It should be noted that cars on and after the above numbers are fitted with oil gauge Part number C.9542 reading up to 100 lbs. per sq.in. in place of oil gauge Part number C.4666 reading up to 60 lbs. per sq.in.

Index Reference - Section P.

BRAKE MASTER CYLINDER.

Model affected.	Commencing Chassis Numbers. R.H.Drive.	L.H.Drive.
2.4 litre	900522	940020

On cars with the above chassis numbers and onwards a modified type of brake master cylinder and reservoir Part number C.12184 is fitted in place of master cylinder and reservoir C.8955. The difference in the two assemblies is in the angle at which the reservoir is attached to cylinder in relation to the mounting studs. When fitted, the original type has the reservoir filler cap immediately in front of the cylinder; the later type has the filler cap situated to the right of cylinder.

Service Procedure.

The later type of master cylinder C.12184 is interchangeable with the previous type C.8955.

For replacement purposes, only the later type of master cylinder C.12184 will be supplied.

Index Reference - Section L.

REVOLUTION COUNTER CABLE.

Models affected.		Commencing Chassis Numbers. R.H.Drive.	L.H.Drive.
XK.140	Drop Head Coupe	807367	818385
XK.140	Fixed Head Coupe.	804640	815395

On Drop Head Coupe cars with the above chassis numbers and onwards modified revolution counter cable Part number C.11961 is fitted in place of cable C.8274.

On Fixed Head Coupe cars with the above chassis numbers and onwards modified revolution counter cable Part number C.11963 is fitted in place of cable C.9154.

Identification.

The modified cables have a nylon insert at one end of the inner cable.

Interchangeability.

(i) The modified cables with nylon inserts are interchangeable, as complete assemblies, with previous types fitted.

(ii) The inner and outer cables are NOT individually interchangeable.

Index Reference - Section M.

April, 1956.

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SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO. 184.

VARIOUS SERVICING ITEMS.

REVOLUTION COUNTER CABLE RUN.

Model affected.	Commencing Chassis Numbers. R.H.Drive.	L.H.Drive.
2.4 litre	900822	940207

On cars with the above chassis numbers and onwards the heater intake duct is modified to provide a straighter run for the revolution counter cable.

Service Procedure.

In the event of a replacement cable being fitted on cars prior to the above chassis numbers the above modification should be carried out. This modification consists of making a depression in the heater intake duct in line with the revolution counter cable run and the procedure is as follows:-

1. Remove the dash casing from underneath the facia panel.
2. Mark the heater intake duct at the point where any fouling occurs with the revolution counter cable.
3. Disconnect the cable from the revolution counter instrument and retain out of the way.
4. With a long drift make a depression approximately 1" (25 mm) wide and ¼" (6 mm) deep along the side of the heater intake duct to provide a straighter run for the cable from the instrument to the rubber grommet in the dash.
5. When refitting the cable ensure that it is routed above the demister flexible pipes and that the connecting nuts at each end of the cable are fully tightened.

Index Reference - Section M.

SOLEX CARBURETTERS - MODIFICATION.

Model affected	Commencing Engine Number.
2.4 litre	BB.2397.

On cars with the above engine number and onwards the following change has taken place on the Solex carburetters.

Part number.		
4984	Choke tube.	24 mm replaces 25 mm.
4977	Air Correction Jet.	180 replaces 160
4989	Needle valve.	1.5 mm replaces 2.0 mm.

Service Bulletin No.178 and the 2.4 litre Operating, Maintenance and Service Handbook should be amended accordingly.

If complaints of "flat spot" on low speed acceleration cannot be cured by normal tuning the above parts should be fitted. The Air Correction Jet is situated in the centre of the choke tube.

Index Reference Section C.

Cont'd....

PISTON RINGS - TAPERED TYPE.

Models affected	Commencing Engine Numbers.
Mark VII	N.4400
XK.140.	G.7229

On cars with the above engine numbers and onwards pistons with tapered periphery compression rings and modified oil control rings are fitted.

The part numbers are as follows:-

Upper Compression Ring (Chrome plated)	C.11954 replaces C.5830.
Lower Compression Ring.	C.11955 replaces C.5831.
Oil Control Ring.	C.11956 replaces C.5832.

Important.

It is MOST IMPORTANT that the tapered periphery rings are fitted the correct way up.

(i) The hard chrome plated upper compression ring has the word "Top" marked on the face to be fitted uppermost.

(ii) The black coated lower compression ring has the letter "T" marked on the face to be fitted uppermost.

The oil control ring can be fitted either way up.

Service Procedure.

In future only the latest types of piston rings will be supplied from the Jaguar Spares Department for the Mark VII, XK.140 and XK.120 models.

This change does not apply to the 2.4 litre model which will continue to be fitted with piston rings C.5830, C.5831 and C.5832.

Index Reference - Section B

SPEEDOMETER CABLES - NYLON INSERT TYPE.

Models affected.	Commencing Chassis Numbers. R.H.Drive.	L.H.Drive.
Mark VII (Standard Transmission).	750190	739886
Mark VII (Automatic Transmission).	750188	739851.

On cars with the above chassis numbers and onwards a modified type of speedometer cable is fitted.

The part numbers of the modified cables are as follows:-

Standard Transmission.	C.8303
Automatic Transmission.	C.8304

Identification.

The modified type of cable has a fluted outer cable and a nylon insert at one end of the inner cable.

Interchangeability.

The modified type of cable is interchangeable with the previous types fitted as a complete assembly. The inner cables and outer cables are NOT individually interchangeable.

Index Reference - Section M.

April, 1956.

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S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO.185.

VARIOUS SERVICING ITEMS.

EXHAUST VALVE GUIDES - "C" TYPE CYLINDER HEAD.

Models affected	Commencing Engine Number.
XK.140.	G.6678.S.

On cars with the above engine number and onwards modified exhaust valves (Part number C.7708 unchanged) and modified exhaust valve guides (Replacement part number C.8312) are fitted.

Identification.

The modified valve has a stem of reduced diameter under the valve head to form a scraping edge inside the guide.

The modified valve guide Part number C.8312 is 1.15/16" long and has no counterbore at the valve head end, the previous valve guide Part number C.9868 being 2" long and having a 7/16" counterbore at the valve head end.

Note: Exhaust valve guide C.8312 is now common to both the standard and "C" type cylinder head and when present stocks of C.9868 are exhausted only C.8312 will be supplied from the Jaguar Spares Department for Mark VII, XK.140 and XK.120 engines.

Index Reference - Section B.

REVOLUTION COUNTER CABLES - NYLON INSERT TYPE.

Models affected.		Commencing Chassis Numbers. R.H.Drive	L.H.Drive.
XK.140.	F.H.Coupe.	804640	815395
	D.H.Coupe.	807367	818385

On cars with the above chassis numbers and onwards a modified type of revolution cable is fitted.

The part numbers are as follows:-

F.H.Coupe.	C.11963.
D.H.Coupe.	C.11961.

Identification.

The modified type of cable has a nylon insert at one end of the inner cable.

Interchangeability.

The modified type of cable is interchangeable with the previous types fitted as a complete assembly. The inner cables and outer cables are NOT individually interchangeable.

Index Reference - Section M.

Cont'd..

ESSO ENGINE OILS - LATEST RECOMMENDATIONS.

Models affected.
All models.

With the introduction of a new range of Esso engine oils the following are the revised recommendations.

ENGINE.

Summer.	32° - 90°F 0° - 32°C	Esso Extra Motor Oil. 20W/30
Winter.	below 32°F below 0°C	Esso Extra Motor Oil. 20W/30
Tropical.	above 90°F above 32°C	Esso Extra Motor Oil. 40/50

GEARBOX.

The recommended lubricant for the gearbox remains "Essolube 30". Esso Extra Motor Oils should not be used in the gearbox.

UPPER CYLINDER LUBRICANT.

"Essomix" is now known as "Esso Upper Cylinder Lubricant".

Index Reference - Section B.

SYNTHETIC PAINT - ADDITIONAL COLOURS.

Models affected.
Mark VII
XK.140.
2.4.litre.

The following are additional paint colours to those given in Service Bulletins 114 and 136. The reference number given for each paint colour is for Quick Air Drying Enamel.

British	Domolac.	British Racing Green.	Q.1076
"	"	Birch Grey.	Q.1079
"	"	Pearl Grey.	Q.1129
"	"	Pacific Blue.	Q.1132/1
"	"	Carmine Red.	Q.1190
"	"	Arbor Green.	Q.1191
"	"	Maroon.	Q.1135/1

Index Reference - Section N.

Addition to Service Bulletin No.176.

Under "Models affected" and "Commencing Engine Number" add the following details in respect of the XK.140 automatic transmission model:-

XK.140 Automatic Transmission. G.6615.

April, 1956.

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S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO.186.

VARIOUS SERVICING ITEMS.

REAR AXLE - LARGER DRIVE GEAR BOLTS.

Models affected.		Commencing Chassis Numbers. R.H.Drive.	L.H.Drive.
Mark VII Standard and Automatic Transmission.			
Mark VII Overdrive models.			
XK.140 Standard Transmission.			
	Open 2 seater	800071	812311
	F.H.Coupe	804676	815528
	D.H.Coupe	807389	818488
XK.140 Overdrive models.			
	Open 2 seater		
	F.H.Coupe.		
	D.H.Coupe.		
2.4 litre...		900862 plus 900613,665,668, 672,734-764.	940210 plus 940089,151-160.

The commencing chassis number for the Mark VII model and the XK.140 Overdrive models will be given in a later bulletin.

On cars with the above chassis numbers and onwards the bolts which secure the drive gear to the differential case are increased in size from 3/8" (9.5 mm) to 7/16" (11 mm).

With this change the drive gear, differential case and lockstraps are modified to suit.

The part number changes are as follows:-

The part numbers of the Rear Axle Assemblies will remain the same but will have the suffix /1.

4HA AXLES.
(Mark VII and XK.140 models)

Description.		New Part Number	Old Part Number.
Drive Gear Bolts.		3HA-075/6	3HA-075/4M
Drive Gear Bolt Lockstrap.		4HA-074/2	4HA-074/1
Diff.Case Assy.(3.31:1 and 3.54:1 ratio)		4HA-082/6	4HA-082
Diff.Case Assy.(4.09:1, 4.27:1,4.55:1 ratios)		4HA-082/7	4HA-082/1
Diff.Case only (3.31:1 and 3.54:1 ratio)		4HA-006/4	4HA-006
Diff.Case only (4.09:1,4.27:1,4.55:1 ratios)		4HA-006/5	4HA-006/1
Drive Gear and Pinions.			
	3.31:1	4HA-105/8A	4HA-105/8
	3.54:1	4HA-105/9A	4HA-105/9
	4.09:1	4HA-105/13A	4HA-105/13
	4.27:1	4HA-105/12A	4HA-105/12
	4.55:1	4HA-105/14A	4HA-105/14

3HA AXLES.
(2.4 litre model).

Description.	New Part Number.	Old Part Number.
Drive Gear Bolts	3HA-075/6	3HA-075/4M
Drive Gear Lockstrap.	3HA-074/3	3HA-074/1
Diff. Case Assy.	3HA-082/15	3HA-082/9
Diff. Case only	3HA-006/9	3HA-006/6
Drive Gear and Pinion 4.55:1	3HA-105/23A	3HA-105/23

Cont'd...

Service Procedure for cars originally fitted with 3/8" Drive Gear Bolts.

When present stocks of Drive Gear and Pinions with 3/8" threads are exhausted only the later type with 7/16" threads will be supplied for 2.4 litre axles and 4HA Mark VII, XK.140 and XK.120 axles. In cases where a Drive Gear with 7/16" threads is supplied to replace a Drive Gear with 3/8" threads it will be necessary to carry out the following modification:-

Note: This change and modification does NOT apply to the 2HA type of axle fitted to early Mark VII and XK.120 cars.

1. Open out the holes in Differential Case with a 29/64" (11.5 mm) drill and reamer; the hole when opened out should be within the limits .448" - .453" (11.38 - 11.509 mm).

2. Fit the 7/16" Drive Gear Bolts 3HA-075/6.

3. Fit lockstraps 4HA-074/2 for the Mark VII, XK.140 and XK.120 models or 3HA-074/3 for the 2.4 litre models.

The above lockstraps are of the flat type and if the type being replaced are of the bridge type it will be necessary to cut back alternate webs on the differential case.

Index Reference - Section H.

CARBURETTER JETS - 7 to 1 Compression Ratio.

Model affected
2.4 litre

The following are the details of the carburetter settings for 7 to 1 compression ratio engines.

Choke	23 mm	Pilot Air Bleed.	1.5 mm
Main Jet.	115	Needle Valve.	1.5 mm
Air Correction Jet.	200	Needle Valve Washer.	1.0 mm
Emulsion Tube.	10	Starter Petrol Jet.	GS.105
Pump Jet.	55	Starter Air Jet.	GA 4.5
Pilot Jet.	60		

Index Reference - Section C.

STATIC IGNITION TIMING - 7 to 1 Compression Ratio.

Model affected
2.4 litre.

The ignition timing for the 7 to 1 compression ratio 2.4 litre engines is 1° B.T.D.C.

Index Reference - Section A

COIL FAILURE AND/OR ENGINE MISFIRING.

Models affected.
All cars fitted with ignition suppressors.

Note that it is ESSENTIAL that the suppressor in the high tension cable between the ignition coil and the distributor must be fitted in the centre terminal post of the distributor cap and NOT in the end of the coil. If the suppressor is fitted in the end of the coil a 1/4" air gap exists resulting in overheating of the coil and rupture of the coil's plastic cap.

If coil failure and/or engine misfiring is encountered a check should be made for the correct location of the distributor suppressor.

Index Reference - Section P.

May, 1956

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO. 187

PANHARD ROD OUTER BRACKET.

2.4 litre model.

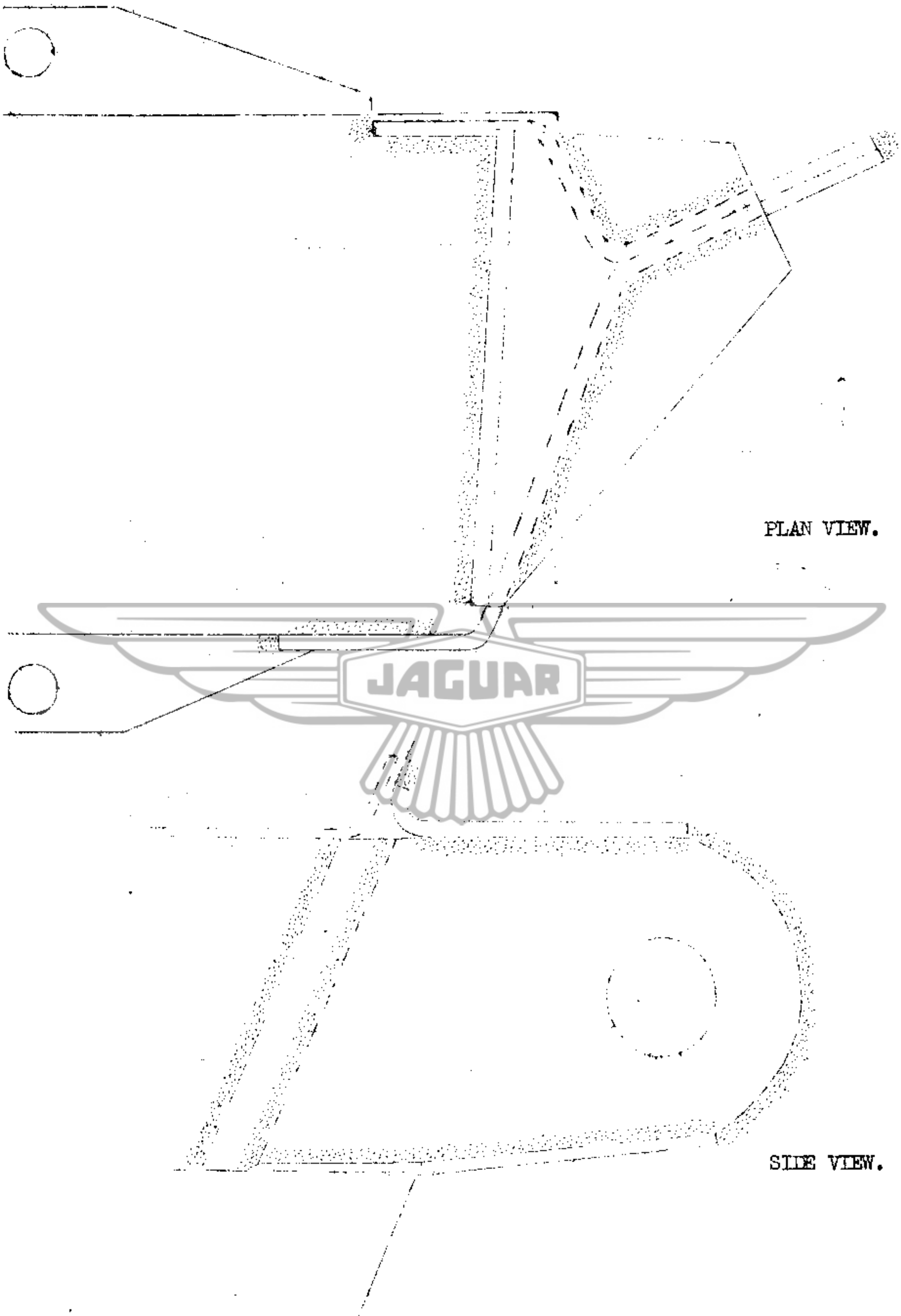
A few cases of breakage of the bracket to which the outer end of the panhard rod is secured (body end) have been reported and examination has shown that the welding of the plates that form this bracket has not, in all cases, been satisfactorily carried out.

Will all Distributors and Dealers please arrange to examine this bracket on any cars coming in for service and ensure that the welding has been carried out fully as shown in the following sketches; this applies to cars prior to approximately 901615 R.H.Drive 940656 L.H.Drive.

In the case of your having an actual breakage reported please take the following action:-

1. Disconnect the panhard rod from the rear axle bracket.
2. Remove the broken piece of bracket from the panhard rod and if the two pieces of plate are not spot welded together, weld around the two rounded edges ensuring that the two holes are in line.
3. Mate up the two parts of the broken bracket at the point of fracture and weld together.
4. Carry out the necessary welding to ensure that the bracket is welded at all the positions indicated in the following sketches.
5. Repaint the bracket and refit the panhard rod.

Continued overleaf.



Index Reference Section N

WELDING.

June, 1956.

JAGUAR

SERVICE AND SPARES ORGANIZATION

SERVICE BULLETIN NO. 188

VARIOUS SERVICING ITEMS

REAR AXLE (NON OVERDRIVE CARS) - CHANGE IN RATIO

Models affected	Commencing Chassis Numbers.	
	R.H. Drive.	L.H. Drive.
2.4 litre.	901582	940606

On cars not fitted with an overdrive on and after the above chassis numbers the rear axle ratio is changed from 4.55:1 to 4.27:1. The axle ratio for cars fitted with an overdrive remains 4.55:1.

Details of the rear axles and the speedometers to suit are as follows:-

Rear Axles

	4.55:1 axle.	4.27:1 axle.
Rear Axle Assy.	C.8951	C.12007
Diff.case (3/8" holes)	3HA.006/6	-
Diff.case (7/16" holes)	3HA.006/9	3HA.006/12

Speedometers.

Non-overdrive cars.

Miles	C.9637	Miles	C.11591
Kilos	C.9638	Kilos	C.11592

Overdrive cars.

Miles	C.11593	-
Kilos	C.11594	-

Index Reference - Section H.

3HA AXLE-PINION SETTING FIGURES.

Models affected
2.4 litre.

The pinion setting figures for the 3HA type of axle fitted to the above model are as follows. These figures apply to both the 4.55:1 and the 4.27:1 ratio; a diagram showing exactly where the dimensions are taken is given on page H.16 of the Mark VII and XK.120 Service Manual.

A.	Pinion Drop	1.375"
B.	Zero Cone Setting	2.250"
C.	Mounting Distance	3.937"
D.	Centre line of Gear to Bearing Housing	5.130" to 5.120"

Index Reference - Section H.

cont'd Overleaf.

CLUTCH WITHDRAWAL LEVER RETURN SPRING.

Model affected.	Commencing Chassis Numbers R.H.Drive.	L.H.Drive.
2.4 litre	901592	940569

plus certain individual cars prior to these numbers.

On cars with the above chassis numbers and onwards a stronger return spring C.5120 (Mark VII type) spring plate C.5178, and shakeproof washer C.726 are fitted.

The spring plate and shakeproof washer are fitted to the lower mounting stud of the clutch slave cylinder and the return spring between the spring plate and the ball end pin of the operating rod; the return spring is fitted at the ball end between the flat washer and the double coil spring washer.

Service Procedure.

In the event of any complaints of clutch slip or difficulty being experienced in obtaining the necessary free travel at the clutch pedal the above parts should be fitted.

After fitting, check that the spring is returning the slave cylinder piston to the end of the cylinder, by pushing the operating rod towards the cylinder - no movement should be felt. If movement is obtained, extra tension can be applied to the return spring by rotating the spring plate and locking up with the nut in the desired position.

Index Reference - Section E.

SPEEDOMETER CABLE - NYLON INSERT TYPE.

Models affected.	Commencing Chassis Numbers R.H.Drive.	L.H.Drive.
2.4 litre.		
Non-overdrive cars.	901483	940560
Overdrive cars.	901561	940580

On cars with the above chassis numbers and onwards a modified type of speedometer cable is fitted.

The part numbers of the modified cables are as follows:-

Non-overdrive cars.	C.11966
Overdrive cars.	C.8305

Identification.

The modified type of cable has a fluted outer cable and a nylon insert at one end of the inner cable.

Interchangeability.

The modified type of cable is interchangeable with the previous types fitted as a complete assembly. The inner cables and outer cables are NOT individually interchangeable.

Index Reference - Section M.

June, 1956.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I Z A T I O N

SERVICE BULLETIN NO. 189

VARIOUS SERVICING ITEMS

TOP DEAD CENTRE INDICATION.

Model affected.	Commencing Engine Numbers.
2.4 litre.	BB.2846

On cars with the above engine numbers and onwards a more accessible indication of Top Dead Centre is provided at the bottom of the clutch housing.

Top Dead Centre on Numbers 1 and 6 pistons is indicated when the embossed line on the clutch housing and an arrow on the edge of the flywheel are in line; the flywheel is visible through a hole in the clutch housing after the small cover plate has been pushed to one side.

The original hole in the left hand side of the clutch housing is retained for production use and should be disregarded.

Important Note.

The hole in bottom of the clutch housing was actually incorporated at Engine number BB.2580 but should be disregarded until Engine number BB.2846 as the marking on the flywheel is for the hole in the left hand side of the clutch housing.

As a check on the use of the correct markings, remove the sparking plug from No.6 (front) cylinder and insert a length of rod (at least 5½" - 14 c.m. long) to ascertain when the piston is approximately on T.D.C. before referring to the markings.

Index Reference - Section B.

CRANKSHAFT VIBRATION DAMPER.

Model affected.	Commencing Engine Number.
2.4 litre.	BB.2500

On cars with the above engine number and onwards a vibration damper is fitted to the front end of the crankshaft.

The parts affected are as follows:-

Part No.	Description.	No. off.	
C.5896	Crankshaft Bolt	1	
C.2468	Crankshaft Washer	1	existing part.
C.12040	Crankshaft Lockwasher	1	
C.12039	Crankshaft Pulley	1	
C.12038	Crankshaft Damper Hub	1	
C.2466	Crankshaft Damper Cone	1	
C.12037	Crankshaft Damper	1	
NB.131/9F	Crankshaft Damper Bolt	6	
C.722	Crankshaft Washer	4	

It is not intended that retrospective action shall be taken in respect of this modification.

Index Reference - Section B.

Cont'd Overleaf...

NEW REAR LIGHTING REGULATIONS. (HOME TRADE ONLY).

With effect from the 1st October, 1956, it is compulsory for all cars to be fitted with two rear lamps which conform with certain regulations concerning size and mounting position.

The only post-war models which do not conform with the new regulations are the 1946-48, 1½ litre, 2½ litre and 3½ litre, and details of a suitable type of lamp and fitting instructions are given below.

The regulations regarding the mounting positions are -

1. One on each side of the car.
2. Not less than 21" apart.
3. Not less than 15" and not more than 42" from the ground.
4. Not more than 16" from the outer edge of the car.
   (the regulation for lamp position is actually 24" but as usually combined rear lamp and reflectors will be fitted, the distance of 16" will conform with the regulations for both rear lamps and reflectors and allow any separate reflectors that are already fitted to car to be dispensed with).

The Rear/Stop lamp (and combined reflector) recommended is as follows:-

Jaguar Part Number.	Lucas Type.	Lucas Service Number.	No.off.
C.9663	549	53330	2

Installation.

The recommended position for the lamps is on the lower portion of the rear quarters panels that is the panels between the rear wings and the spare wheel compartment lid.

It will be necessary to drill approximately ½" diameter holes through the sides of the spare wheel compartment and through the rear quarter panels for the wires to the rear lamps. Fit rubber grommets to holes. Discard the lamp securing screws provided and fit appropriate sized self-tapping screws.

Electrical Installation.

Some wiring modifications will have to be carried out when fitting the new lamps. It will be found that the leads from the illumination box are connected to the leads in the body harness by means of rubber snap connectors at the rear of the spare wheel tray. When inserting the new leads, the leads should be connected at the following points.

1. Connect a length of 14/.012 cable from each new tail lamp filament to the lead (normally red) connected to the original rear lamp bulbs. (If a single snap connecter was used to join the two original leads together, replace the single connector with a double snap connector, Jaguar Part No.3570, Lucas Part No. 850641, which can then be used to join the original two leads and the two new leads.)

2. Disconnect the lead from the Illumination Box stop lamp bulb. (This stop lamp will no longer be used, except perhaps as a reverse lamp as mentioned in number 3). Connect a length of 14/.012 cable from each new stop lamp filament to the original lead in the body harness from the stop lamp switch.

3. Some owners may prefer to utilise the original stop lamp bulb as a second reverse lamp. To do this, replace the original all-red glass with a half white and half red glass, Jaguar Part No.3394, Lucas Part No.523308, and connect the lead from the original stop lamp to the lead from the reverse lamp switch.

Index Reference - Section P.

June, 1956.

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I Z A T I O N

SERVICE BULLETIN NO. 190.

VARIOUS SERVICING ITEMS

REMOVAL OF FACIA PANELS AND CAPPINGS.

Model affected.
2.4 litre.

Remove the dash casing situated between the facia panel and the toe-boards.

Withdraw the ash tray fully and from the underside remove the four screws securing the ash tray bracket at front and rear.

Remove the lighting switch lever knob and the windscreen wiper knob, both being retained by a spring-loaded pin registering with a hole in the side of the knob; press in pins and withdraw knobs.

Unscrew the two thumbscrews at the top corners of the centre facia panel. Unscrew the two round-headed screws securing the brackets at the underside of the centre facia panel.

The centre facia panel can now be withdrawn.

Removal of The Windscreen Rail.

Remove the Centre Facia Panel as described above.
From the underside of the windscreen rail remove the four nuts and washers when the rail can be withdrawn by lifting upwards.

Removal of the Side Facia Panels.

Remove the Centre Facia Panel and the Windscreen Rail as described above.
Remove the two countersunk screws securing each side facia panel to the body facia support; these screws are visible on the front faces of the panels.
From underneath each side facia panel remove the nut at the rear of the body facia support which secures the panel bracket. The side facia panels can now be withdrawn.

Removal of the Door Cappings.

With a wide thin bladed instrument prise the polish wood window surround away from the door until the clips are exposed. Press down the clips and withdraw the window surround.
Remove the two screws now exposed when the door capping can be withdrawn by lifting upwards.

Index Reference - Section N.

WITTER TRAILER TOWING BRACKET - INSTALLATION.

Model affected.
2.4 litre.

A trailer towing bracket (Part No.C.12310) is available for the 2.4 litre model from the Jaguar Spares Dept., price £3.10.0d retail.

Material.

A.	1 off.	Angle steel Cross Bar.
B.	1 off.	Pad shaped to outer contour of bumper and drilled to S.M.M. & T.Standard No.7. to suit all British makes of trailer coupling.

cont'd Overleaf...

B.1.	1 off.	Pad shaped to inner contour.
C.	1 off.	Angle steel Bracing Bar.
D.	2 off.	1" x 3/8" H.T.Bolts,Nuts and Springs,Plain and large Plain Washers.
E.	2 off.	Bushes 1.11/16" long.
F.	1 off.	Plate.
G.	1 off.	1" x $\frac{1}{2}$" H.T.Bolt,Nut and Spring Washer and Plain Washers.
H.	1 off.	Yoke.
L.	2 off.	$3\frac{1}{2}$" x 5/8" H.T.Bolts,Nuts and Spring Washers.

FITTING.

Remove spare wheel. On the horizontal centre line of bumper drill, say, 3/8" hole 1.3/4" each side of centre line(marked vertically from boot lock), i.e. at standard $3\frac{1}{2}$" centre for coupling.

Pilot or mark through these holes on to rear body skirt, taking care to project horizontally and to maintain the $3\frac{1}{2}$" centres.

Detach bumper by undoing, on the inner mounting, the $\frac{1}{2}$" bolts screwed into rubber centre and, on the outer mountings, the smaller bolts holding the rubber blocks to the body, and spring one end of bumper away first. (Take care that the other bumper end does not cut the paint when detaching or when remounting). Open up holes in bumper to 21/32".

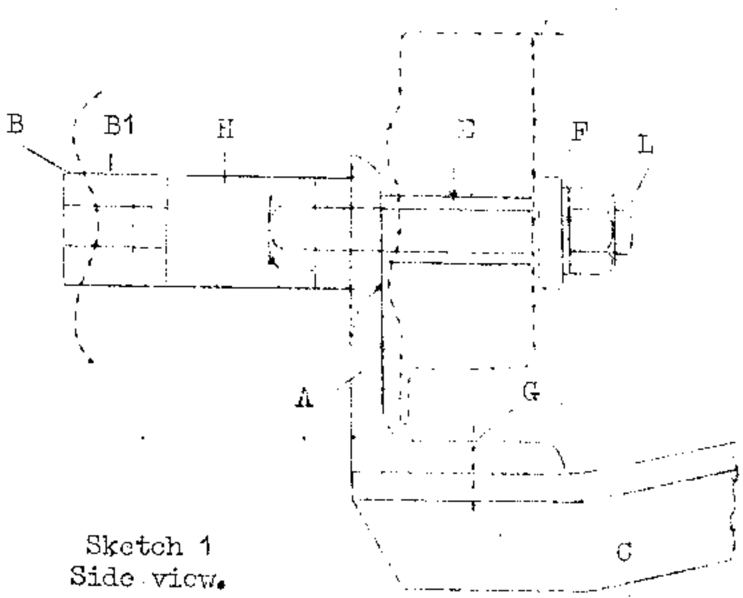
At the two points marked (at $3\frac{1}{2}$" centres) on the body skirt drill 21/32" holes right through both panels and then file out holes in outer or rearmost panel to close fit on Bushes(E) 7/8" diameter. Assemble Cross Bar(A),Yoke(H) and Plate(F)with Bolts(L)and Bushes(E)as sketch 1 - but insert Bolt(G)first.

Attach Bracing Bar(C)loosely to Cross Bar(A)with Bolts(G)and, after positioning, as Sketch 2, drill two 13/32" holes up through the centres of the ribs in the spare wheel container and attach with Bolts(D). Washers should be used between Bracing Bar(C)and Cross Bar(A), or between Bracing Bar(C)and spare wheel floor, if required, to ensure that this floor is not stressed when the bolts are tightened up.

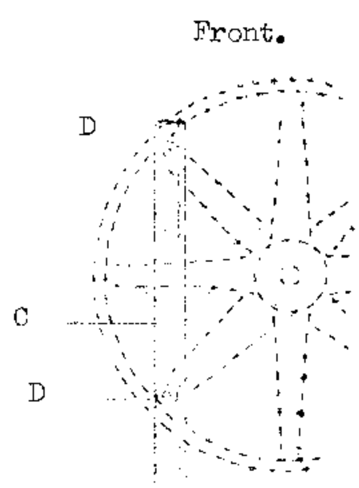
Remount the bumper without tightening bolts. Slip inner Pad (B1) between Yoke(H)and bumper and attach your coupling with outer Pad(B) with 5/8" H.T.Bolts of suitable length ($2\frac{1}{2}$"+ thickness of your coupling base). Tighten all bolts.

The Towing Capacity of the 2.4 litre model is 25 cwts(1270 kg).

Index Reference - Section 2.



Sketch 1
Side view.



Sketch 2
Plan view of spare wheel container.

June, 1956.

JAGUAR

SERVICE AND SPARES ORGANIZATION

SERVICE BULLETIN NO.191

INSTRUCTIONS FOR FITTING AN OVERDRIVE UNIT TO THE 2.4 LITRE MODEL.

General.

If the chassis number of the car concerned is prior to 901582 R.H.Drive or 940606 L.H.Drive the existing rear axle can be retained. On cars on and after the above chassis numbers it will be necessary to change the existing 4.27:1 ratio rear axle for one of 4.55:1 ratio Part No.C.8951.(see Service Bulletin No.188).

It will be found advantageous to carry out the installation of the wiring harnesses and the relay while the engine and gearbox is removed from the car. See "Electrical Installation".

Remove Engine and Gearbox.

- As described in Service Bulletin No.181.

Fit Overdrive Mainshaft to Gearbox.

Detach the clutch housing from the engine.

Dismantle gearbox and fit the overdrive mainshaft in place of the existing mainshaft.

The circlip C.5685 and spacing washer C.5983 supplied are fitted on the mainshaft behind the gearbox rear bearing. Shims C.8458/1,2 & 3(.002", .003" and .004" thick) are to take up clearance, if any exists, between the rear bearing and the spacing washer.

Fit Overdrive Unit to Gearbox.

- As described on page 14 of the "Service Manual" for the Laycock de Normanville overdrive unit for the Mark VII model".

If it is found necessary to align the splines in the overdrive unit turn the rearmost splines anti-clockwise with a long bladed screwdriver.

Refit Engine, Gearbox and Overdrive.

Assemble the gearbox and overdrive to the engine.

Refit the engine, gearbox and overdrive as a unit - see Service Bulletin No.181.

Fit Overdrive Type Propellor Shaft.

Fit propellor shaft assembly supplied in place of the existing shaft.

Remove Centre Facia Panel.

Remove the dash casing situated between the facia panel and the toe-boards.

Withdraw the ash tray fully and from the underside remove the four screws securing the ash tray bracket at front and rear.

Remove the lighting switch lever knob and the windscreen wiper knob, both being retained by a spring-loaded pin registering with a hole in the side of the knob; press in pins and withdraw knobs.

cont'd
Overleaf....

Unscrew the two thumbscrews at the top corners of the centre facia panel.

Unscrew the two round-headed screws securing the brackets at the underside of the centre facia panel.

The centre facia panel can now be withdrawn.

<u>Remove Windscreen Rail.</u>

Remove the centre facia panel as described above.

From the underside of the windscreen rail remove the four nuts and washers when the rail can be withdrawn by lifting upwards.

<u>Remove Side Facia Panel(Drivers Side)</u>

Remove the centre facia panel and the windscreen rail as described above.

Remove the two countersunk screws securing the side facia panel to the body facia support; these screws are visible on the front face of the panel.

From underneath the side facia panel remove the nut at the rear of the body facia support which secures the panel bracket. The side facia panel can now be withdrawn.

<u>ELECTRICAL INSTALLATION.</u>

<u>Fit Top Gear Switch.</u>

Remove the brass blanking plug from the gearbox top cover and fit the top gear switch and gasket.

<u>Fit Wiring Harnesses.</u>

It will be found advantageous to fit the two wiring harnesses while the engine and gearbox unit is removed from the car.

The gearbox harness connections are as follows:-

Top Gear Switch	Green/Purple and Green.
Reverse Light Switch	Green/Brown and Green.(2 off to one side of switch).
Solenoid	Green/Black.

The Relay Harness connections are as follows:-

Relay.	
Terminal W1.	Green/Yellow.
Terminal W2.	Black.
Terminal C1.	Green/Black.
Terminal C2.	Green/Purple.
Manual Switch.	
Terminal B.	Green/Purple.
Terminal E.	Black.
Terminal-blank.	Green/Yellow.

Remove the existing reverse light switch wires from the snap connectors at the front of the scuttle and fit the new wires in their place. Dispense with the old reverse light switch wires.

Connect up the wires from the top gear switch with similar coloured wires in the relay harness.

cont'd on page 3.

(Service Bulletin No. 191)

After connecting up the wires to the relay fit the relay to the cover. Attach the cover to the left hand wing valance between the windscreen washer bottle and air cleaner intake pipe. The holes are already drilled in the valance and cage nuts are provided.

Take the wires for the manual switch through the hole in the scuttle adjacent to the heater box and fit a rubber grommet to the hole.

Take the wires for the manual switch through the hole in the metal dash behind the position for the manual switch and fit a rubber grommet to the hole. Connect up the wires to the manual switch (the earth wire from the manual switch is positioned under the nut securing the side facia panel and is connected when the panel is refitted).

Fit Manual Switch to Facia Panel.

A rebate for the overdrive switch is already made in the back of the side facia panel(drivers side).

Drill a 5/8" hole in the facia panel to take the threaded portion of switch. The switch is fitted with the terminals at the bottom and is secured with the knurled bezel behind which the escutcheon plate is fitted.

Fit Overdrive Speedometer and Cable.

Remove the three setscrews which secure the metal instrument panel.

Withdraw panel slightly and disconnect the oil gauge pipe and the speedometer and revolution cable cables.

Remove the three screws at back of the speedometer and withdraw the instrument. Fit speedometer provided to suit the overdrive speedometer gear ratio.

Remove the existing speedometer cable and fit the longer cable supplied, following the same run.

cont'd Overleaf....

MATERIAL REQUIRED FOR 2.4 LITRE OVERDRIVE CONVERSION

The following are the parts required to convert the 2.4 litre to overdrive. They can be supplied as a kit by quoting part number -

S.D.1046 for Right Hand Drive Cars.
S.D.1047 for Left Hand Drive Cars.

Qty.	Description.	Part No.
1	Gearbox Mainshaft	C.6830
1	Cam Operating Oil Pump	C.5982
1	Circlip on Gearbox Mainshaft	C.5685
1	Spacing Washer	C.5983
1 off each	Shims	C.8458/1,/2,/3.
1	Overdrive Unit	C.11032
1	Gasket	C.5935
1	Propellor Shaft Assembly	C.8933
1	Speedometer (Miles)	C.11593
	(Kilos)	C.11594
1	Speedometer Cable	C.8305
1	Top Gear Switch	C.1083
1	Gasket for Top Gear Switch	C.4531
1	Relay Switch	C.7472
1	Cover for Relay Switch	C.11618
1	Grommet in Relay Switch Cover	C.11808
2	Setscrews	UFS.419/3H
2	Nuts	UFN.119/L
2	Washers	C.723/A
3	Setscrews	UFS.125/3R
3	Washers	C.724
1	Manual Switch	C.7474
1	Escutcheon for Switch	C.8574
1	Electrical Harness for Gearbox	C.11803
1	Electrical Harness for Relay Switch. (Right hand drive)	C.11805
	(Left hand drive)	C.11804

-----------ooOoo-----------

1	4.55:1 Rear Axle Assy. (if required: see "General" on page 1 of S.Bulletin).	C.8951

Service Bulletin No.191

MATERIAL AND LABOUR COST FOR 2.4 LITRE OVERDRIVE CONVERSION

Qty.	Description.	Part No.	Price.
1	Gearbox Mainshaft	C.6830	£10. 7. 9d
1	Cam Operating Oil Pump	C.5982	14. 4d
1	Circlip on Gearbox Mainshaft	C.5685	1. 8d
1	Spacing Washer	C.5983	3. 0d
1 off ea.	Shims	C.8458/1,/2,/3.	6d
1	Overdrive Unit	C.11032	£54. 8. 6d
1	Gasket	C.5935	1. 3d
1	Propellor Shaft Assembly	C.8933	£ 7. 14. 5d Exchange.
1	Speedometer (Miles)	C.11593	£ 3. 9. 9d
	(Kilos)	C.11594	Exchange.
1	Speedometer Cable	C.8305	£ 1. 2. 6d
1	Top Gear Switch	C.1083	7. 9d
1	Gasket for Top Gear Switch	C.4531	1d
1	Relay Switch	C.7472	13. 6d
1	Cover for Relay Switch	C.11618	1. 0d
1	Grommet in Relay Switch Cover	C.11808	3d
2	Setscrews	UFS.419/3H	4d
2	Nuts	UFN.119/L	4d
2	Washers	C.723/A	3d.Doz.
3	Setscrews	UFS.125/3R	9d
3	Washers	C.724	3d. Doz.
1	Manual Switch	C.7474	15. 0d
1	Escutcheon for Switch	C.8574	9d
1	Electrical Harness for Gearbox	C.11803	6. 6d
1	Electrical Harness for Relay Switch. (Right hand drive)	C.11805	13. 0d
	(Left hand drive)	C.11804	
			£81. 3. 0d
	Labour costs when carried out at Jaguar Service Department.		£32. 10. 0d
		TOTAL	£113. 13. 0d

-------ooOoo-------

1	4.55:1 Rear Axle Assy. (if required:see "General" on page 1 of Service Bulletin)	C.8951	£21. 0. 0d Exchange.

July,1956.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I Z A T I O N

SERVICE BULLETIN NO.192.

VARIOUS SERVICING ITEMS.

SPEEDOMETER DRIVE - OIL WORKING UP CABLE.

Model affected.
2.4 litre.

If complaints are received of oil working up the speedometer cable the following rectification procedure should be adopted.

Non-overdrive cars.

Fit a modified type of Speedometer drive assembly C.12256 which incorporates a lip type rubber seal in the bore of bearing assembly. The speedometer drive assembly is supplied complete with the driven gear and it is IMPORTANT that the assembly is not dismantled before fitting.

Overdrive cars.

Disconnect the speedometer cable at the overdrive rear extension. Remove the screw and washer retaining the speedometer drive gear bearing and withdraw the assembly.

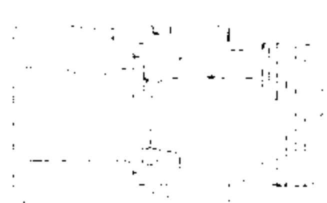
Withdraw the drive gear from the bearing.

Drill out the steel pin retaining the brass adapter to the phosphor-bronze bearing.

Unscrew the adapter from the bearing by means of the flats provided.

Remove the rubber seal from the recess in the bearing. Fit a new seal part number C.8773 so that the open end of the seal, through which the spring is visible, is to the bottom of the recess.(see sketch).

Screw the adapter into the bearing fully. If necessary, drill a new 1/16" (1.5 mm.) hole not more than 7/32" (5.5 mm.) in the side of the bearing; fit a mild steel pin, peen over and file flush.



Index Reference - Section M.

LOSS OF WATER FROM COOLING SYSTEM.

Model affected.
2.4 litre.

If complaints are received of appreciable loss of water from the Cooling system a check should be made at the two following points.

1. Cylinder Head.

Check that the domed cylinder head nuts are threaded to the bottom of the bore. If an unthreaded portion exists at the bottom of the hole increase the length of the thread by means of a 7/16" ANF. tap.

2. Radiator Filler Cap.

Check the cap and seating on the radiator filler neck for surplus solder, dirt or excess paint. Also ensure that the rubber faced pressure valve is seating properly on the rim in the radiator filler neck.

To check for efficient sealing of the filler cap run the engine at 3,000 r.p.m. for half a minute and note if an undue amount of water escapes from the radiator overflow pipe.

Note. Complaints of this trouble have only been received in respect of the 2.4 model, but similar trouble could conceivably be experienced on the Mark VII and XK.140 models in which case the above checks should be made.

Index Reference - Section D.

RENOLD HYDRAULIC CHAIN TENSIONER- SPARES KIT.

Models affected.	Engines affected.
Mark VII	After number D.9869
XK.140	after number G.4431
2.4 litre.	From commencement of production.

A spare kit for servicing the Renold type of chain tensioner part number C.10332 is available under part number SD.1042.

This kit comprises the following items:-

Cylinder assembly	1 off	Bottom plug	1 off
Spring	1 off	Tab washer	1 off

Index Reference - Section B.

Amendment to Service Bulletin No.191.Page 4.

Add the following details to the list of parts required:-

Qty.	Description.	Part No.
4	Propeller shaft bolt	C.11207
4	Washer	C.787
4	Nut	NN.737/L
4	Split Pin	L.102.5/S.

SEPTEMBER.1956.

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.193.

VARIOUS SERVICING ITEMS

REAR ENGINE MOUNTING - COIL SPRING TYPE.

Model Affected.	Commencing Chassis No. R.H.Drive.	Commencing Chassis No. L.H.Drive.
2.4 model.	902169	940973

On cars with the above chassis numbers and onwards a coil spring type of rear engine mounting is fitted in place of the rubber type of mounting.

The parts affected are as follows:-

Part Number.		No. off.	Remarks.
C.12298	Engine Mounting coil spring (3.5/32" long).	1	Non-overdrive cars.
C.12299	Engine Mounting coil spring ($3\frac{1}{2}$" long).	1	Overdrive cars.
C.12292	Channel support assy.	1	
FW.108/T	Washer	2	
C.12295	Spring Retainer assy.	1	

Assembly Procedure.

It will be found advantageous to remove and refit the coil spring mounting and channel support as an assembly. The coil spring mounting should be kept under compression and connected to the channel support by fitting a large flat washer to the bottom of the rubber bush and inserting a rod through the hole provided in the bottom of the centre pin. The rod should be 1/8" diameter and one end formed into a loop to enable the rod to be withdrawn after the assembly has been removed or refitted.

This also applies when removing or refitting the engine and gearbox.

Index Reference - Section B.

cont'd overleaf.

ENGINE STABILIZER - CORRECT ASSEMBLY.

Model affected.
2.4 litre.

When reassembling the stabilizer at the rear of cylinder head, on refitting the engine, the following procedure must be adopted.

1. The front and rear engine mountings must first be connected and tightened up.

2. Screw the lower flanged washer up the stabilizer pin until the flange contacts the bottom of the stabilizer rubber mounting. The washer is slotted on its upper face and can be screwed up the pin by engaging a thin bladed screwdriver in the slot through the centre hole of the rubber mounting.

3. Fit the upper flanged washer and tighten down with the self-locking nut.

Failure to observe the above procedure may cause engine vibration and/or fouling of the gearbox in the cowl owing to the engine being pulled up on its mountings.

Index Reference - Section B.

REAR ROAD SPRING FRONT MOUNTING PLATE.

Model affected.	Commencing Chassis Nos.	
2.4 litre.	R.H.Drive.	L.H.Drive.
	902220	941010

On cars with the above chassis numbers and onwards a front mounting plate consisting of a one piece pressing is fitted in place of the fabricated type of front mounting plate.

Details of the new parts are as follows:-

Part Number.		No. off.
C.12343	Front mounting plate.	2
UFS.131/8R	Bolts.	4

Interchangeability.

The new mounting plate C.12343 is interchangeable with the previous type but they must be fitted in pairs, and the longer bolts detailed above fitted at the rear mounting points.

Index Reference - Section K.

SEPTEMBER, 1956.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 194

VARIOUS SERVICING ITEMS.

SOLEX CARBURETTERS - WEIR TYPE.

Model affected.	Commencing Engine Nos.
2.4 litre.	BB.3118

On cars with the above engine number and onwards modified carburetters which incorporate a weir in the float chamber, are fitted.

Identification.

Weir type carburetters can be identified outwardly by the number 72 stamped on the accelerator pump housing; previous carburetters were stamped with the number 75.

	7 to 1 Compression Ratio.		8 to 1 Compression Ratio.	
	Part No.	Size.	Part No.	Size.
Carburetter complete-front.	C.12220	-	C.12250	-
Carburetter complete-rear.	C.12219	-	C.12251	-
Choke.	6654	23 mm.	4984	24 mm.
Main jet.	4981	115	4981	115
Air Correction jet.	6655	200	4977	180
Emulsion tube.	+ 6612	14	+ 6612	14
Pump jet.	4982	55	4982	55
Pilot jet	+ 6614	50	+ 6614	50
Pilot air bleed.	+ 6613	1.2 mm.	+ 6613	1.2 mm.
Needle Valve.	4989	1.5 mm.	4989	1.5 mm.
Needle valve washer.	4990	1.0 mm.	4990	1.0 mm.
Starter petrol jet.	4979	GS.105	4979	GS.105
Starter air jet.	4978	GA.4.5	4978	GA.4.5

+ denotes change in size from previous carburetters.

High Altitude - Adjustments required.

The adjustments required for high altitude operation with this type of carburetter are as follows:-

5,000 - 10,000 ft.   Reduce main jets from 115 to 110.
Above 10,000 ft.   Reduce main jets to 105.

No alteration to the pilot jets are necessary.

Index Reference - Section C.

SOLEX CARBURETTERS - SERVICING PROCEDURE.

Model affected.
2.4 litre.

To facilitate the servicing of the 2.4 litre carburetters and to reduce the number of jets to be held in stock, carburetters fitted prior to Engine Number BB.3118 can be brought up to the latest condition (as for the 'weir' type carburetters see above) in jets sizes by fitting all the items listed overleaf.

cont'd overleaf...

Engine Numbers.
BB. 1001 - BB.2396

	Part No.
Choke Tube(8 to 1 compression)	4984
Choke Tube(7 to 1 compression)	6654
Air Correction Jet(8 to 1) compression.	4977
Air Correction Jet(8 to 1 compression)	6655
Needle Valve	4989
Emulsion tube	6612
Pilot jet	6614
Pilot air bleed	6613

Engine Numbers.
BB.2397 - BB.3117

	Part No.
Emulsion tube.	6612.
Pilot jet	6614
Pilot air bleed.	6613

In both cases a type 72 accelerator pump (Part Number 6646) must be fitted in place of the existing type 73 pump. Note that when connecting the pump lever to the push rod the split pin should be inserted in the centre hole of the three.

Index Reference - Section C.

ENGINE OIL LEVER - REVISED METHOD OF CHECKING.

Model affected.
2.4 litre.

The revised procedure for checking the engine oil level is as follows:-

Check the oil level with the car standing on level ground and when the engine has reached its normal operating temperature.

The previous recommendation (Page 22 of the Operating Maintenance and Service Handbook) was for the level to be checked before starting the engine from cold.

Index Reference - Section B.

ENGINE REFILL CAPACITY.

Model affected.
2.4 litre.

The quantity of oil required to replenish the engine after draining and refilling the sump and oil filter is as follows:-

11 Imperial pints. 13¼ U.S.pints. 6¼ litres.

This amount of oil will bring the level above the top mark on the dipstick, but the level will fall as soon as the engine has been run.

The quantity of 13 Imperial pints quoted in the handbook and Service Bulletin No.178 is the total capacity of the engine and this amount will only be required when replenishing a completely dry engine.

Index Reference - Section B.

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J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 195.

VARIOUS SERVICING ITEMS.

CLEANING OFF LANOLIN.

Models affected.
ALL.

Engine parts liable to corrosion are coated with Lanolin before cars leave the factory and it has been assumed that this would be cleaned off before the car was delivered to the customer.

It would appear, however, that this has not always been carried out and we would request that Distributors and Dealers ensure that engines are cleaned down prior to delivery.

Index Reference - Section Q.

'FLY-OFF' HANDBRAKE.

Model affected.	Commencing Chassis Nos. R.H.Drive.	Commencing Chassis Nos. L.H.Drive.
XK.140 Open 2-seater.	800072	812647
Fixed head coupe.	804767	815755
Drop head coupe.	807441	818729

On cars with the above chassis numbers and onwards a 'fly-off' type of handbrake is fitted.

The operation of this type of handbrake should be explained to owners collecting a new car. That is, to release the handbrake pull back the lever and allow it to 'fly-off'; to apply the handbrake pull back the lever and press down the button.

Index - Reference - Section L.

STATIC IGNITION TIMING.

Model affected.
2.4 litre. 8 to 1 compression ratio.

The static ignition timing for all 8 to 1 compression ratio 2.4 litre engines has been changed from 10° B.T.D.C. to 6° B.T.D.C. (1¾" flywheel teeth).

Amend Service Bulletin No.178 and the 2.4 litre Operating, Maintenance and Service Handbook in accordance with the above information.

Index Reference - Section B.

CONT'D OVERLEAF..

SUMP STRAINER COVER PLATE.

Model affected.
2.4 litre.

Commencing Engine Nos.
BB.5024

On cars with the above engine number and onwards copper washers Part No.FW/105/E are fitted to the cover plate studs in the base of the sump.

If trouble is experienced with oil leakage at this point the above washers should be fitted in addition to the spring washers.

Index Reference - Section B.

OVERDRIVE CONVERSION - FITTING OF PACKING PIECES.

Model affected.
2.4 litre.

When carrying out a conversion to overdrive as described in Service Bulletin No.191 it is necessary ,if they are not already installed, to fit 4 aluminium packing pieces(Part No.C.11427) and 8 longer setscrews (UFB.131/9R) between the rear engine mounting channel support and the body floor. This will ensure that no fouling takes place between the overdrive unit and the gearbox cowl).

Amendment to Service Bulletin No.191.

Add the above parts to the 'Material Required' on Page 4 with the remark 'If not already fitted'.

Index Reference - Section F.

Amendment to Service Bulletin No.189.

A more suitable type of lamp for fitting to the 1946-48, $1\frac{1}{2}$, $2\frac{1}{2}$ and $3\frac{1}{2}$ litre models to conform with the new rear lighting regulation is as follows:-

Jaguar Part Number.	Lucas type & service number.		No. off.
C.8266 (right hand)	L.549	53341	1
C.8267 (left hand)	L.549	53340	1

This is the type of rear lamp that is fitted to the Type 'M' Mark VII.

Amendment to Service Bulletin No.183.

The commencing chassis numbers for the modification to the 'Panhard Rod' are transposed and should read:-

R.H.Drive.	L.H.Drive.
900480	940020

SEPTEMBER, 1956.

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO. 196.

GEARBOX IDENTIFICATION.

The following details are issued to assist Distributors and Dealers in identifying the various types of gearboxes and the gears which are fitted to each type. This information supplements that already given in Service Bulletin No. 145.

It will be appreciated that it is more than ever important to quote the gearbox number together with any prefix or suffix letters when ordering parts for a particular gearbox.

The details given below apply to gearbox types:-

JH, JL, JLN, GB, GBN, SH, SL. JLE.

	STANDARD RATIO	CLOSE RATIO.
IDENTIFICATION	No suffix letters after gearbox number.	Suffix letters to gearbox number. CR or MS.
GEARBOX RATIOS.		
Top.	1:1	1:1
3rd.	1.367:1	1.21:1
2nd.	1.982:1	1.74:1
1st.	3.375:1	2.98:1
Reverse	3.375:1	2.98:1
CONSTANT MESH GEARS - NUMBER OF TEETH.		
Constant pinion.	26	28
Constant wheel (layshaft)	39	37

PART NUMBER OF GEARS.	JH, JL, JLE, JLN, GB, GBN,	SH, SL.	CR.	MS.
Constant pinion	C6751	C.1836	C.9252	C.8912
Mainshaft-1st speed gear.	C2040	C.1897	C.2040	C.1897
" -2nd speed gear.	C4125	C.4118	C.4125	C.4118
" -3rd speed gear.	C4123	C.4117	C.4123	C.4117
Layshaft -constant wheel.	C2045		C.5826	
" -1st speed gear.	C2041	C.1857	C.2041	
" -2nd speed gear.	C2047		C.2047	C.8913
" -3rd speed gear.	C2046		C.2046	

cont'd overleaf..

PROTECTIVE TREATMENT ON NEW CARS

To preserve the exterior finish, cars now being produced are treated with a protective wax coating.

This protective coating must be removed when the car is being prepared for delivery to the customer or before the car is placed in your Showrooms.

REMOVAL OF PROTECTIVE COATING.

1. Wash car to remove any grit or abrasive dirt.
2. Remove wax using white spirit (petroleum distillate) or petrol applied with mutton cloth or similar non-abrasive cloth.
   Use of petrol having alcohol must be avoided.
3. Polish car.

Index Reference - Section Q.

October 1956.

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N.

SERVICE BULLETIN NO.197

REAR ROAD SPRINGS

2.4 Litre Model

REAR ROAD SPRINGS - CHANGE IN TYPE.

Models affected.	Commencing Chassis number	
	R.H.Drive	L.H.Drive
2.4 litre	902882	941156

On cars with the above chassis numbers and onwards modified rear springs are fitted incorporating synthetic rubber buttons in the ends of the spring leaves. The part number of the rear spring (C10791) is unchanged.

Index Reference. Section K.

REAR ROAD SPRINGS - MODIFICATION TO OVERCOME KNOCKING OR CREAKING.

Model affected.
2.4 litre

If complaints of knocking or creaking from the rear springs are received gaiters should be fitted in accordance with the following instructions. This modication applies only to springs NOT fitted with synthetic rubber buttons. (see above).

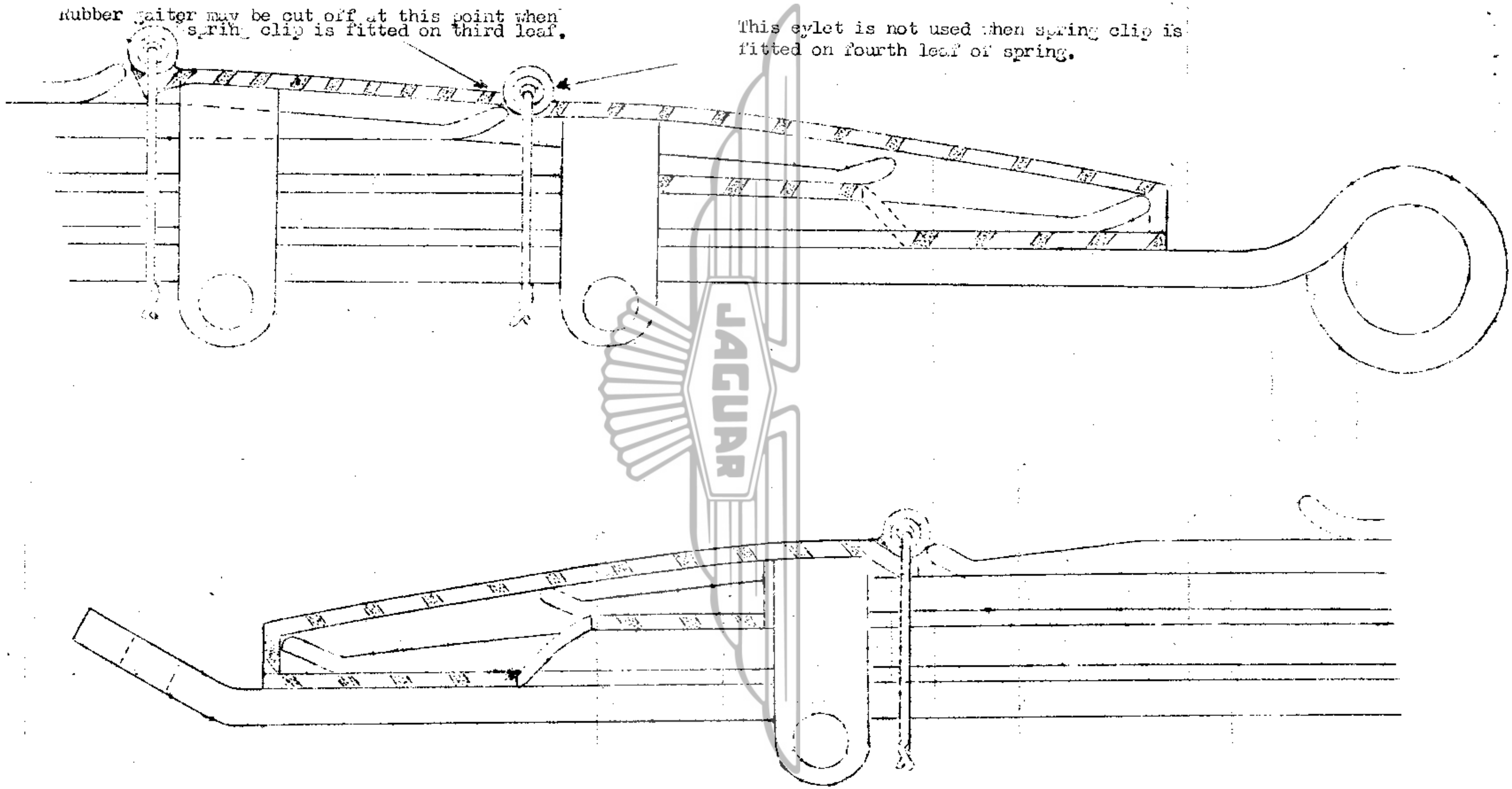
Parts required.

C12521	Rubber gaiter-short (Front end of spring)	2 off
C12518	Rubber gaiter-long (Rear end of spring)	2 off
C12668	Spring clip bolts	4 off

Fitting Instructions.

1. Remove rear springs as described in Service Bulletin No.182.
2. File off the peened over ends of the spring clip bolts and remove the bolts and distance pieces.
3. Separate the second and third longest leaves at each end of the spring by means of wedges.
4. Fit the rubber gaiters to the ends of the spring leaves; the longer gaiter is fitted to the rear of spring or spring eye end, as shown in the following sketch.
5. Secure the rubber gaiters to the spring by means of locking wire; pass the locking wire through the ferrules in the end of the gaiter and twist wire together against the main leaf inward of the spring clip.
   Note. When the spring clip at the eye end of the spring is fitted on the 3rd leaf the extended portion of the gaiter may be cut off as shown in the following sketch.
6. Fit new spring clip bolts C12668 and peen over ends. Do NOT refit the distance pieces to the spring clip bolts.
7. Refit rear springs to car.

Index Reference Section K.


Rubber gaiter may be cut off at this point when spring clip is fitted on third leaf.
This eylet is not used when spring clip is fitted on fourth leaf of spring.

October 1956.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.198.

VARIOUS SERVICING ITEMS.

AUTOMATIC TRANSMISSION - OVERHAUL KITS.

Models affected.	Effective from
Mark V11 Automatic Transmission	Automatic Transmission
XK.140 Automatic Transmission	Serial Number J.2426

Kits of gaskets and seals for use when overhauling or repairing Automatic transmission units are available from the Jaguar Spares Department under the following part numbers:-

SD.1049 Overhaul gasket set.
SD.1050 Repair kit of seals.

These kits are only for use on first speed start transmission units, that is, with effect from the above serial number.

Index Reference. Section FF.

LOSS OF WATER FROM COOLING SYSTEM.

Model affected.
2.4 litre.

If complaints of an appreciable loss of water from the cooling system cannot be cured by following the instructions given in Service Bulletin No.192 the following check should be made:-

1. Remove the cylinder head.

2. Check if any fouling has taken place between the projection of the machined face at the left-hand side (Looking from the rear) of the cylinder block adjacent to No.1 cylinder and the raised boss at the same corner of the cylinder head.

3. Whether there is evidence of fouling or not, file a chamfer to eliminate the cylinder block face projection.
   Note: No alteration is necessary to the other cylinder block face projection adjacent to No 4 cylinder.

4. Refit the cylinder head.

On current production cylinder heads the milled joint face is extended so that no fouling can occur. These cylinder heads can be recognised by the fact that the raised bosses at the left hand and right-hand sides of the cylinder head are of unequal width.

Index Reference. Section D.

SPEEDOMETERS - DETAILS

Model Affected.
2.4 Litre.

The following information is issued to assist in the identification of speedometer for the variations of the above model.

Model.	Axle Ratio.	Jag:Part Number	Smiths Code Number	Cable Revs. per mile.
Non-overdrive	4.55:1			
		MPH. C9637.	51-116-303-00	1300
		KPH. C9638.	51-116-303-01	820
Non-overdrive	4.27:1			
		MPH. C11591	SN.6303-10	1240
		KPH. C11592	SN.6303-11	760
With overdrive	4.55:1			
		MPH. C11593	SN.6303-02	1400
		KPH. C11594	SN.6303-03	860
Police Cars. Non-overdrive	4.55:1			
		MPH. C12115	SN.45752	1325
Non-overdrive	4.27:1			
		MPH. C12202	SN.6303-12	1240
With-overdrive	4.55:1			
		MPH. C12116	SN.45755	1400

Note. The Smiths code number and cable revolutions per mile are marked on the speedometer dial.

Index Reference. Section P.

DOORS-CHANGE IN MATERIAL.

Model Affected.
XK.140

	Commencing Chassis numbers R.H.Drive	L.H.Drive
Fixed H.Coupe	804781	815773
Drop H.Coupe	807447	818796

On coupe cars with the above chassis numbers and onwards, steel doors are fitted in place of aluminium alloy doors.

Index Reference. Section N.

Amendment to Service Bulletin No.195.

The information at the end of the first paragraph under the heading "Static Ignition Timing" should read (1½ flywheel teeth) and not (1½" flywheel teeth.)

October 1956.

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.199

VARIOUS SERVICING ITEMS

SOLEX WEIR CARBURETTERS - MODIFICATION TO WEIR.

Model affected.
2.4 litre.

If complaints are received on cars fitted with "Weir" type carburetters (see Service Bulletin No.194) of the engine "cutting out" when taking bends at high speed the following modification should be carried out.

1. Remove the carburetters from the engine.
2. Remove the float lid and float.
3. Remove the jet marked "Main Jet holder"
4. Using a 4mm drill through the main jet passage make a small spot in the weir to locate the smaller drill to follow. With a 2.5 mm drill make a hole completely through the weir.
5. Clean out the drilling swarf from the float chamber.
6. Reassemble carburetters and refit to engine.

Index Reference. Section C.

SPEEDOMETER CABLES - NYLON INSERT TYPE.

Models affected.		Commencing Chassis numbers	
		R.H.Drive	L.H.Drive
XK.140	Standard transmission.		
	Open 2 seater	800074	812707
	Fixed H.Coupe	804781	815778
	Drop H.Coupe	807447	818801
	Overdrive Cars		
	Open 2 seater	800072	812735
	Fixed H.Coupe	804784	815784
	Drop H.Coupe	-	818830
	Auto:Transmission cars.		
	Fixed H.Coupe	804677	815532
	Drop H.Coupe	807387	818493

On cars with the above chassis number and onwards a modified type of speedometer cable with a nylon insert at one end of the inner cable is fitted. The part numbers are as follows:-

Standard transmission	C.8303
Overdrive cars	C.11964
Automatic Transmission cars	C.11965

Interchangeability.

The modified type of cable is interchangeable with the previous types fitted as a complete assembly. The inner cables and outer cables are NOT individually interchangeable.

Index Reference - Section N.

HYDRAULIC DAMPERS - MODIFIED TYPE.

Model affected.	Commencing Chassis numbers	
	R.H.Drive	L.H.Drive
2.4 litre	904285	941631

On cars with the above chassis numbers and onwards modified front and rear hydraulic dampers are fitted. The part numbers are as follows:-

	Old type	New type
Front	C.10841	C.8923
Rear	C.10842	C.8926

Interchangeability.

The new type dampers are interchangeable with the previous type fitted.

Index Reference. Section J. and K.

November 1956.

J A G U A R

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.201

VARIOUS SERVICING ITEMS.

GEARBOX MAINSHAFT - CORRECT ASSEMBLY.

Attention is drawn to the correct assembly of the following parts of the mainshaft assembly.

First speed wheel to 2nd speed synchronising sleeve.

Ensure that the relieved tooth at the rear end of the first speed wheel is in line with the plunger and ball in the 2nd speed synchronising sleeve. (see Plate F.14 in the Mark V11 and XK120 Service Manual).

3rd/top synchronising sleeve to 3rd/top operating sleeve.

The larger boss of the inner synchronising sleeve must be on the same side as the wide chamfer of the outer synchronising sleeve. The holes in the inner synchronising sleeve for the balls and plungers must be in line with two relieved teeth in the outer synchronising sleeve.

Assembly of 3rd/top synchronising sleeve assembly to mainshaft.

It should be noted that there are two tranverse grooves on the mainshaft splines which take the 3rd/top synchronising sleeve assembly and that one groove is further forward (nearer the spigot end) on the mainshaft than the other.

When fitting the synchronising sleeve assembly to the mainshaft observe -

(a) That the end of the outer sleeve with the wide chamfer is facing forward (towards the spigot end).
(b) That the relieved tooth at the wide chamfer end of the outer sleeve is in line with the foremost groove (nearest the spigot end) in the mainshaft.

Failure to observe operation (b) will result in the locking plungers engaging with the wrong grooves, preventing full engagement of top and third gears.

Index Reference - Section. F.

SCUTTLE VENT SHROUD.

Model affected	Commencing Chassis numbers	
	R.H.Drive	L.H.Drive
2.4 litre	905061	941767.

On cars with the above chassis numbers and onwards a shroud is fitted to the scuttle vent aperture to prevent the ingress of water behind the instrument panel when the car is driven in the rain with the vent open.

If such complaints are received the shroud can be fitted to cars prior to the above chassis numbers by carrying out the following procedure.

Fitting Instructions.

The part required are as follows:-

BD.12487.	Scuttle vent shroud		1 off.
UCS.519/3H.	Countersunk screw. 10 UN.C. $\frac{3}{8}$" long		3 off.
BD.5440/4.	Square nut.		3 off.

Open the scuttle vent fully. Remove the gauze by unscrewing the three screws. From underneath the vent lid remove the two nuts, spring and flat washers and lift off the lid. Remove the lid sealing rubber.

Using the shroud flange as a template mark the positions for the three securing screws at the rear end of the scuttle vent aperture. With a 3/16" drill make three holes for the screws; countersink with a $\frac{3}{8}$" drill.

Fit the three screws and start the nuts on the threads. Enter the flange of the shroud between the nuts and the body and tighten screws.

If the shroud is in contact with the sealing rubber for the recirculation door prise the centre of the plate forward.

Refit the sealing rubber, vent lid and gauze.

Index Reference. Section N.

TRACK ROD - CORRECT FITTING PROCEDURE.

Model affected.
2.4 litre.

As the track rod ends are fitted with rubber bushes it is essential that steering drop arm and idle lever are parallel to the centre line of the car before tightening up the track rod end nuts. Failure to observe this procedure will cause undue torsional loading of the rubber bushes, resulting in premature failure and a possible tendency for steering wander.

Index Reference. Section I.

November 1956.

JAGUAR

SERVICE AND SPARES ORGANISATION.

SERVICE BULLETIN NO.202

VARIOUS SERVICING ITEMS

BRAKE LININGS - CHANGE IN TYPE.

Model affected	Commencing Chassis Number. R.H.Drive	L.H.Drive
2.4 litre	905431	941795

On cars with the above chassis numbers and onwards the leading shoes of the front brakes only are fitted with M.S.3. linings in place D.M.52. material.

Service Procedure.

If complaints of brake grab on light pedal application or persistent brake squeal are received, brake shoes with M.S.3. linings should be fitted at the front brake leading shoe position only. The leading shoe is the foremost of the two shoes on either the right-hand or left-hand side, that is, the shoe adjacent to the smaller diameter of the wheel cylinder.

The parts affected are as follows:-

		Jag:Part Number	Lockheed Part Number
Brake shoe complete with M.S.3. lining.		6792	89121
M.S.3. lining only	Export Only.	6798	89125
Rivets (12 off per shoe)	Export Only.	2586	KLB 48045

Index Reference. Section L.

BRAKE SERVO CYLINDER - LUBRICATION.

Models affected
Mark V11

The Silicone M.S.4 compound recommended in Service Bulletin No.177 is superseded by "Molytone C" available in 2 ounce tubes (Part number 6763, from the Jaguar Spare Parts Department.

Index Reference. Section L.

BRAKE REPAIR KITS.

Model affected.
2.4 litre.

The following repair kits for the overhaul of the brake hydraulic system are available from the Jaguar Spare Parts Department.

	Part number
Master cylinder kit.	6592.
Front wheel cylinder kit.	6594.
Rear wheel cylinder kit.	6595.
Vacuum servo kit.	6596.
Servo vacuum piston kit.	6597.

Index Reference. Section L.

CLUTCH HYDRAULIC SYSTEM - REPAIR KITS.

Model affected.
2.4 litre.

The following repair kits for the overhaul of the clutch hydraulic system are available from the Jaguar Spare Parts Department.

	Part number
Clutch master cylinder kit.	6593
Clutch slave cylinder kit.	6053.

Index Reference. Section [illegible].

SOLEX CARBURETTERS - CHANGE IN MAIN JET.

Model affected.	Commencing Engine Number
2.4 litre	BB.7113

On cars with the above engine number and onwards the main jets are reduced in size from 115 (part number 4981) to 110 (part number 6748).

High Altitude - Adjustments required.

The adjustments required for high altitude operation are as follows:-

5,000-10,000 ft. Reduce main jets from 110 to 105 (Part Number 6747)
Above 10,000 ft. Reduce main jets to 100 (Part number 6811).

Amendment to Service Bulletin 194.

Under the heading "Solex Carburetters - Servicing Procedure" page 2 add:-

Prior to Engine number 7113

	Part number
Main Jet (110)	6748

Index Reference Section C.

November 1956.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN 203

VARIOUS SERVICING ITEMS

ENGINE SUMP.- CHANGE FROM ALUMINIUM TO STEEL

Model affected	Commencing Engine Number
2.4 litre	BB.9001

On cars with the above engine number and onwards a pressed steel sump is fitted in place of the cast aluminium sump used previously.

The principal parts affected by this change are as follows:-

Part number		No.off.
C9155.	Sump (pressed steel)	1.
NS131/5D	Sump strainer cover bolts	8.
C12532	Oil filter assy.	1.
C12381	Oil filter blanking plate	1.
C12534	Oil filter banjo connection	1.
C12533	Oil filter banjo bolt	1.
6153	Aluminium washer - banjo bolt	2.
C12382	Rubber hose - filter to sump	1.
C2905/2	Rubber hose - clip	2.
C12620	Dipstick - oil level	1.

Oil Capacity.

The oil capacity of the pressed steel sump is the same as for the aluminium sump, that is,

	Imp. pints	U.S. pints	Litres
Refill capacity	11	$13\frac{1}{4}$	6.25
Total capacity	13	$15\frac{1}{2}$	7.5

Oil Level.

With the new dipstick C12620 used in conjunction with the pressed steel sump the oil level marking is represented by a knurled patch on the blade.

If the oil level is on the knurled patch with the engine hot or cold no additional oil is required. If the engine has been run immediately prior to making the oil level check, wait one minute after switching off before checking the oil level.

The new dipstick C.12620 is not interchangeable with dipstick C.10369 used on the cast aluminium sump.

Oil Pressure.

With the pressed steel sump the return from the oil pressure relief valve is taken to the rear of the sump via an external pipe.

With this type of return a considerable variation in oil pressure exists between starting from cold, when the pressure may be in the region of 70 to 80 lbs per sq.inch, and with the oil hot when the normal running pressure of 40 to 50 lbs per sq.inch will be registered. With the direct return of the cast aluminium sump the oil pressure does not vary to any extent between starting from cold or when the oil is hot.

Oil Filter Blanking Plate.

With the new type of oil return from the pressure relief valve a blanking plate is fitted between the oil filter head and the flange on the cylinder block.

It is ESSENTIAL, after removal for any reason, that this blanking plate is fitted the correct way round otherwise the oil feed to the bearings will be cut off.

The holes in the blanking plate must match up with the holes in the flange on the cylinder block and blank off the original return hole which is the hole that is drilled completely through the crankcase.

Index Reference. Section B.

PANHARD ROD - CORRECT ASSEMBLY.

Model affected
2.4 litre

There have been certain cases of the rear axle being pulled out of alignment owing to incorrect adjustment when refitting the Panhard rod.

The following points must be observed when refitting the Panhard rod.

1. The full weight of the car must be on the wheels or axle.

2. After screwing the adjusting rod into the tube to enable the Panhard rod to be entered into the brackets fully tighten the securing nut at the rear axle bracket end.

3. Screw out the adjusting rod fully and hold the rod by means of the flats provided while tightening the securing nut at the body bracket end. Secure the adjusting rod by tightening the locknut.

4. When completely refitted the distance between the inner faces of the Panhard rod brackets on the rear axle and the body should be 14 11/16" (37.3 cm).

Index Reference Section K.

January 1957.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO. 204

VARIOUS SERVICING ITEMS.

FITTING LOCK TO PETROL FILLER DOOR.

Models affected.
2.4 litre.

If it is desired to fit a lock to the petrol filler door of the 2.4 litre model a satisfactory job can be made by utilising a Mark V11 petrol filler lock and making up a striker plate to suit.

Procedure.

1. Drill a 11/16" hole at the rear of the door ¾" from the rear edge and 1¾" from the top. File out the hole to take lock.

2. Make up a striker plate 1 15/16" long, 7/16" wide and ½" thick.

3. Remove the top rubber button and offer up the striker plate to suit the lock striker. Drill two 7/32" holes in the depression of the door aperture for securing the striker plate.

4. Mark off the positions of these holes on the striker plate and drill and tap two 3/16" threads.

5. Secure striker plate inside door aperture with two 3/16" countersunk screws.

The part numbers of suitable Mark V11 locks are as follows:-
BD.4360 or BD.9186.

One key will be supplied with each lock and if a further key is required a request should be made on the order.

Index Reference. Section N.

SPEEDO DRIVEN GEAR AND CABLE.

Models affected	Commencing Chassis Number	
	R.H.Drive	L.H.Drive
2.4 litre Non-Overdrive Cars.	906248	941930

On cars with the above chassis numbers and onwards a modified Speedometer drive gear and bearing assembly part number C.12378 and Speedometer cable C.8305 are fitted.

Interchangeability.

This speedometer driven gear has a smaller square hole for the cable than the previous type and therefore Speedometer gear C.12378 and cable C.8305 must only be used in conjunction with each other.

Index Reference. Section M.

- - -

SPEEDOMETER CABLE.

Model affected	Commencing Chassis Numbers R.H.Drive	L.H.Drive
2.4 litre Overdrive models	906251	941930.

On overdrive cars with the above chassis numbers and onwards Speedometer cable Part number C.12756 (78" long) is fitted in place of cable Part number C.8305 (70" long).

Interchangeability.

These two cables are interchangeable as complete assemblies.

MULTI-GRADE OILS - OIL CONSUMPTION

Models affected
A11.

You will be aware that multi-grade engine oils are approved (see Service Bulletins 167 and 175) since this type of lubricant is of value to owners operating in low temperature conditions or under stop-start conditions.

It must however be pointed out that the oil consumption rate with multi-grade oils is in excess of that which applies to the normal grades of engine oils that we recommend. This matter should be pointed out to customers making enquires regarding the use of multi-grade lubricants.

Index Reference. Section B.

VACUUM CHECK VALVE- INTRODUCTION.

Model affected	Commencing Chassis Numbers R.H.Drive	L.H.Drive
2.4 litre	906247	941930

On cars with the above chassis numbers and onwards a check valve is fitted in the vacuum line between the inlet manifold and the brake servo. The check valve is attached to the inlet manifold studs.

The new parts are as follows:-

Part numbers		No.off.
C.12790	Check valve	1
C.12798	Check valve mounting plate	1
C.12796	Inlet pipe	1
C.12797	Outlet pipe	1
C.12795	Hose - check valve	2
C.2905/2	Clips	4
C.12802	Servo banjo union	1
C.8070	Hose - banjo union	1
C.2905/2	Clips	2

Index Reference - Section L.

Additions to Service Bulletin No.200.

Under the heading "Carburetter - needles" add:-
T.L. (7 to 1 compression ratio).
Under the heading "Ignition Timing" add:-
4° B.T.D.C. (7 to 1 compression ratio).

January 1957

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO. 205

VARIOUS SERVICING ITEMS

SPARKING PLUGS - CHANGE IN TYPE

Model affected.	Commencing Engine Number
2.4 litre (8 to 1 compression ratio).	BB. 9234

On cars with the above engine number and onwards Champion N.A.8 sparking plugs are fitted in place of Champion N.8.B.

Servicing Procedure.

When it becomes necessary to change the sparking plugs, Champion N.A.8. type should be fitted on all 8 to 1 compression ratio 2.4 litre engines.

Index Reference. Section B. and P.

PETROL FILLER CAP.

Models affected.
2.4 litre

If trouble is experienced with petrol starvation or if there is evidence of weak mixture a 1/16" (1.5 mm) hole should be drilled through the top of the filler cap. The hole should be drilled in the centre of cap and through the outer skin only; a hole is already drilled through the inner skin of the filler cap.

Index Reference Section C.

SYNTHETIC PAINT - ADDITIONAL COLOURS

Models affected.
Mark V11
Mark V111
XK.140
2.4 litre

The following are additional paint colours to those given in Service Bulletins No's 114,136 and 185. The reference number given for each paint colour is for Quick Air Drying Enamel.

Imperial Maroon	Q.1229
Claret.	Q.1230
Sherwood Green	Q.1231
Cornish Grey	Q.1236
Mist Grey	Q.1235
Indigo Blue	Q.1233
Cotswold Blue	Q.1234

Index Reference. Section N.

STARTER MOTOR - REMOVAL

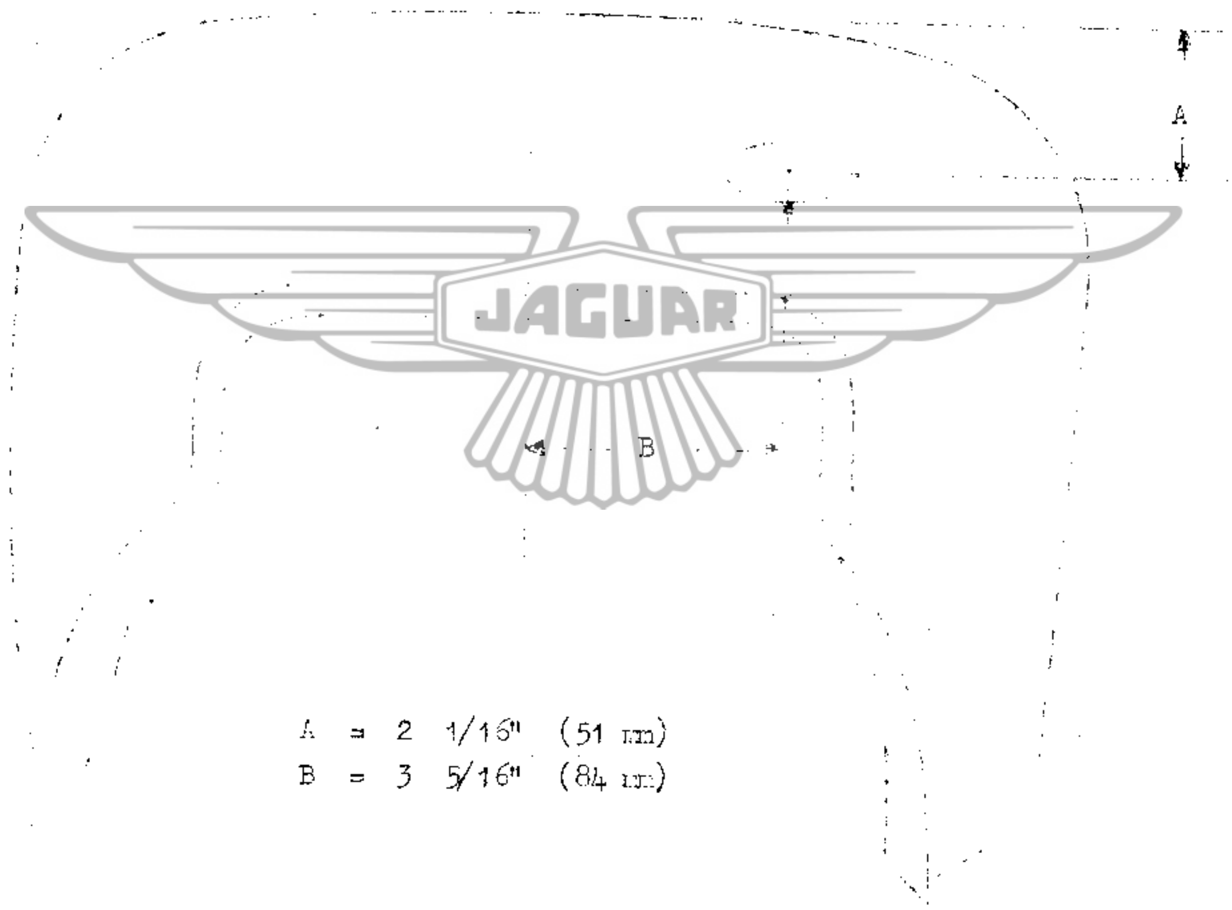
Model affected
2.4 litre

The two bolts securing the starter motor are welded to a semi-circular plate and two securing nuts are fitted adjacent to the clutch housing.

On later cars, access to the top nut is gained through an aperture (covered by a circular plate) on the right-hand side of the gearbox cowl underneath the carpet and anti-drum material.

When removal of the starter is necessary on early cars without this aperture a hole can be made in gearbox cowl at the position shown in the following sketch. After making a suitably sized hole to gain access to the top securing nut, a sheet metal cover plate should be made up and secured with three self-tapping screws.

Index Reference. Section P.



A = 2 1/16" (51 mm)
B = 3 5/16" (84 mm)

REAR HUB PULLER:-

Models affected
MK.V, MK.V11, MK.V111
XK.120, XK.140, 2.4 litre

A service tool for withdrawing rear hubs of the five stud type is available from V.L.Churchill and Co Ltd., Gt.South West Rd, Bedfont, Feltham, Middlesex. The part number is J.1. and the price to the trade is £6.9.4d. nett.

Order for this tool should be placed with Messrs V.L.Churchill direct and not through Jaguar Cars Ltd.

Index Reference. Section H.

January 1957.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 206

PETROL ECONOMY

The following information is issued for the benefit of owners who live in countries where petrol rationing exists.

It is stressed that the following economy measures should only be adopted while the present rationing exists and as soon as sufficient petrol supplies are available the normal carburetter settings should be restored.

It must be understood that with the economy settings, performance will be sacrificed and owners installing the economy settings must be prepared to limit the maximum speed by at no time exceeding 3,000 r.p.m.

If the following recommended economy settings are adopted in conjunction with a suitable driving technique, considerable fuel economy will result.

Warning: If coasting downhill is resorted to, do not switch off the engine on cars fitted with vacuum servo brakes (that is MK.V11, MK.V111 and 2.4 litre, models) otherwise greatly increased pressure on the footbrake pedal will be required to obtain satisfactory retardation.

GENERAL

Sparking Plugs.

While the economy settings are installed, Champion N.A.8 plugs should replace Champion N.8.B where this latter type of plug is fitted as standard.

Multi-grade Engine Oils

Multi-grade oil can be used with advatage in the engine to reduce the use of the choke when starting and will be found particularly beneficial for stop-start driving conditions.

Tyre Pressures.

Increasing the tyre pressures to the "Fast touring" figures, that is, 6lbs/sq.in (.42 kg/cm^2) above the normal pressures, will also assist in economising fuel.

Thermostat.

Ensure that the thermostat is operating correctly and gives a running temperature of 70/75°C.

Air Cleaner

Ensure that the air cleaner element is absolutely clean. If of the wire mesh type, re-oil the mesh sparingly after having thoroughly washed out the mesh in a bath of petrol or paraffin.

If the element is of the felt type and if there is any doubt as to its state of cleanliness it will be found advantageous to fit a new element.

Continued on page 2.

S.U. CARBURETTERS - MK V11, MK V111, XK 140.

The following economy settings are recommended for S.U.Carburetters on models as set out below.

The recommendation is to fit the weak needle and, as far as possible, to limit the maximum revolutions used in any gear to 3,000 r.p.m. By this means a considerable economy will be effected.

An additional economy can be obtained by fitting a cut-out switch to the starting carburetter circuit to reduce the period for which this is engaged. Weakness will be observed, particularly on acceleration, but the cars will all operate satisfactorily up to speeds of 80 m.p.h.

The LBA in the very weak column is usable and will give maximum possible economy. Weakness however, is apparent and with this setting it is necessary to drive with consideration.

The following are the details of economy needles for current models.

MODEL	STANDARD	WEAK	V.WEAK
MK.V11 Std.	SR.	CIW	LBA.
MK.V11 C.Type Head.	SL.	SJ.	
XK.140 Std.	SJ.	LBA.	
XK.140 C.Type Head	WO2	SL.	
MK.V111	TL.	CIW	LBA.

SOLEX CARBURETTERS - 2.4 LITRE.

Ensure that the carburetters are brought up to the latest condition as detailed in Service Bulletin No.194 under the heading "Solex Carburetters - Servicing Procedure." and in No.202 under the heading "Solex Carburetters - Change in Main Jet."

Observe the recommendations under the heading "General".

February 1957.

JAGUAR
SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.207

VARIOUS SERVICING ITEMS

VALVE SPRINGS

Models affected	Commencing Engine Number
Mark V111.	N.6545

On cars with the above engine number and onwards Exhaust Valve springs Part number C.7137 (Inner) and C.7136 (Outer) are fitted, replacing Part number C2271 (Inner) and C2272 (Outer). This makes Valve springs C7137 and C7136 common to both Inlet and Exhaust valves and only these springs will be supplied as replacements.

Amendment to Service Bulletin No.200 A.

On page 1 of Service Bulletin No.200 A amend the details concerning valve springs in accordance with the above information.

Index Reference Section B.

RELINED BRAKE SHOES - (HOME TRADE ONLY)

Model affected.
Mark V11.

A number of braking complaints received have, on investigation, been found to be due to cars fitted with relined brake shoes other than those supplied by Jaguar Cars Ltd., and having brake linings of a different make and type than those we recommend. This has occurred in spite of such lined shoes bearing different suffix letters and colour code to any shown in our Service and Spares literature.

It is MOST IMPORTANT that Distributors and Dealers should avoid such complaints arising by obtaining their brake shoes through the normal Jaguar supply channels, and by ensuring that their existing stocks are correct by both part number and colour code.

The correct details are as follows:-

Front Brakes

Girling Part No.	Ferodo Quality	Colour Code
GB/B.46100 CJ	DM.8 WM	1 blue and 1 yellow stripe
GB/B.46101 CJ	DM.8 WM	

Rear Brakes

Girling Part No.	Ferodo Quality	Colour Code.
GB/B.41470 CF (Leading)	M.S.1.	All blue
GB/B.41471 CF (Trailing)	M.S.1.	All blue

Index Reference. Section L.

Continued on page 2.

RECOMMENDED LUBRICANTS - ADDITIONAL BRAND

Models affected
All.

The following lubricants manufactured by Messrs Alexander Duckham and Co Ltd., are now added to our list of recommendations.

Engine - Summer, 32° - 90°F Winter, below 32° Tropical, above 90°F	NOL Thirty NOL Twenty NOL Forty
Gearbox Carburetter Hydraulic Piston Dampers Distributor Oil Can Lubrication	NOL Thirty
Rear Axle	Hypoid 90
Steering Gear (Mark V11, Mark V111, XK.120, 2.4 litre) Propeller Shaft Needle Bearings	NOL.E.P.140
Wheel Bearings	L.B.10 Grease
Propeller Shaft Spline Water Pump Fan All Chassis Nipples Steering Gear (XK.140)	L.B.10 Grease or H.B.G.
Upper Cylinder Lubrication	Adcoid Liquid
Automatic Transmission	NOLMATIC

Multigrade Engine Oil...... Q.5500

Index Reference. Section Q.

February 1957

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.208

VARIOUS SERVICING ITEMS

BRAKE LININGS - CHANGE IN TYPE

Model affected	Commencing Chassis Number R.H.Drive	L.H.Drive
2.4 litre	906508	941994

On cars with the above chassis numbers and onwards Ferodo M.S.3 brake linings are fitted all round in place of Ferodo D.M.52 linings. NOTE: This change took place at an earlier date at the leading shoe position of the front brakes only - see Service Bulletin number 202.

The new part numbers are as follows:-

FRONT BRAKES

	No.off	Jaguar Part No.	Lockheed Part No.
Brake shoe complete with M.S.3 linings	4	6792	89121
M.S.3 Lining only) Export	4	6798	89125
Rivets) Only.	48	2586	KLB 48045

REAR BRAKES

	No.off	Jaguar Part No.	Lockheed Part No.
Leading shoe R.H.	1	6793	89122
Leading shoe L.H.	1	6794	89123
Trailing shoe	2	6795	89124

Identification.

	Colour of lining.	Colour Code.
D.M.52	Straw	5 blue 5 yellow paint stripes on edge of lining.
M.S.3.	Grey	2 blue 2 yellow paint stripes on edge of lining.

Interchangeability.

Although brake shoes with M.S.3 linings (and M.S.3 linings only for export countries) are interchangeable with D.M.52 type it is IMPORTANT that individual cars are fitted with brake linings to one or other of the following conditions.

Condition 1. M.S.3 linings at the leading shoe position of the Front brakes only. DM.52 linings at all the remaining positions.

Condition 2. M.S.3 linings all round.

Index Reference. Section L.

Continued on page 2.

OIL BATH AIR CLEANERS - MAINTENANCE.

Models affected.
Export models fitted with
oil bath air cleaners.

Remove the top cover. Lift out filter element, and wash element by swishing up and down in a bowl of paraffin and allow to drain thoroughly. Empty oil from the oil base and clean out the accumulated sludge. Fill oil base with engine oil to the level indicated by the arrow. Replace filter element and top cover, ensuring that the gaskets are clean and in good condition. It is unnecessary to reoil the filter element as this is done automatically when the car is driven.

The periods at which procedure must be carried out will vary according to the particular conditions under which the cleaner operates. For Export territories where dust is prevalent once every 1,000 miles may be necessary; as a general rule 2,500 miles can be taken as a safe guide to the proper cleaning period.

Reference - Section C.

REAR BRAKE OPERATING CYLINDER - FIXED PIVOT TYPE BRAKES.

Model affected
Mark V.

For early production cars fitted with fixed pivot type brakes, replacement cylinders may have one of two methods for securing the locating bolt (see Plate L.17 in the Mark V Service Manual.)

(i) Spring Washer
(ii) Locking wire through hole in bolt head.

It is MOST IMPORTANT that the two methods should not be mixed owing to the difference in length of the Bolts. Either the Bolt with Spring Washer or the Bolt with Locking Wire may be used.

If the earlier locating Bolt is used without the washer, the Sleeve will not be free to move, and if the washer is used beneath the Bolt with a hole drilled through the head, the Sleeve could rotate and render the cylinder inoperative.

Careful setting is always necessary to ensure that the full stroke of the cylinder and the expander is available, by locking up the shoes in the drum with the adjuster before fitting a Transverse Wheel Cylinder or adjusting any part of the Handbrake mechanism.

Index Reference. Section L.

February 1957.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.209

VARIOUS SERVICING ITEMS

SPEEDOMETER DRIVEN GEAR AND CABLE.

Model affected.
2.4 litre
Non-Overdrive Cars.

Reference the above subject in Service Bulletin number 204 note that in future speedometer drive gear and bearing assembly (with a small square drive hole) part number C.12378 will be supplied for all 2.4 litre non-overdrive cars.

Where this type of speedometer driven gear is supplied to replace the previous type of driven gear C.12256 with the large square drive hole, that is, prior to chassis numbers 906248 R.H.Drive and 941930 L.H.Drive a speedometer cable C.8305 will also be supplied.

The above remarks supersede those given in Service Bulletin number 192 for non-overdrive cars.

Index Reference. Section M.

SUSPENSION HYDRAULIC DAMPERS - MODIFIED TYPE.

Model affected	Commencing Chassis Numbers R.H.Drive	L.H.Drive
2.4 litre	906500	941985

On cars with the above chassis numbers and onwards higher setting suspension hydraulic dampers (Part numbers C.12692 Front and C.12693 Rear) are fitted.

Service Procedure

When present stocks of the previous type dampers (C.10841 and C.8923 Front and C.10842 and C.8926 Rear) are exhausted only the high setting type will be supplied from the Jaguar Spares Department.

Interchangeability.

The high setting dampers are interchangeable with the previous types fitted but must be fitted in PAIRS to either front or rear and should preferably be fitted in car sets.

Index Reference. Section J.and K.

Continued on page 2.

DRILLED CAMSHAFTS.

Model affected.	Commencing Engine Numbers
Mark V111	N.6662
2.4 Litre	BB.9657

On cars with the above engine numbers and onwards modified camshafts are fitted, to reduce tappet noise when starting from cold.

The modified camshafts have a hole drilled through the base of each cam into the main oilway.

The part numbers of camshafts with this modification are as follows and are fully interchangeable with the previous types fitted.

	Inlet.	Exhaust
Mark V111 ($\frac{3}{8}$" lift)	C.13080	C.13081
2.4 litre (5/16" lift)	C.13082	C.13083

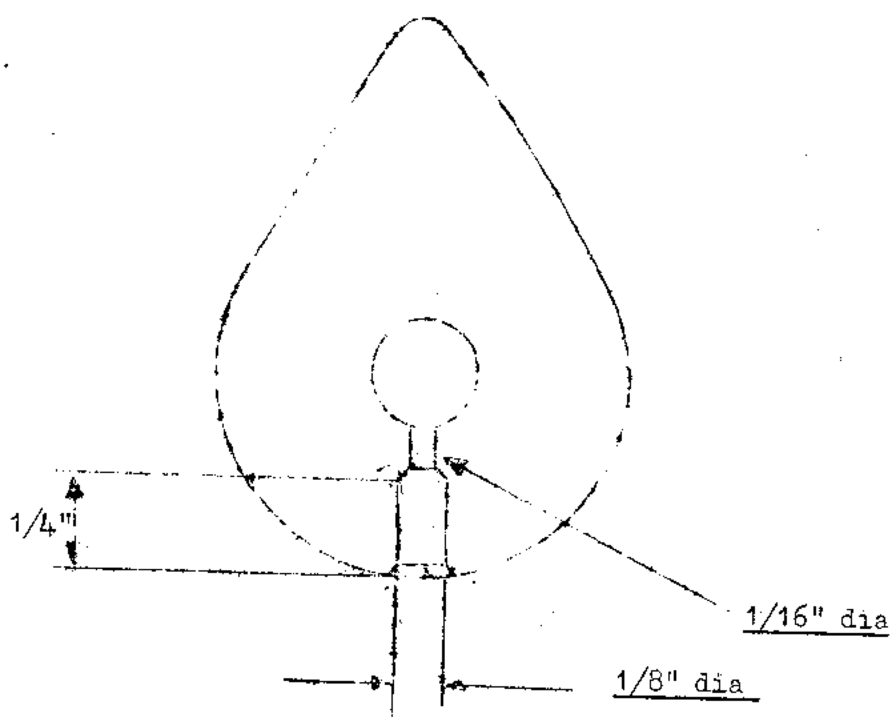
Service Procedure.

If complaints of tappet noise when starting from cold are received this modification can be carried out in service by carrying out the following procedure.

1. Support the camshaft on Vee blocks at the front and rear bearing journals and clamp down the camshaft while drilling each cam.

2. With a high speed drill make an $\frac{1}{8}$" (3 mm) diameter hole $\frac{1}{4}$" (6.35 mm) deep in the centre of the base of each cam and follow through with a 1/16" (1.5 mm) high speed drill until the hole breaks through into the main oilway. (see sketch). Chamfer the edge of the $\frac{1}{8}$" hole to remove the sharp corner.

3. After drilling all the cams thoroughly was out the oilways to remove all traces of drilling swarf.



Index Reference.. Section B.

February 1957.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.210

VARIOUS SERVICING ITEMS.

REAR SPRING MOUNTING - MODIFICATION

Model affected.

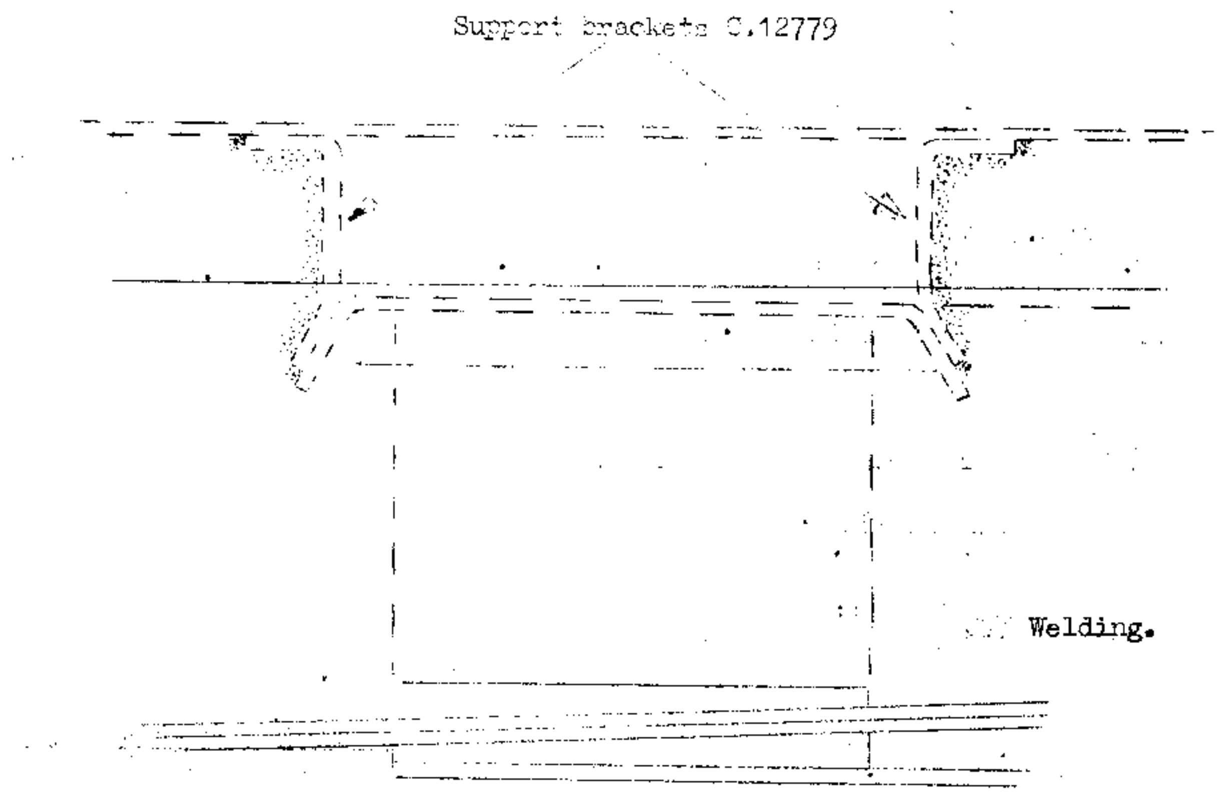
2.4 litre.

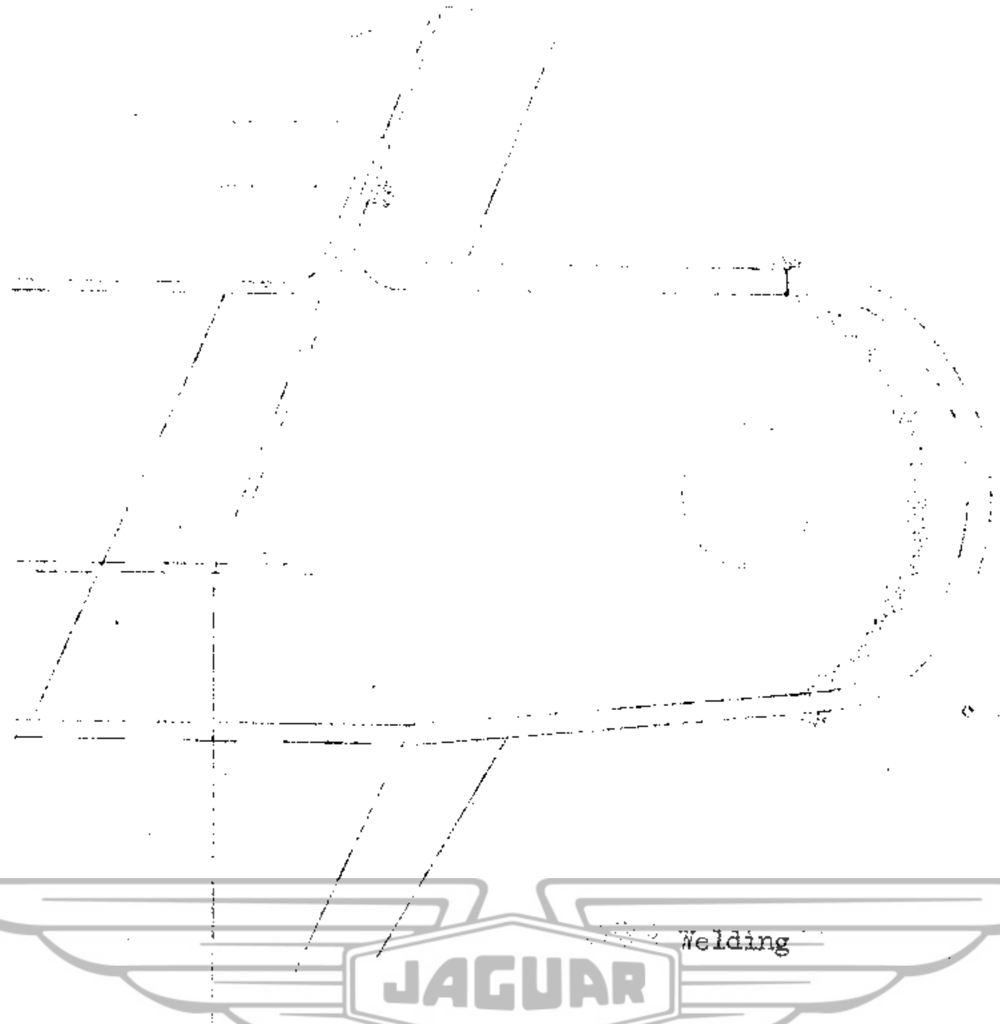
If a complaint of knock from the rear springs is received which cannot be traced to the rear springs themselves, the upper spring mounting clamps (see Fig 2 items 6 and 7 in the Integral. Body/Chassis Repair Manual) should be examined for distortion. If any distortion exists this should be rectified and in addition support brackets, (Part number C.12779) should be fitted and welded between the spring mounting clamp and the spring reinforcing channel (Fig 2, item 5) as shown in the following sketch.

Note:- At the left-hand side a support bracket is fitted at both front and rear of the spring mounting clamp.
At the right-hand side, a support bracket is fitted at the front of the spring mounting clamp only.

While carrying out this modification a semi-circular bracket C.12778 should be welded to the end of the panhard rod bracket on the body as shown in the sketch overleaf.

If the semi-circular edge of the panhard rod bracket has been welded previously, face off the edge until the semi-circular bracket will butt against the top and bottom plates.





Index Reference. Section N.

CYLINDER HEAD GASKET.

Models affected.
Mark V11
XK.120
XK.140
Mark V111
2.4 litre.

In future, the only cylinder head gaskets supplied by the Jaguar Spares Department for the above models will be the steel type Part number C.7861, which supersedes the previous type Klingerite gasket (C.2250) and cupro-nickel gasket (C.3335).

Index Reference. Section B.

REAR ENGINE MOUNTING - COIL SPRING TYPE.

Model affected.
2.4 litre.

On a few occasions we have found that Dealers have fitted a split pin and washer to the centre pin of the rear engine mounting as there is an unused hole at the bottom of this pin.

It is pointed out that this hole is for assembly purposes only (see S.Bulletin No.193) and on no account must a washer and split pin be fitted at this point.

Index Reference. Section Q.

MAY 1957

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.212

VARIOUS SERVICING ITEMS

REAR ROAD SPRINGS - RUBBER INTERLEAVED TYPE

Models affected	Commencing Chassis Numbers	
	R.H.Drive	L.H.Drive
Mark V11	750788	740195
Mark V111	760476	780462

On cars with the above chassis numbers and onwards Rear Springs Part Number C.13109 are fitted replacing Rear Springs Part Number C.7914.

Rear Springs C.13109 are fitted with synthetic rubbers buttons between the spring leaves, and therefore no gaiters are fitted.

Interchangeability.

Rear Springs C.13109 are interchangeable with the previous type C.7914 but should be fitted in pairs.

Index Reference. Section K.

RADIATOR ASSEMBLY

Model affected	Commencing Chassis Numbers	
	R.H.Drive	L.H.Drive
2.4 litre	906964	942194

On cars with the above chassis numbers and onwards Radiator Part Number C.12672 is fitted replacing Radiator Part Number C.8972.

Radiator C.12672 has a separate filler and inlet pipe whereas Radiator C.8972 has the filler incorporated in the inlet pipe.

Note:- Radiator C.12672 is fitted on the 3.4 litre model from the commencement of production.

Interchangeability

Radiator C.12672 is interchangeable with the previous type of radiator C.8972. The radiator hoses are unchanged.

Index Reference. Section D.

VOLTAGE AND CURRENT REGULATOR

Model affected	Commencing Chassis Numbers	
	R.H.Drive	L.H.Drive
2.4 litre	906949	942190

On cars with the above chassis numbers and onwards an RB.310 Voltage and Current Regulator Part Number C.8821 is fitted replacing the RB.106 Voltage Regulator Part Number C.9631. To suit this change chassis harness C.13550 is fitted replacing chassis harness Part Number C.8914.

Interchangeability

The RB.310 regulator is interchangeable with the RB.106 regulator provided the following instructions are carried out.

1. Remove the existing regulator and dispense with the plate on which the regulator is mounted.
2. Join the two wires originally connected to the A and A1 terminal and solder them to a spade terminal. Connect these wires to the "B" terminal on the regulator.
3. Join the two wires originally connected to the "D" terminal and solder them to a spade terminal. Connect these wires to the "D" terminal on the new regulator.
4. Solder a spade terminal to the wire originally connected to the "F" terminal. Connect this wire to the "F" terminal on the new regulator
5. The wire originally connected to the "E" terminal should be taped up and dispensed with, as the RB.310 regulator is earth by the securing screws.
6. Secure the regulator and shield plate to the scuttle with the existing setscrews in the cage nuts already fitted.

Index Reference   Section P.

DISTRIBUTOR SUPPRESSOR

Models affected
Mark V111 cars fitted with ignition suppression
2.4 litre cars fitted with ignition suppression
3.4 litre cars fitted with ignition suppression

Note that the DMBZ type of distributor fitted to the above models incorporates an inbuilt suppressor.

The suppressor normally fitted in the centre terminal post of the distributor is therefore unnecessary and must not be fitted.

Index Reference. Section P.

MAY 1957

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.214

VARIOUS SERVICING ITEMS

"J.S." SUFFIX GEARBOX

Models affected
All

A new type of gearbox with shaved gears which has the suffix "J.S." to the gearbox number is now in production. The gearbox ratios are as follows:-

Top	1:1
3rd	1.283:1
2nd	1.86:1
1st & rev	3.378:1

The importance of quoting the gearbox number together with both the prefix and suffix letters is again stressed when ordering spare parts for a particular gearbox.

The parts which vary from other production gearboxes are as follows:-

C.11931	Front End Cover	1	J.L. and S.L. prefix ser
C.11934	Front End Cover Oil Seal	1	
C.11932	Locknut - Front Bearing	2	
C.11933	Tab Washer for Locknut	1	
C.10200	Constant Pinion Shaft	1	
C.10208	3rd/Top Synchro Sleeve	1	
C.10201	1st Speed Mainshaft Gear	1	
C.10202	2nd Speed Mainshaft Gear	1	
C.10203	3rd Speed Mainshaft Gear	1	
C.10204	Countershaft Cluster	1	
C.10205/1	Reverse Gear Assy	1	
C.10209	2nd Speed Synchro Sleeve Assy	1	
C.10210	Spacer for Needle Rollers	1	
C.10206/1	Thrust Washer (.471"/.472" thick)	2	Front and rear of
C.10206/2	Thrust Washer (.473"/.474" thick)	2	2nd and 3rd speed
C.10206/3	Thrust Washer (.475"/.476" thick)	2	Mainshaft Gears
C.12178	Clutch Housing Assy	1	G.B. prefix series
C.11934	Clutch Housing Oil Seal	1	

Note: With the "J.S." type gearbox the constant pinion shaft is located by a nut and locknut and a smaller front oil seal is fitted.

Index Reference   Section F.

CARBURETTER NEEDLES - CHANGE IN RECOMMENDATION

Model affected
3.4 litre

The recommended carburetter needle for the above model is changed from L.B.1 to T.L. Service Bulletin No.211 should be amended in accordance with this information.

Index Reference - Section C.

CHASSIS SIDE MEMBER ASSEMBLY - SERVICE CONDITION

Models affected
2.4 litre
3.4 litre

A service condition of the body chassis side members (Item 1, Fig 2 in the Repair Manual for Integral Body/Chassis Construction) will, in future, be obtainable from the Jaguar Spares Department.

This assembly is a more suitable condition for repair work and consists of the complete chassis side member back as far as the front mounting point of the rear springs, with all the brackets and reinforcements etc, but less the front jacking bracket.

The part numbers of the "Service condition" chassis side members are as follows:-

471/102	Right-hand
471/103	Left-hand

and comprise -

371/022-3	Member Chassis Side Assy, less -
171/700-1	Longitudinal Member Rear
371/714-5	Bracket Attachment Front Jacking Tube Assy
371/712-3	Bracket Attachment Rear Jacking Tube Assy
171/702-3	Extension Rear - Chassis side
171/852	Brackets Front Mounting Plate Rear Springs

Index Reference - Section N.

PANEL VALANCE ASSEMBLY - SERVICE CONDITION

Model affected
2.4 litre
3.4 litre

A service condition of the Panel Valance will, in future, be obtainable from the Jaguar Spares Department.

This condition is the panel valance (Item 11 Fig 2) but complete with all the captive nuts which are not included on the production condition 171/088 Right-hand and 171/089 Left-hand

The part numbers of the "Service Condition" panel valances are as follows:-

471/100	Right-hand
471/101	Left-hand

Index Reference - Section N.

JULY 1957

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.216.

VARIOUS SERVICING ITEMS

HYDRAULIC CHAIN TENSIONER FILTER.

Models affected	Commencing Engine Number
2.4 litre	BC.1881
3.4 litre	KE.2705
Mark V111	N.8252
XK.150	V.1191

On cars with the above engine number and onwards a conical filter gauze (Part number C.13457) is fitted to the oil feed hole for the hydraulic chain tensioner in the cylinder block.

Service Note.

If the hydraulic tensioner is removed for any reason on engines prior to the above numbers a filter gauze can be fitted to the cylinder block. The gauze should be inserted into the hole pointed end first until the ferrule is located by the small shoulder in the hole.

Index Reference - Section B.

RADIATOR GRILLE FRAME AND BONNET TOP MOTIF

Model affected.	Commencing Chassis Numbers R.H.Drive	L.H.Drive
Mark V111.	761116	780870

On cars with the above chassis number and onwards the radiator grille and bonnet top motif are die-cast alloy the previous types being brass.

The part numbers of the relevant parts are as follows:-

	1st Type. (Brass)	2nd Type. (Die-cast)
Radiator grille frame	BD.12294	BD.12745 - J24
Bonnet top motif	BD.12301	BD.14154
Jaguar mascot base.	BD.12717	BD.12253

Index Reference - Section N.

CARBURETTER INSULATING WASHER.

Model affected.	Commencing Engine Number.
2.4 litre	BC.2011

On cars with the above engine number and onwards Carburetter insulating washer Part number C.13562 replaces C.11549.

In future, only the latest type washer will be supplied from the Jaguar Spares Department.

Index Reference - Section C.

Continued.....

REMOVAL OF WAX COATING ON NEW CARS.

Further to Service Bulletin No.196 which gave instructions for the removal of the protective wax coating on new cars, experience has shown that the following procedure is advantageous. The use of paraffin is advised instead of petrol or white spirit (petrol distillate.)

The following procedure should now be adopted:-

1. Place car on wash.
2. Remove all dust and grit by thoroughly hosing down car, using high pressure hose.

   NOTE:- Do not dry car.

3. Dissolve wax coating, using paraffin liberally, applied by mutton cloth or similar non abrasive cloth.
4. Dry off car using compressed air only.
5. Polish car in normal way, using liquid polish, not wax polish.

The time required for the complete operation is four hours per car.

Index Reference - Section Q.

WHEEL BEARING ADJUSTMENT

Model affected.
XK.150

Note that on cars fitted with disc brakes the end float of the wheel bearing must be kept to a minimum otherwise the brakes may tend to drag and not function correctly.

The correct end float for both front and rear wheel hub bearings is .003" to .005" (.07 to .13 mm).

Adjustment of the front wheel bearings is by means of the hub nut which should be tightened until there is no end float, that is, when rotation of the hub feels slightly "sticky." The hub nut should be slackened back one castellation and the split pin inserted in the nearest hole.

Adjustment of the rear wheel bearings is by shims between the flanges of the axle tubes and the caliper mounting plates. The normal procedure applies but it will be necessary to remove the brake caliper, brake disc and hub before access to the shims is gained. Installation instructions for the brake assemblies are given in the Disc Brake booklet for the XK.150 model.

Index Reference - Section J. and H.

JULY 1957

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.217

VARIOUS SERVICING ITEMS.

OIL FILTER AND BLANKING PLATE - MODIFIED TYPE

Model affected.	Commencing Engine Number
2.4 litre	BC.2256
3.4 litre	KF.3054

On cars with the above engine numbers and onwards a modified type of oil filter is fitted.

The modified type of oil filter has a dome nut to retain the oil pressure relief valve and has a straight outlet adaptor for the hose to the oil sump whereas the previous type of filter had a banjo connection.

The modified blanking plate has a "dimple" formed in the plate to ensure that it cannot be fitted the wrong way round.

The part affected by this change are as follows, the remaining parts are as for the previous type of oil filter C.12532.

Part Number	Description	No. off
C.12776	Oil filter, complete (FA.2720)	1
6884	Canister assembly	1
6886	Pressure plate at bottom of canister	1
6885	Bolt through canister	1
6877	Filter head assembly	1
6882	Outlet adaptor for attachment of hose to oil sump	1
6881	Sealing washer on outlet adaptor	1
6883	Sealing ring between filter head and canister	1
6879	Spring for relief valve	1
6154	Dome nut retaining relief valve spring	1
6880	Washer under dome nut	1
C.12803	Blanking plate between filter head and cylinder block	1
C.13091	Gasket at each side of blanking plate	2
NB.131/15D	Bolt (short) securing oil cleaner to cylinder block	2
C.12861	Hose between oil filter and oil sump	1

NOTE:- Oil filter C.12776 may be used to replace oil filter C.12532 providing the following parts are also changed:-

Fit C.12803 Blanking plate to replace C.12381
Fit C.13091 Gasket to replace C.12177
Fit C.12861 Hose to replace C.12382
Fit NB.131/15D Bolt to replace C.NB.131/11D

Index Reference - Section B.

WINDSCREEN WIPER MOTOR - CHANGE IN TYPE

Model affected.	Commencing Chassis Numbers.	
	R.H.Drive	L.H.Drive
Mark V111	760989	780777
2.4 litre	907359	942311
3.4 litre	970327	986134

On cars with the above chassis numbers and onwards a DR 3 type windscreen wiper motor is fitted replacing the DR.1 type motor.

The part numbers are as follows:-

	Mark V111	2.4 and 3.4 litre	
		R.H.Drive	L.H.Drive
Windscreen wiper motor	C.13501	C.13503	C.13504
Windscreen wiper motor harness	C.13485	C.13492	C.13492

The motor cables should be connected to the lead cables at the snap connectors as follows:-

Green with white tracer	to White
Green with blue tracer	to Blue
Green with brown tracer	to Brown
Green with yellow tracer	to Yellow
Green with red tracer	to Red
Green	to Green.

The connections to the two speed wiper switch are as follows:-

	Mark V111.	2.4 and 3.4 litre
Terminal Number 1.	-	Black
2.	Green with blue	-
3.	Green with brown	Green with yellow
4.	Black	-
5.	Green with yellow	Green with brown
6.	Green with red	-
7.	Green with white	-
8.	-	Green with blue
10.	-	Green with white
11.	-	-
12.	-	-
13.	-	Green with red

Index Reference - Section P.

SPARKING PLUGS - CHANGE IN DESIGNATION

Models affected
All

In the near future Champion sparking plugs will have a simplified type designation. The new designations for sparking plugs fitted to current production vehicles are as follows:-

Old designation	New designation.
L.10 S	L.7
N.8 B	N.8
NA 8	N.5
NA 10	N.3

Note that this is a numbering change only and involves no change in the heat value for individual sparking plugs. Under the new system a lower number indicates a colder plug.

Index Reference - Section B and P.

AUGUST 1957.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.220

VARIOUS SERVICING ITEMS

OVERDRIVE HYDRAULIC PRESSURE

The following are the working oil pressures for overdrives fitted to the various model and should be referred to when testing the hydraulic pressure as a check for faulty operation of an overdrive unit.

	Pressure	Overdrive unit type
Mark V11	480-500 p.s.i.	28/1270
Mark V111	480-500 p.s.i.	28/1270
XK.140		
Early cars	420-440 p.s.i.	28/1390
Later cars	480-500 p.s.i.	28/1482
2.4 litre	350-370 p.s.i.	28/1369
3.4 litre	420-440 p.s.i.	28/1474
XK.150	480-500 p.s.i.	18/1516

Index Reference - Section F.

BRAKE AND CLUTCH MASTER CYLINDERS - IDENTIFICATION

Models affected
2.4 litre
3.4 litre

The brake and clutch master cylinders are now fitted with an hexagon end plug in place of a circular end plug.

The means of differentiating between the two cylinders remains the same, that is:-

The brake master cylinder has a plain hexagon.
The clutch master cylinder has a groove at each point of the hexagon.

Note that some cars have been fitted with one cylinder having an hexagon end plug and the other a circular end plug.

Index Reference - Section L.

Continued ......

OIL FILTER ELEMENTS AND SEALING RINGS - SUMMARY

The following is a summary of the oil filter elements and sealing rings (fitted between canister and filter head) for all post-war models.

ELEMENTS

Jaguar Part No.	Tecalemit Part No.	Remarks
1523	FG.2312	1946-8 1½ litre R.H.D.
1527	FG.2346	1946-8 1½ litre L.H.D.
1526	FG.2306	1946-8 2½/3½ litre Mark V 2½ and 3½ litres 2.4 litre 3.4 litre XK.150
1535	FG.2383	XK.120 up to Eng.No.W.4382
1538	FG.2388	XK.120 for W.4383 and subs Mk.V11 up to Eng.No.B.5304
1550	FG.2421	MK.V11 for B.5305 and subs XK.140 "C" Type.
6691	FG.2326	"D" Type XK.'SS'

SEALING RINGS

Jaguar Part No.	Tecalemit Part No.	Remarks
C.1088/W	-	1946-8 1½/2½/3½ litres Mk V 2½ and 3½ litres
5911	137353	XK.120 Mark V11 up to Eng.No.B.5304
5180	137365	Mark V11 for B.5305 and subs XK.140,"D" Type, XK 'SS'. 2.4 litre up to Eng.No.BC.2255 3.4 litre up to Eng.No.KE.3053
6883	137493	2.4 litre for BC.2256 and subs 3.4 litre for KE.3054 and subs XK.150

Index Reference - Section B.

AUGUST 1957

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.221

VARIOUS SERVICING ITEMS

ENGINE COMPRESSION PRESSURES.

Models affected
Mark V111
XK.150
2.4 litre
3.4 litre

The following are the compression pressures at starter cranking speed for the current production range of vehicles.

Compression pressures should be taken with all sparking plugs removed, carburetter throttles wide open and engine at normal operating temperature (70° C approx)

7 to 1 compression ratio	8 to 1 compression ratio
125 p.s.i. (approx) (8.79 kg/cm²)	155 p.s.i. (approx) (10.90 kg/cm²)

The compression pressures for previous models fitted with the XK type engine are:-

7 to 1 compression ratio	8 to 1 compression ratio
110 p.s.i. (approx) (7.73 kg/cm²)	120 p.s.i. (approx) (8.44 kg/cm²)

Index Reference - Section B.

PROCEDURE TO OVERCOME FOULING BETWEEN WATER HOSE AND TIMING COVER SETSCREWS

Model affected	Cars affected
XK.150	Prior to chassis numbers F.H.Coupe 834380 L.H.Drive D.H.Coupe 837005 L.H.Drive

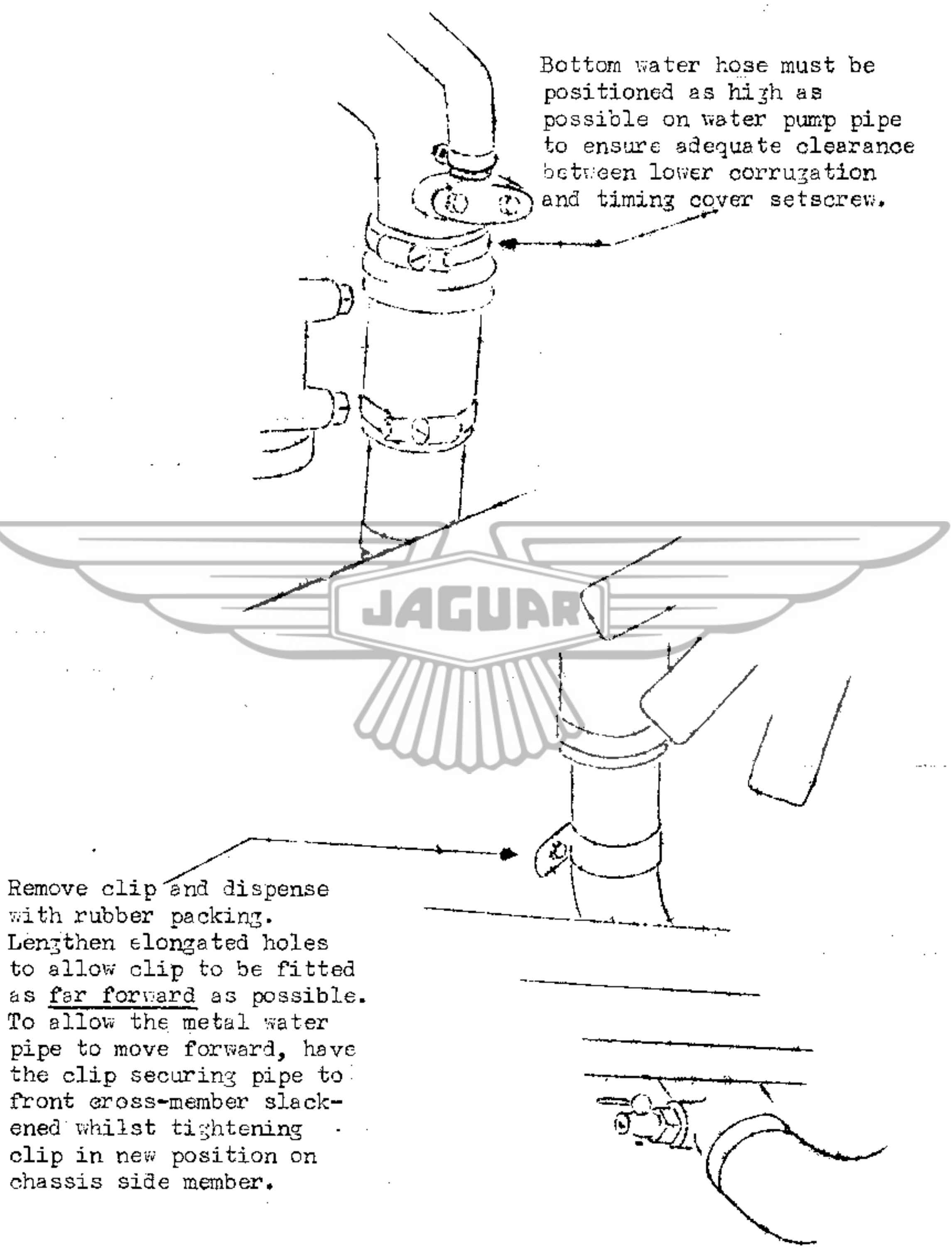
In some instances, on left hand drive cars prior to the above chassis numbers, the water hose between the water pump and the metal pipe may be positioned too close to the timing cover with consequent chafing between the hose and timing cover setscrews.

Distributors and dealers are, therefore, requested to examine all XK.150 cars prior to the above chassis numbers, which come into their premises, for adequate clearance between the hose and timing cover setscrews. If insufficient clearance exists the following rectification procedure should be carried out and if chafing of the hose has occured a new hose (Part number C.12924) must be fitted.

Continued...

Rectification Procedure

Carry out the instructions detailed on the following sketch.



Index Reference - Section B.

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S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.222

WINDSCREEN WIPER MOTOR - REPLACING TYPE DR1 WITH TYPE DR3.

Models affected.
Mark V11
XK.140
Mark V111
2.4 litre
3.4 litre

See Service Bulletin No.217 for introduction point of DR3 type motor.

As present stocks of DR1 wiper motors become exhausted DR3 motor will be supplied as a service replacement. The DR3 wiper motor and the DR1 motor are similar type units, both being two speed, self-parking wipers, the main difference between the two units being that whereas with the DR1 the mounting pillars are secured to the motor portion, the pillars are cast as part of the gearbox with DR3 units. Therefore a conversion bracket Jaguar Part number 7259 (Lucas Part number 744144) will be necessary with each DR3 replacement which when bolted to the DR3 mounting pillars, will allow the new unit to be fitted as a direct replacement for the DR1 motor.

NOTE:- When replacing the DR1 motor on the 2.4 litre model it will be found that the conversion bracket is not necessary, since the DR3 mounting pillars will fit directly into the holes drilled in the wheel valance after removing the DR1 complete with the original fixing bracket.

Fitting Instructions.

1) Disconnect the cables and remove the original motor from the vehicle. To disconnect the crosshead and flexible rack, the circlip (or hexagon nut on earlier DR1 motors) around the gear shaft on the underside of the gearbox should be removed. This will allow the final gear assembly to be partially withdrawn so that the connecting rod can be lifted clear of the crosshead.

2) Remove the gearbox cover and circlip from the replacement DR3. Partially withdraw the final gear assembly and connecting rod, and attach the crosshead to the connecting rod. Push the final gear back into its original position and replace the circlip and gearbox cover

3) Fit the conversion bracket to the motor, and bolt the assembly in position on the vehicle.

Wiring Instructions.

1) Cut off the original five connectors from the wiper motor harness, and solder on the five "bullet" connectors.

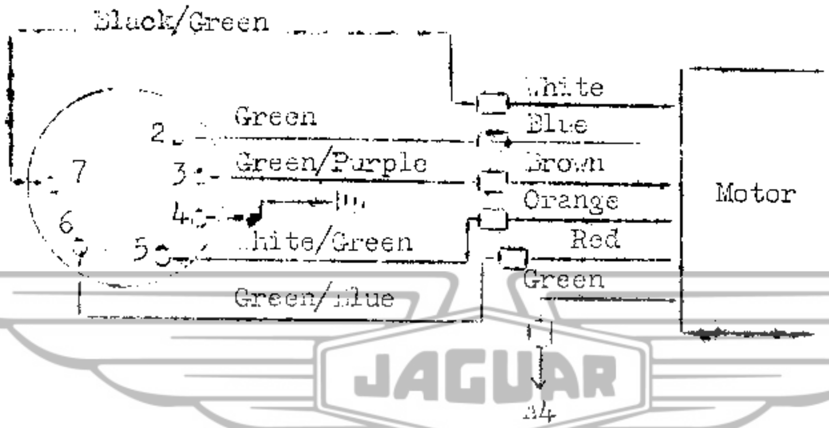
2) Using rubber snap connectors, connect the leads from the DR3 motor to the harness, as illustrated below. (it will be seen from the two circuits that two methods of wiring are involved dependent on whether the vehicle is equipped with a Model PRS5 or PRS7 panel switch.)

Continued....

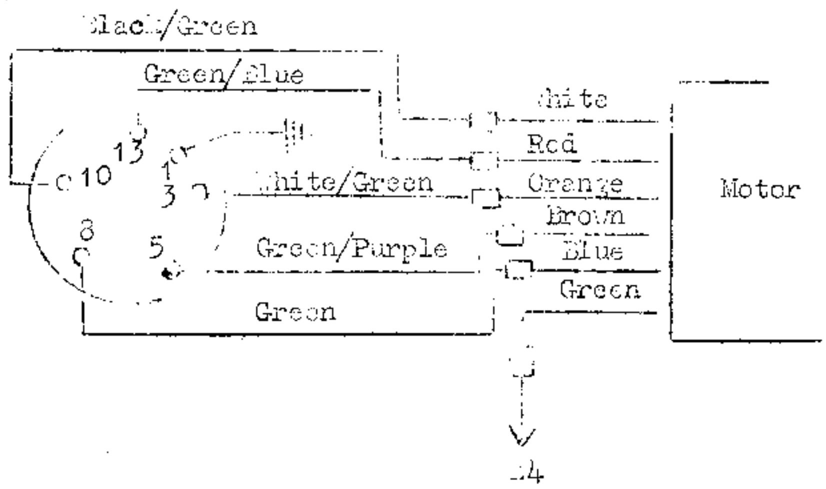
3) It will be necessary to remove and tape up the green cable feeding the panel control switch, since it is no longer required. (With PR55 switches, the feed cable is connected to terminal 2; with PR57 switches, the feed cable is connected to terminal 8) Using the length of green cable supplied with the replacement motor, connect the green lead from the motor to the "A4" fuse box terminal.

NOTE:- The PR55 type switch is fitted to the Mark VII and Mark VIII model; the PR57 is fitted to the XK.140, XK.150, 2.4 and 3.4 litre models.

If on testing the wiper it is found that the blades fail to park correctly, the parking position can be corrected by turning the knurled adjusting nut located near the gearbox cable outlet, one or two serrations at a time until the correct position is obtained.



DR3 Motor and PR55 Switch



DR3 Motor and PR57 Switch

Index Reference - Section P.

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S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.223.

VARIOUS SERVICING ITEMS

DYNAMO SPEED - INCREASE.

Model affected	Commencing Engine Number
Mark V111	N.8974
2.4 litre	BC.2959
3.4 litre	KE.3888
XK.150	V.1599

and onwards

On cars with the above engine number/the dynamo speed has been increased by the fitting of a smaller dynamo pulley. The length of the fan belt has been shortened to suit.

The details are as follows:-

	Dynamo Pulley Size	Dynamo Pulley Part Number	Fan Belt Part Number
Mark V111	3"	C.13594	C.13595
3.4 litre	3"	C.13594	C.13595
XK.150	3"	C.13594	C.13595
2.4 litre	3⅜"	C.13592	C.13593

Index Reference - Section P.

TOP DEAD CENTRE MARKS - LOCATION

Model affected
2.4 litre-Automatic Transmission model
3.4 litre-Automatic Transmission model

On the above models T.D.C. indication is provided at the left-hand side of the converter housing, below the left-hand camshaft cover.

A T.D.C. mark, visible through a hole in the converter housing, is stamped on the converter behind the starter ring gear which should be aligned with the mark scribed on the converter housing and crankcase.

Index Reference - Section B.

Continued ....

CYLINDER BLOCK - REAR COVER AND SEALING RING

Models affected	Commencing Engine Numbers
2.4 litre	BC.3048
Mark V111	N.9062
3.4 litre	KE.4018
XK.150	V.1631

On cars with the above engine numbers and onwards the cylinder block rear cover (Part number C.2258) and sealing ring (Part number C.2332) are of a modified type.

On the modified type the Allen headed cap screws are inserted from the top instead of from the bottom as on the previous type.

Interchangeability.

As stocks of the earlier type of rear cover and sealing ring are now exhausted, it will be necessary, on all XK type engines prior to the above numbers, to fit both items as an assembly.

Index Reference - Section B.

ANTI-CREEP SOLENOID VALVE

Model affected		Commencing Chassis Numbers	
		R.H.Drive	L.H.Drive
Mark V111		761907	781082
3.4 litre		971141	986771
XK.150	F.H.Coupe	824046	834491
	D.H.Coupe	-	837030

On automatic cars with the above chassis numbers and onwards Anti-creep solenoid valve Part No.C.12750 is fitted replacing Part number C.6857.

Solenoid valve Part number C.12750 (Lucas Part number 76502D) is of a larger diameter than C.6857 but the two parts are interchangeable.

Index Reference - Section FF.

Amendment to Service Bulletin No.220

Under the heading "Sealing Ring" delete Tecalemit Part number 137365 and insert Part number 137494.

In the "Remarks" column for Element, Jaguar Part number 1550 add "Mark V111".

In the Remarks column column for Sealing Ring, Jaguar Part number 5180 add "Mark V111".

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JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.224

VARIOUS SERVICING ITEMS

OVERDRIVE THROTTLE SWITCH - ADJUSTMENT

Model affected

Mark V11 Overdrive models.

Mark V11 cars are fitted with H.D.6 type carburetters which have no throttle adjusting screws it is therefore necessary to adjust the overdrive switch by a different method to that given on page 16 of the Mark V11 Overdrive Service Manual.

The procedure is as follows:-

1. Check that the idling speed of the engine is 500 r.p.m, if not, adjust the slow running by rotating the two volume screws by exactly equal amounts. Switch off engine.

2. Engage top gear.

3. With a screwdriver short out the C1 and C2 terminals on the top relay secured to the wing valance. The overdrive solenoid will then be heard to engage with a click and the manual switch warning light will become illuminated.

4. Slacken the pinch bolt securing the operating lever to the spindle of the throttle switch.

5. By trial and error position the operating lever on the spindle so that when the carburetter spindles are rotated, the full throttle stops on the spindles move approx $\frac{1}{8}$" before the overdrive solenoid is heard to disengage and the warning light in manual switch goes out.

Index Reference — Section P.

OVERDRIVE THROTTLE SWITCH - ADJUSTMENT

Model affected
XK.150

The throttle switch is located in a bracket situated between the two carburetters.

1. Check that the idling speed of the engine is 500 r.p.m, if not, adjust the slow running by rotating the two volume screws by exactly equal amounts. Switch off engine.

2. Slacken the locknut and screw down the switch until the plunger in the centre of the switch is fully depressed by the lever on which it operates. Tighten the locknut.

Index Reference - Section P.

Continued....

ADJUSTMENT OF REVERSE LIGHT AND STARTER CUT-OUT SWITCH.

Models affected.
2.4 and 3.4 litre Automatic Transmission

On the above models the Starter cut-out and Reverse light switch is situated behind the dash casing and is connected to the manual selector control linkage.

The purpose of the switch to ensure that (i) the starter motor circuit is only operative when the manual selector lever is in the P (Park) or N (Neutral) so that the engine cannot be started when the transmission is in any one of the driving ranges (ii) the reverse light is closed when the manual selector lever is in the R (Reverse) position and the ignition is switched on.

The method of adjustment for the switch is as follows:-

1. Remove dash casing.

2. Raise the boot lid so that the reverse light can be seen through the rear window.

3. Switch on the ignition. Place the selector lever in the R (Reverse) position so that the centre line of lever is in line with the letter R; move lever $\frac{1}{8}$" - $\frac{1}{4}$" (3 - 6 mm) towards the L position.

4. Slacken the nut securing the switch bracket to the radio mounting bracket. Move the switch bracket until the reverse light becomes illuminated and tighten the securing nut.

Test the operation of the starter switch with the manual selector lever in the P N and D positions. The starter should operate only when the lever is in the P or N position.

Note:- When testing in the "D" position apply the footbrake firmly.

Index Reference - Section FF.

REAR BRAKE SHOE RETURN SPRINGS.

Model affected
Mark V11

On early Mark V11 cars the return spring (Part number 2515 or GB 41734) at the wheel cylinder end of the rear brake assembly was fitted between a pin in the backplate and the leading shoe. On later cars the return spring is a double formation spring (Part number 6169 or 48185) which is fitted between the leading and trailing shoes.

Interchangeability

The latest type spring can be fitted in place of the early type.

Index Reference - Section L.

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S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 225

VARIOUS SERVICING ITEMS

PROCEDURE TO OVERCOME HANDBRAKE COMPENSATOR FOULING BODY

Model affected

3.4 litre
2.4 litre cars fitted with handbrake compensator

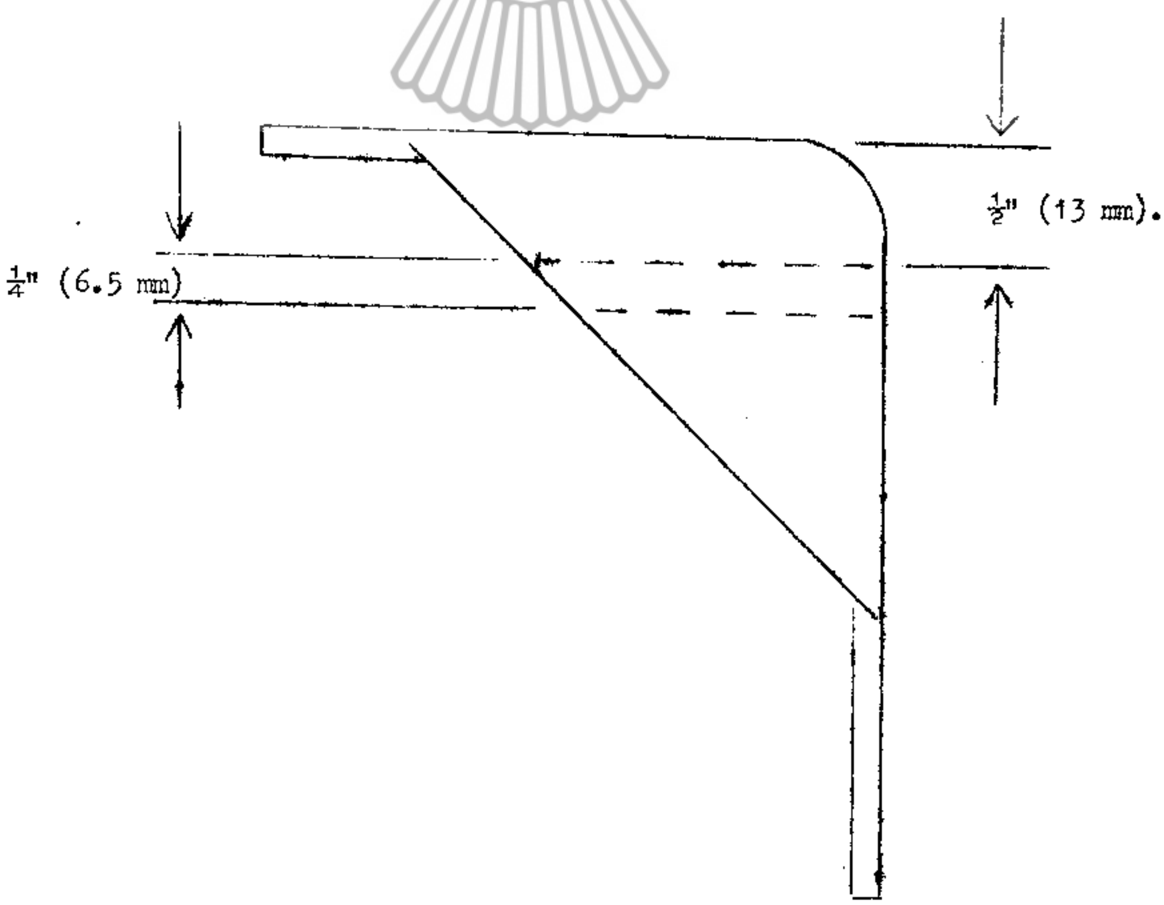
Under full bump conditions there is a possibility that the handbrake compensator fitted to the rear axle may foul the bottom of the luggage boot floor giving rise to a knock from the rear of the car.

Rectification Procedure.

1. Remove the handbrake compensator bracket which is secured by two of the rear axle cover screws.

2. With a hacksaw cut out a ¼" (6 mm) strip of metal to reduce the effective height of the bracket. Weld the two halves of the bracket together. (see sketch).

NOTE: Do not cut more than ¼" (6 mm) from the bracket, or when assembled the cross wires may foul the torque arms.



Index Reference - Section L and N.

Continued...

PRESSURE "BUILD-UP" IN HYDRAULIC SYSTEM

Model affected
Mark V11
Mark V111

A number of complaints of pressure "build-up" in the hydraulic system have been traced to blockage of the breather hole in the brake fluid supply tank filler cap.

Blockage of the breather hole is usually due to an accumulation of brake fluid and dirt on top of the filler cap and is usually indicated by an escape of air pressure when the cap is removed.

Rectification Procedure

1. Clean out the existing breather hole and wash cap in methylated spirits. Lift the spring retainer on the inside of the cap to allow hole to be cleaned.

2. Drill a further 1/16" (1.61 mm) diameter breather hole at 90° to the existing breather hole and $\frac{3}{8}$" (9.5 mm) from the centre of the cap.

3. Obtain a 1/16" or 3/64" (1.6 or 1.2 mm) split pin and cut off legs to a length of $\frac{1}{2}$" (12.5 mm). Insert the split pin in the hole from the top and bend the legs at right-angles at $\frac{1}{8}$" (3 mm) from the bottom of each leg.

Ensure that the split pin is a free sliding fit in the hole.

Index Reference - Section L.

BRAKE SERVO - AIR CLEANER

Models affected
XK.150
2.4 litre cars fitted with disc brakes
3.4 litre cars fitted with disc brakes

On the above types of cars fitted with the large type brake servo ($6\frac{7}{8}$" diameter) an air cleaner is fitted to air intake of the servo.

Maintenance

Every 5,000 miles (8,000 kilometres) the air cleaner should be removed and washed in methylated spirits. After drying out re-lubricate the wire mesh with brake fluid.

Location.

On the XK.150 model the air cleaner is connected directly to the brake servo which is situated in a compartment at the rear of the left-hand front wheel opening.

On the 2.4 litre and 3.4 litre the air cleaner is attached to the right-hand wing valance.

Index Reference - Section L.

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S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.226

VARIOUS SERVICING ITEMS

WHEEL BEARING ADJUSTMENT - CARS WITH DISC BRAKES.

Models affected

2.4 litre cars with disc brakes
3.4 litre cars with disc brakes

Further to Service Bulletin No.216 dealing with Wheel bearing adjustment on the XK.150 model, attention is drawn to the importance of keeping the end-float of the wheel bearings to a minimum, on cars with disc brakes.

In production, the end float of both front and rear wheel bearings will be set at between .003" - .005" (.07 - .13 mm) on both cars fitted with disc and drum brakes.

When setting the end-float in service it is IMPORTANT that on cars fitted with disc brakes the end-float does not exceed .005" (.13 mm).

On cars fitted with drum brakes a wider tolerance of .003" - .008" (.07-.2mm) for the rear wheel bearing end float is permitted.

Index Reference - Section J and H.

INLET VALVE GUIDES - LONGER TYPE

Model affected	Commencing Engine Numbers.
Mark VIII	N.8478
3.4 litre	KE.3025
XK.150	V.1281

On cars with the above engine numbers and future, plus certain individual engines prior to these numbers, longer inlet valve guides are fitted.

The details are as follows:-

	1st Type	2nd Type
Length	1¾"	1 13/16"
Part Number	C.9867	C.7260

The 2nd type inlet valve guides are interchangeable with the first type in complete sets.

Index Reference - Section B.

REVISED MARKING ON IGNITION COILS

Models affected

All

The markings SW (switch) and CB (contact breaker) for the coil terminals is to be replaced by the positive sign (+) and the negative sign (-).

On positive earth circuits the lead from the distributor must be connected to the + (positive) terminal of the coil and the lead from the ignition switch to the - (negative) terminal.

On negative earth circuits the connections must be the reverse, ie distributor to - (negative) terminal and switch to + (positive) terminal.

Index Reference - Section P.

SILENCERS AND TAILPIPES

Model affected	Commencing Chassis Numbers	
	R.H.Drive	L.H.Drive
3.4 litre	970[illegible]77	986554

On cars with the above chassis numbers and onwards modified silencers and tailpipes are fitted:-

The details are as follows:-

	1st type Part number	2nd type Part number
Twin silencer assy	C.12717	C.13578
Inner silencer only	C.13225	C.13578/1
Outer silencer only	C.13226	C.13578/2
Inner tail pipe	C.12723	C.13577
Outer tail pipe	C.12724	C.13576
Mounting bracket	C.12725	C.13609

Interchangeability

The above parts are not interchangeable.

Index Reference - Section M.

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S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO.227

VARIOUS SERVICING ITEMS.

RADIATOR GRILLE AND FRONT WINGS - STANDARDISATION BETWEEN 2.4 AND 3.4 LITRE

Model affected	Commencing chassis numbers R.H.Drive	L.H.Drive
2.4 litre	907974	942465

On cars with the above chassis numbers and onwards the wider 3.4 litre type of radiator grille is fitted. The front wings and the intake for the air cleaner situated behind the grille are modified to suit.

The parts affected by this change are as follows:-

Part Number		No.off
BD.13161	Radiator Grille Assy	1
BD.12448	Medallion	1
BD.11499	Medallion Backing Piece	1
BD.12558	Medallion Packing Piece	1
BD.13160	Medallion Box Assy	1
371/196	Front wing assy. Right-hand	1
371/197	Front wing assy. Left-hand	1
C.12709	Air Intake Adaptor	1

Index Reference - Section N.

PETROL FILTER - INTRODUCTION

Model affected	Commencing Engine Numbers
2.4 litre	BC.3161

On cars with the above engine number and onwards a Petrol Filter (Part number C.13681) is fitted. The filter is attached to the inlet manifold, and is of the glass bowl type with a flat filter gauze.

Maintenance.

Every 5,000 miles (8,000 kilometres), or more frequently if the glass bowl shows signs of becoming full of sediment, slacken the locking nut, swing the retaining clip to one side and remove the bowl, sealing washer, and filter gauze.

Clean the filter gauze and bowl by washing in petrol. Examine the sealing washer and if necessary fit a new one.

Index Reference - Section C.

REAR BRAKE CALIPER - MODIFIED TYPE

Model affected		Commencing Chassis Numbers	
		R.H.Drive	L.H.Drive
XK.150	F.H.Coupe	824023	834454
	D.H.Coupe	-	837014

On cars with the above chassis numbers and onwards Rear brake calipers with 1⅝" (41.3 mm) diameter pistons are fitted replacing calipers with 1¾" (44.4 mm) diameter pistons.

The part numbers are as follows:-

	1st Type (1¾" pistons)	2nd Type (1⅝" pistons)
Right-hand	C.13010	C.13910
Left-hand	C.13011	C.13911

Index Reference - Section L.

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S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.228

VARIOUS SERVICING ITEMS

HANDBRAKE ADJUSTMENT

Models affected.

All cars fitted with disc brakes.

If reasonable travel of the handbrake lever cannot be obtained by following the method detailed in the handbook, the following procedure should be adopted.

Adjust handbrake pads by means of adjuster bolt until a solid contact between the pads and disc is obtained and with the handbrake lever in the full off position, adjust the handbrake cable to eliminate all slack, but ensuring that a tight condition of the cables is not created.

Fully release handbrake pads by means of the adjuster bolt and with a .006" (.15 mm) feeler inserted between the face of one pad and the disc face re-adjust with the adjuster bolt until the feeler is just nipped.

With the handbrake lever in the "off position rotate the discs and check that the handbrake friction pads are not rubbing.

Index Reference. Section L.

UPPER STEERING COLUMN ASSEMBLY.

Models affected	Commencing Chassis Numbers. R.H.Drive	L.H.Drive.
2.4 litre	908570	942574
3.4 litre	971313	986950
XK.150 F.H.Coupe	824076	834600
XK.150 D.H.Coupe	827001	837071

On cars with the above chassis numbers and onwards a modified upper steering column is fitted. This modification is to provide more positive locking of the steering wheel.

The part numbers are as follows:-

	R.H.Drive	L.H.Drive.
2.4 and 3.4 litre.	C.13669	C.13670
XK.150	C.13666	C.13666

Interchangeability. The above numbered upper steering columns are interchangeable with the previous types fitted as complete assemblies.

Index Reference Section I.

Cont'd.........

OIL PRESSURE. RELIEF VALVE - MODIFIED TYPE.

Model affected.	Commencing Engine numbers.
2.4 litre	BC.3600
3.4 litre	KE.4856
XK.150	V.2011

On cars with the above engine numbers and onwards a modified type of oil pressure relief valve is fitted.

The modification consists of a stop pin part number 7357 fitted in the centre of spring which limits the travel of the oil pressure relief valve. In conjuction with the stop a new relief valve spring (Part number 7315) is fitted. This spring is longer and lighter than the previous type of spring fitted (Part number 6879).

Interchangeability. The new spring (Part number 7315) can be fitted in place of the previous type of spring (Part number 6879) fitted to Oil Filter C.12776 (FA 2720) but the stop pin, must also be fitted. (Part number 7357).

The following table gives the position regarding oil pressure relief valves since the commencement of production of each model:

RELIEF VALVE SPRING Part No.	Free Length	Fitted to Oil Filter	Fitted to Engine Numbers. 2.4 litre	3.4 litre	XK.150
6462.	2" (50.8mm)	C.9085 (FA2705) C12532 (FA2705)	BB1001-9000 BB9001-9999 BC1001-2255	KE1001 to 3053	-
6879	1¾" (44.5mm)	C12776 (FA2720)	BC2256-3599	KE3054 to 4855	V1001 to V2010
7315 (and Stop Pin.7357)	2 1/16" (52.4mm)	C.12776 (FA2720)	BC3600 - onwards	KE4856- onwards	V2011 onwards

Index Reference Section B.

TIMING COVER AND SETSCREWS.

Models affected.	Commencing Engine Numbers.
MK.V111	N9460
3.4 litre	KE4580
XK.150	V1921

On cars with the above engine numbers and onwards the five bottom setscrew hole bosses are machined to the same length. The five setscrews are of the same length and setscrew part number NB.137/11D must be fitted at the five lower holes.

On engine prior to the above numbers, one short setscrew NB.137/11D and four longer setscrews NB.137/13D were fitted.

Index Reference Section B.

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J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.229

VARIOUS SERVICING ITEMS

TIMING CHAIN DAMPERS - RUBBER TYPE.

Models affected.	Commencing Engine numbers.
2.4 litre	BC.3699
3.4 litre	KE.4964
XK.150	V.2029
Mark V111	N.9628

On cars with the above engine numbers and onwards synthetic rubber bonded chain dampers are fitted replacing the nylon type. The part numbers are as follows:-

	3.4 litre, XK.150. Mark V111.	2.4litre.
Left-hand Damper (Upper chain)	C.13616.	C.13616.
Right-hand Damper (Upper chain)	C.13617.	C.13617.
Distance Piece. 4 off	C.13660.	C.13660.
Intermediate Damper (Upper chain)	C.13615.	-
Damper (Lower chain)	C.13614.	C.13613.

Interchangeability: The rubber type of chain dampers are interchangeable with the previous types fitted.

Index Reference. Section B.

EXHAUST SILENCERS AND DOWNPIPES.

Model affected	Commencing Chassis numbers. R.H.Drive.	L.H.Drive.
3.4 litre.	971503	987132

On cars with the above chassis numbers and onwards the stub pipes at the front of the exhaust silencers (Part numbers C13578/1 and C13578/2) are increased in length by 2" (50 mm). To suit this modification the down pipes are shortened in length by 2" and/1 added to the part number, that is C.12720/1 for the rear pipe and C.12718/1 for the front pipe.

Interchangeability. The latest type of silencers are interchangeable with the previous type fitted from chassis numbers 970877 R.H.Drive and 986554 L.H.Drive, but it will be necessary to cut 2" (50 mm) off each of the down pipes.

Index Reference. Section M.

OIL BATH AIR CLEANER - INTRODUCTION.

Model affected.	Commencing Chassis numbers	
	R.H.Drive.	L.H.Drive.
3.4 litre	971637	987293

On cars with the above chassis numbers and onwards an oil bath air cleaner is fitted as standard. With the introduction of this type of cleaner the carburetter needles are changed from TL to SC.

An oval shaped air silencer, is also fitted across the cylinder head. This silencer is similar in appearance to the previous type of air cleaner but is not fitted with a wire mesh element and is without a detachable end cover. The silencer requires no maintenance.

It is important that only an air silencer is fitted in conjuction with the oil bath air cleaner ; a wire mesh air cleaner must not be fitted.

Maintenance.

The periods at which the following procedure must be carried out will vary according to the conditions under which the car is operated. For normal conditions every 2,500 miles (4,000 kms) can be taken as the proper cleaning periods, but in dusty territories more frequent cleaning, as often as 1,000 miles (1,600 kms) or less, may be necessary.

The cleaner is situated underneath the left-hand front wing and should be completely removed from the car for attention.

Slacken the clip and disconnect the large diameter hose from the cleaner. Slacken the pinch bolt securing the cleaner in the circular retainer and lift out the cleaner complete. Remove the rubber band, unscrew the central screw and withdraw the shell and top cover from the oil base. Lift out filter element, and wash element by swishing up and down in a bowl of paraffin and allow to drain thoroughly. Empty oil from the oil base and clean out the accumulated sludge. Fill oil base with engine oil to the level indicated by the arrow. Ensure that the top cover gasket is in good condition. It is unnecessary to re-oil the filter element as this is done automatically when the car is driven.

Re-insert the centre screw through the shell and top cover and assemble to oil base. Refit rubber band to cover the join between shell and oil base.

Index Reference. Section B and C

BRAKE AND CLUTCH PEDALS.

Models affected.
XK.150.

On earlier XK.150 cars certain of the pedals were made with alternative holes for use as either brake or clutch pedals.

If the master cylinder push rod is disconnected from the pedal it is most important that they are reconnected as follows:-

Brake pedal. - Top hole.
Clutch pedal. - Bottom hole.

Index Reference. Sections L and E.

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J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 230

VARIOUS SERVICING ITEMS

5½" BRAKE SERVO UNIT - MODIFIED TYPE.

Models affected.	Commencing Chassis numbers R.H. Drive.	L.H. Drive.
2.4 litre cars with drum brakes.	908095	942483
3.4 litre cars with drum brakes.	970948	986592

On cars with the above chassis numbers and onwards a modified Brake Servo Unit Part No. C.13821 is fitted, replacing Servo Unit Part No. C.11000.

The effect of this modification is to introduce an adjustable type of Push Rod and, as the parts affected are all internal (which eliminates the possibility of identifying the revised Unit) a tab is wired to the modified Servo Unit bearing the number 89368.

Interchangeability.

Servo Unit Assembly Part No. C.13821 may be used to replace a Servo Unit Part No. C.11000 fitted prior to the above Chassis numbers but if it is desired to replace internal items interchangeability is affected and reference should be made to the items listed below.

Servo Unit C.11000 Part No.	Description	Servo Unit C.13821 Part No.	Remarks
6352	Slave Cylinder Body	7268	Interchangeable, Use modified Cylinder Body
6381	Distance Piece	7265	Not interchangeable
6387	Vacuum Cyl. Piston Assembly	7269	Not interchangeable
6396	End Stop	7270	Not interchangeable
6393	Piston Plate (Outer)	7271	Not interchangeable
6390	Piston Plate (Inner)	7272	Not interchangeable
6389	Locating Washer	7273	Not interchangeable
6388	Push Rod	7274	Not interchangeable
6391	'O' Ring	7142	Not interchangeable
FW.106/T	Backing Washer	7276	Not interchangeable
UFN.137/L	Nut	7277	Not interchangeable
C.741	Shakeproof Washer	7278	Not interchangeable
-	Spring	7266	Additional item
-	Washer	7171	Additional item
-	Circlip	6444	Additional item
-	Adjuster Nut	7275	Additional item
-	Nut	7279	Additional item
-	Gasket	2538	Additional item
6597	Vacuum Cyl. Piston Repair Kit	7280	Not interchangeable

Index Reference   Section L.

BRAKE SERVO UNIT - REPAIR KIT.

Models affected.

Mark V11
Mark V111

A Repair Kit is now available for servicing the Hydraulic Cylinder on Brake Servo Units fitted to Mark V11 and Mark V111 models.

Supplies of the Repair Kit may be obtained from Jaguar Spares Department through the Distributor organisation under Part No.7317.

This Kit is additional to the Main Repair Kit (Part No.6995) which is already available for this Servo Unit.

Index Reference. Section L.

CLUTCH MASTER CYLINDER REPAIR KIT.

Model affected.

XK.150

A Repair Kit is available for the servicing of Clutch Master Cylinders on XK.150 models. Repair Kits may be obtained from Jaguar Spares Department through the Distributor organisation under Part No.7012.

Index Reference Section E.

Amendment to Service Bulletin No.224

Under the heading "Overdrive Throttle Switch Adjustment" alter Mark V11 under "Model affected" and on the first line to read Mark V111.

CORRECTION TO 2.4 LITRE SPARES PARTS CATALOGUE (PUBLICATION J.20.)

There has unfortunately been a transposition of Part Nos. on Page 31A of the above publication. The following correction should be made:-

Plate No.AH.5 - The item should read

Part No.6817 Seating Gasket between Element Assembly and Oil Container(1573510)

Plate No.AH.6 - The item should read

Part No.6816 Seating Gasket between Element Assembly and Cover (1579931).

November, 1957.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 231

VARIOUS SERVICING ITEMS

BRAKE FLUID - CHANGE IN SPECIFICATION.

Model affected.

2.4 litre cars with drum brakes.
3.4 litre cars with drum brakes.

Note that the specification for the Lockheed brake fluid recommended for 2.4 and 3.4 litre cars fitted with drum brakes has been changed from SAE Spec: 70R2 to SAE Spec: 70R1.

Index Reference. Section L.

FRONT WINGS - NOSE SECTION.

Models affected.

XK.140.

A service condition of the XK.140 front wings is now available from the Jaguar Spares Dept., and will be found useful for accident repair where damage is confined to the nose of the wing.

The service condition of the front wing consists of the nose section and includes the headlamp and sidelamp nacelles.

The part numbers are as follows:-

Front wing nose section Left-hand 7319
Front wing nose section Right-hand 7320

Index Reference. Section N.

ENGINE OIL CHANGING - ADVERSE CONDITIONS.

Models affected
All

Under certain adverse operating conditions, conducive to oil dilution and sludge formation, more frequent oil changing that the normal 2,500 mile (4,000 km) period is advised.

Where the car is used mainly for low-speed city driving, stop-start driving particularly in cold weather or in dusty territory the oil should be changed at least every 1,000 miles (1,600 km).

Index Reference. Section B.

CARBURETTER FLOAT CHAMBER - CLEANING.

Models affected.
Mark V111
3.4 litre.
XK.150

It has been found that on cars fitted with the HD.6 type of carburetter, blowing out the float chamber with compressed air is likely to cause rupture of the rubber jet diaphragm. This method of cleaning out the float chamber should, therefore, not be resorted to.

Index Reference. Section C.

50 AMP ELECTRICAL FUSES - INTRODUCTION.

Models affected.	Commencing Chassis numbers. R.H.Drive.	L.H.Drive.
2.4 litre	908751	942616
Mark V111	762263	781141
3.4 litre.	971462	987106
XK.150 F.H.Coupe.	824096	834658
XK.150 D.H.Coupe.	827001	837090

On cars with the above chassis numbers and onwards 50 amp fuses are fitted to certain of the electrical circuits in place of the 35 amp type.

Taking the appropiate Operating Handbook illustration as a guide, fuses are now fitted as follows:-

	Fuse number. 1	2	3	4	5	6
Mark V111	35 amp	35 amp	50 amp	50 amp	-	-
2.4/3.4 litre.	50 amp	50 amp	-	-	-	-
XK.150	50 amp	50 amp	35 amp	35 amp	50 amp	50 amp

If required 50 amp fuses can be fitted to the circuits detailed above, on cars prior to the above chassis numbers.

Index Reference. Section P

RETRACTOR PIN SLEEVES.

Models affected
All cars fitted with disc brakes.

As stated in the Dunlop Disc Brake booklet for the XK.150 model the amount of friction pad wear can be estimated by the amount the retractor pins have receded into the cylinder block - when the ends of the retractor pins are approximately 5/16" (8 mm) below the face of the cylinder block the pads need renewing.

It may be found, however, that some cars are fitted with sleeves around the retractor pins which project above the cylinder block. In this case the sleeves, which are only a taper fit in the cylinder block can be withdrawn with a pair of pliers. The sleeves need not be-refitted as they are provided primarily for protection of the retractor pins during transit.

Index Reference. Section L.

November, 1957.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.232

DIVIDED PROPELLER SHAFT ALIGNMENT

Models affected.

3.4 litre Automatic Transmission.
2.4 litre Automatic Transmission.

The alignment of the divided propeller shaft is most important and if removal of the engine or propeller shafts has taken place the following checks should be made on replacement. Failure to do this may result in Transmission shudder when taking up the drive from a standing start.

NOTE -

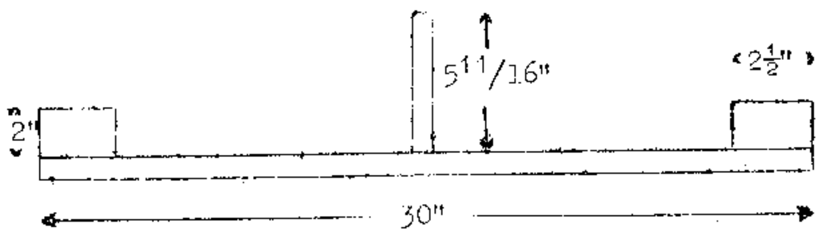
Before carrying out any checking or rectification work ensure -

(a) That the Engine Stabilizer at the rear of the cylinder head is disconnected. To disconnect the engine stabilizer remove the self-locking nut and flanged washer from the top of the stabilizer and screw the lower washer down the centre pin by engaging a thin bladed screwdriver in the slot in the washer through the centre hole of the rubber mounting.

(b) That the rear engine mounting rubbers are not distorted. Note that the holes in the rear engine mounting cradle are slotted and the holes in the bracket attached to the extension case are enlarged to allow the positions of the rubbers to be adjusted.

Check 1.

Check the distance from the bottom of the front flange of the front propeller shaft to the bottom faces of the longitudonal chassis side members. This distance should be 3.11/16" ± 1/16" (93.5 mm ± 1.5 mm). A simple checking jig can be made for checking this distance as shown in the following sketch.



Remedy

If the propeller shaft flange is too LOW suitable packings can be fitted between the rear engine mounting rubbers and the mounting brackets at the top or bottom of the rubbers.

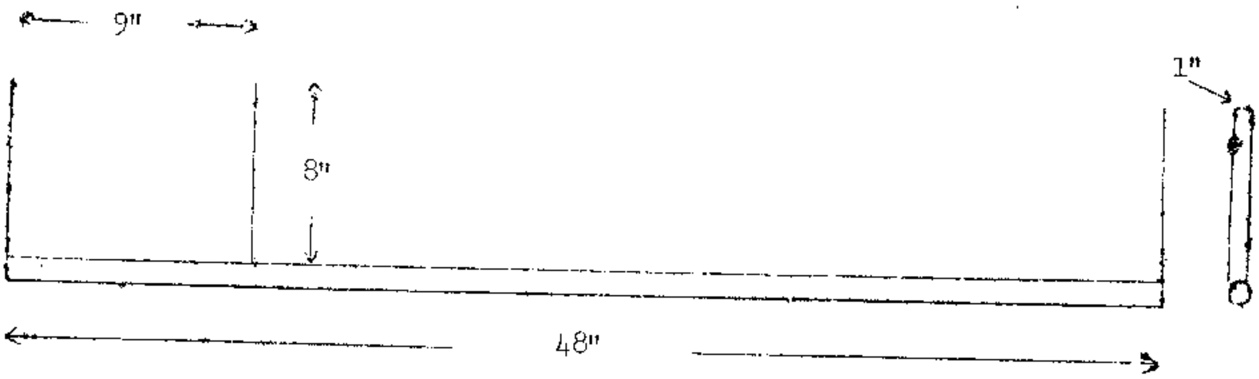
If the propeller shaft is too HIGH suitable packing can be fitted between the rear engine mounting cradle and the body floor.

Check 2.

Check that the front and rear propeller shafts are in a straight line in the horizontal plane.

Cont'd..........

The most convenient way to do this is to make up a simple jig as shown in the following sketch. The jig consists of 3 pieces of flat bar 8" x 1" x 3/16" (20.5 cm x 2.5 cm x 4.75 mm) which are welded exactly in line on to a piece of tube of 1⅛" (28.5 mm) outer diameter at the distances shown in the sketch. The jig is then held against the front and rear propeller shafts, with the three bars vertical, when any malalignment will be evident.



An alternative method is to use three plumb bobs and sight along the three cords. Two cords should be positioned at the front and rear of the front propeller shaft tube and the remaining cord at the rear end of the rear propeller shaft tube.

Remedy.

Alignment of the propeller shafts is carried out at the centre bearing bracket by elongating the two holes through which the setscrews pass to secure the bracket to the body floor. The position of the centre bearing bracket can then be adjusted to allow the propeller shafts to be aligned.

Adjustment of Engine Stabilizer.

After having carried out the work and tightened up the rear engine mounting adjust the stabilizer as follows:-

1. Screw the lower flanged washer up the stabilizer pin until the flange contacts the bottom of the stabilizer rubber mounting. The washer is slotted on its upper face and can be screwed up the pin by engaging a thin bladed screwdriver in the slot through the centre hole of the rubber mounting.

2. Fit the upper flanged washer and tighten down with the self-locking nut.

Failure to observe the above procedure may cause engine vibration and/or fouling of the gearbox in the cowl owing to the engine being pulled up on its mountings.

Index Reference Section G.

November, 1957.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 233

2.4 LITRE AUTOMATIC TRANSMISSION.

The automatic transmission unit fitted to the 2.4 litre model is basically the same, both in construction and operation, as transmission unit, (Part number J20-004/B). Serial number 3001 onwards but varies in the following respects.

2.4 litre automatic transmission units can be of either American or British manufacture, and can be distinguished by the identification plate on the side of the unit. American units are marked Detroit. Mich. U.S.A., whereas British units are marked Letchworth. Herts. England. The variations that exist between American made and British made units are detailed in the following information.

Note: Details of Transmission unit J20-004B are contained in the Spare Parts Catalogue for Automatic Transmission (Publication No.J.19) and in the "Supplement to the Automatic Transmission Service Manual" pages 12 to 35.

Torque Converter.

Although externally similar, a different type of converter is fitted. The variation is in respect of the direct drive clutch plate and it is important that the correct type of converter is fitted.

The 2.4 litre converter is identified by a pink paint patch, irrespective of any other colour paint patches on the converter.

Low and Forward Servo Unit

A single piston is fitted to the low cylinder which necessitate a different Low and Forward brake cylinder.

Note: American made units are fitted with a double piston low cylinder as used on transmission unit J20-004B.

Relay Valve.

No relay valve (see Fig.22 in Automatic transmission supplement) is fitted in the Valve block assembly which necessitates having a different Converter valve Body.

Note: On American made units the relay valve is fitted but is rendered inoperative by the inclusion of a plug under the head of the valve.

Multiple Disc Clutch.

Only four separator plates (J.20-3461) and three friction discs(J.20-3472) are fitted in the multiple disc (first) clutch. To compensate for this decrease in thickness of the multiple disc plates a thicker Retainer plate is fitted.

9 retractor springs (J.20-348) are fitted instead of 12.

Parking Brake Actuating Rod.

The parking brake rod has a lighter tension spring incorporated.

Intermediate Speed Hold.

An intermediate speed hold mechanism is fitted which necessitates alterations to the rear pump.

Selector Valve. A lighter tension selector valve detent spring is fitted.

Cont'd.......

Automatic Low in "D" (Drive) Position (see Fig. 9 and 10 in the Automatic Transmission Supplement).

Only the forward band is applied for low gear in the "D" position. Hydraulic flow to the low band servo is stopped by the converter valve body (or by the position of the relay valve on American made units).

For the Selected Low position both the forward and low bands are applied (see Fig. 15).

The following lsit shows component parts of the 2.4 litre Automatic Transmission Unit which are not common to the Mark Vll Automatic Transmission Unit J.20-004/B.

To aid identification of spares items for 2.4 litre Units, reference is made to the page in Publication J.19 upon which the similar item for the Mark Vll Unit appears.

Description.	2.4 Litre Part No.	Replaces Mark Vll Part No.	Remarks.
	Page 1		
AUTOMATIC TRANSMISSION UNIT COMPLETE (J.20-0043)	C.13774	C.12092	
CONVERTER ASSEMBLY (TC.90002)	C.13773	C.10986	
	Page 2		
ROD ASSEMBLY, ACTUATING PARKING BRAKE, FROM SELECTOR CONTROL SHAFT TO TOGGLE ARM LEVER (J.20-6443).	7336	J.20-6441	
	Page 3		
SERVO CYLINDER FOR FORWARD LOCK-UP BAND (J.20-525/C).	7362	J.20-525/D.	
NOTE: British built Transmission Units are fitted with a single piston for the Low Band cylinder whilst on Units of American manufacture a double piston Low Band cylinder is still incorporated as on J.20-004/B Units.			
	Page 4		
PISTON ASSEMBLY FOR LOW LOCK-UP BAND	Not required	J.20-513/A	
Seal for Piston	Not required	J.20-516	
PLATE ASSEMBLY FOR LOW BAND SERVO CYLINDER (J.20-5271).	7363	J.20-5272	
'O' Ring between Plate and Piston.	Not required	J.20-120	
NOTE: Outer Piston Assembly, Piston Seal and 'O' Ring are eliminated from British built Transmission Units but are still fitted to Transmission Units of American manufacture.			

Cont'd.....

Description.	2.4 Litre Part No.	Replaces Mark V11 Part No.	Remarks.
	Page 7		
Plate between Friction Discs (J.20-3461)	6683	J.20-3461	4 only required for 2.4 litre.
Friction Disc for First Clutch (J.20-3472)	6676	J.20-3472	3 only required for 2.4 litre.
Retainer Assembly for First Clutch Plate (J.20-349/B)	7364	J.20-417	
	Page 10		
VALVE BLOCK ASSEMBLY, COMPLETE (J.20-54053)	7365	J.20-5405	
Manifold Plate Assembly (J.20-5414)	7367	J.20-5412	
Body Assembly for Converter Valve (J.20-5602).	7368	J.20-5603	
Gasket for Converter Valve Body (J.20-5732).	7373	J.20-5733	

NOTE: 2.4 litre Valve Block Assembly, Part No.7365, is fitted to British built Units (i.e.Relay Valve is eliminated - see paragraph headed "Relay Valve"). All other components for Valve Block Part No.7365 are as quoted under group Part No. J.20-5405 on page 10 of Publication J.19.

VALVE BLOCK ASSEMBLY, COMPLETE (J.20-54054).	7366	J.20-5405	

NOTE: 2.4 litre Valve Block Assembly, Part No.7366 is fitted to American built Units (i.e. Relay Valve is included but is rendered inoperative by the fitting of a plug under the head of the Valve - see paragraph headed "Relay Valve"). All components for Valve Block Part No. 7366 are as quoted under group Part No. J.20-5405 on Page 10 of Publication J.19.

MANIFOLD PLATE ASSEMBLY (J.20-5414).	7367	J.20-5412	
Spring, Selector Valve Detent (J.20-544/B)	7337	J.20-544	
Ball, ¼" dia., for Selector Valve (JGM.147485)	5914	JGM.147485	

Cont'd...........

Description	2.4 litre Part No.	Replaces Mark V11 Part No.	Remarks.
Page 10 Cont'd.			
CONVERTER VALVE BODY ASSEMBLY (J.20-5602)	7368	J.20-5603	
Body only for Converter Valve (J.20-5612)	7369	J.20-5613	
Converter Shuttle Valve, Direct (J.20-6381)	6754	J.20-6381	
Converter Shuttle Valve, Reverse (J.20-6411)	6779	J.20-6411	
Sleeve for Converter Shuttle Valve (J.20-6431)	6999	J.20-6431	
Retainer for Shuttle Valve Sleeve (J.20-617/A	6681	J.20-617/A	
Relay Valve	Not required	J.20-677	
Plunger for Relay Valve	Not required	J.20-676	
Spring, operating Relay Valve	Not required	J.20-675	
End Cover for Relay Valve Body	Not required	J.20-6791	
Gasket for End Cover	Not required	J.20-6781	
Screw and Lockwasher Assembly, securing End Cover to Relay Valve Body	Not required	JGM.216357	
Page 11			
EXTENSION CASE ASSEMBLY, COMPLETE (J.20-7019)	7370	J.20-7013	
Valve and Fork Assembly for Governor Control (J.20-7902)	7339	J.20-790	
Extension Case Assembly (J.20-7049)	7371	J.20-704	
NOTE: All other components for Extension Case, complete, are as quoted under group Part No.J.20-7013 on Page 11 of Publication J.19.			
Page 12			
Return Spring on Governor Shaft (J.20-7848)	7372	J.20-7843	
REAR PUMP ASSEMBLY (J.20-7503)	7180	J.20-750	
Body only for Rear Pump (J.20-7512)	C.12644	J.20-751	
Cover for Rear Pump (J.20-7622)	C.12714	J.20-762	
Plug in Rear Pump Cover (JGM.444732)	7341	Not required	
NOTE: All other components for Rear Pump Assembly are as quoted under group Part No.J.20-750 on page 12 of Publication J.19.			
Gasket between Rear Pump and Extension (J.20-7662)	C.12755	J.20-766 .	
Screw, countersunk head, for Pump Cover	C.12753	Not required.	

Cont'd.......

Description.	2.4 Litre Part No.	Replaces Mark V11 Part No.	Remarks.
The following are ADDITIONAL ITEMS which are required for the 2.4 litre Automatic Transmission Unit.			
GUIDE TUBE AND BELLOWS ASSEMBLY FOR INTERMEDIATE SPEED HOLD	C.12652	-	
Ferrule at end of Guide Tube	C.12633	-	
Washer behind Ferrule	C.12634	-	
Locknut	UFN.225/L	-	
Connecting Pin for Guide Tube	C.12635	-	
Spring Washer behind Connecting Pin	AG.102/X	-	
OUTER TUBE FOR INTERMEDIATE SPEED HOLD	C.12637	-	
SEAL FOR OUTER TUBE	C.12640	-	2 required
SPRING BEHIND GUIDE TUBE	C.12638	-	
Seat for Spring	C.12639	-	
BRACKET, MOUNTING SOLENOID FOR INTERMEDIATE SPEED HOLD.	C.12713	-	
SOLENOID FOR INTERMEDIATE SPEED HOLD (76459/A)	C.12740	-	
Plunger for Solenoid	C.12708	-	
Setscrew, securing Solenoid	UFS.319/3H	-	3 required
Washer, Spring, on Setscrews	AG.102/X	-	3 required.

Index Reference. Section FF

BRITISH MADE AUTOMATIC TRANSMISSION UNITS - IDENTIFICATION

The following are the prefixes and commencing serial numbers for current production automatic transmission units manufactured in England.

Mark V111 -----------J B 8 1001 onwards.

XK.150 --------------J B X 1001 onwards.

3.4 litre ----------J 3 B 1001 onwards.

2.4 litre ----------J 2 B 1001 onwards.

Index Reference. Section FF

January, 1958.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO.235

VARIOUS SERVICING ITEMS

COLD STARTING IN EXTREME CONDITIONS - MODIFICATION.

Model affected.

2.4 litre

Where difficulty is experienced with starting from cold in extreme conditions, that is, temperature consistently in the region of - 15°F (-26°C) the following alterations can be carried out to the Solex carburetters.

(i) Remove the GS.105 Starter Petrol Jet and fit a GS.135 jet (This jet is Item 20 Plate G in the 2.4 litre Spare Parts Catalogue).

(ii) Remove the GA.4.5 Starter Air Jet (Item 19 Plate G in the 2.4 litre Spare Parts Catalogue), and leave the hole in the carburetter open.

Note: The above settings must only be used when extreme cold conditions in the region of -15°F (-26°C) prevail and when normal conditions return the standard starter petrol jet and starter air jet must be refitted.

Index Reference. Section 3 and C.

REAR SPRING MOUNTING MODIFICATION

Model affected.

2.4 litre
3.4 litre

It should be noted that the modification to the rear spring mounting as detailed in Service Bulletin No.210 was carried out in production from the following approximate chassis numbers:-

	R.H.Drive	L.H.Drive
2.4 litre	906119	941878
3.4 litre	Commencement of production	

At a later date a different modification was incorporated which did not include the Support brackets C.12779 as shown in Service Bulletin 210, and we understand that in some cases it has been assumed that the rear spring mounting has not been strengthened.

It will be appreciated therefore that the absence of the Support brackets welded between the rear spring clamp and the channel is now no indication that this part has not been strengthened.

Index Reference. Section N.

Cont'd.........

THERMOSTAT - MODIFIED TYPE

Models affected.	Commencing Engine numbers.
Mark VIII	NA.1076
2.4 litre	BC.4408
3.4 litre	KE.5733

On cars with the above engine numbers and onwards a modified Thermostat Part number C.13944 is fitted replacing Thermostat C.3731/1.

To suit this change the bore in the water outlet pipe to take the thermostat has been increased in diameter by .010" (.25 mm) and the part numbers changed as follows:-

2.4 litre.	C.14134 replaces C.11533
3.4 litre and Mark VIII	C.14133 replaces C.12439

Interchangeability.

The new thermostat C.13944 must not be fitted in place of Thermostat C.3731/1 (that is, to cars prior to the above engine numbers) as there is a possibility of the movement of the thermostat being restricted in the smaller bore water outlet pipe.

Thermostat C.3731/1 can be used to replace C.13944 on cars on and after the above engine numbers if the latter type is not available.

Identification.

Thermostat C.3731/1	Thermostat C.13944
Smith number ~~X.85025/74~~ stamped on body.	Smith number ~~43570/5~~ stamped on body.
Opening temperature 78°C.	Opening temperature 74°C.

Index Reference. Section B and D.

VACUUM BRAKE SERVO KIT.

Model affected.

XK.140

For XK.140 owners who would prefer less effort to operate the brake pedal a servo kit is now available from the Jaguar Spares Department under Part number 7076.

Detailed instructions for carrying out this modification to the Fixed Head Coupe Model are included with each kit.

The details for the Open 2 seater and Drop Head Coupe models are similar to those for the Fixed Head Coupe Model except that on the side to which the servo unit is fitted, that is the steering column side, there is no battery compartment. It will therefore be necessary to make up a shield to protect the servo from mud thrown up from the road wheel, instead of the box described and illustrated in the instructions.

Index Reference. Section L.

Amendment to Service Bulletin No.233.

Under the heading "Multiple Disc Clutch" on page 1 delete the line:-

9 retractor springs (J20-348) are fitted instead of 12.

January, 1958.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO.236

DISC BRAKES AND WIRE SPOKE WHEELS-CONVERSION KITS.

Models affected.

2.4 litre
3.4 litre

For customers who purchased cars just prior to the introduction of Disc brakes and Wire spoke wheels as optional equipment and who may have expressed a desire to have their cars converted, the above kits are now available from the Jaguar Spares Department. Instructions for carrying out these conversions will be included with each kit.

Requests for these kits should be made on a separate order form and the following particulars given:-

Model - 2.4 litre or 3.4 litre.
Right - hand or Left - hand Drive.
Chassis number of vehicle (if possible).

FOR CONVERTING DRUM BRAKES TO DISC BRAKES ONLY

Requirements:-

Kit A (Part number 7389)

plus items listed below to suit the particular model.

		2.4 litre	3.4 litre
Handbrake compensator assembly	R.H.Drive	C.13873	C.13875
	L.H.Drive	C.13874	C.13876
Vacuum Check Valve		C.12790	-
Vacuum check mtg. plate		C.12798	-
Sleeve nut		C.12799 (2 off)	-
Bolt		UFB.125/7R (2 off)	-
Setscrew		UFS.125/5R (2 off)	-
Plain washer		FW.105/T (2 off)	-
Spring washer		FG.104/X (4 off)	-
Nuts		NN.125/L (2 off)	-
Vacuum pipe		C.13963 (1 off)	-
Vacuum pipe		C.13962 (1 off)	-
Hose - check valve		C.13964 (2 off)	-
Hose		C.14135 (1 off)	-
Hose		C.13965 (1 off)	C.13704
Adaptor plate		-	C.13254

Cont'd..........

FOR CONVERTING DRUM BRAKES TO DISC BRAKES AND DISC WHEELS TO WIRE SPOKE WHEELS.

Requirements:-

Kit B (Part number 7390)
Kit C (Part number 7391)

plus items listed below to suit the particular model.

		2.4 litre	3.4 litre
Handbrake compensator assembly	R.H.Drive	C.13873	C.13875
	L.H.Drive	C.13874	C.13876
Vacuum Check Valve		C.12790	-
Vacuum check mtg. plate		C.12798	-
Sleeve nut		C.12799 (2 off)	-
Bolt		UFB.125/7R (2 off)	-
Setscrew		UFS.125/5R (2 off)	-
Plain washer		PW.104/T (2 off)	-
Spring washer		FG.104/X (4 off)	-
Nuts		FN.125/L (2 off)	-
Vacuum pipe		C.13963 (1 off)	-
Vacuum pipe		C.13962 (1 off)	-
Hose - check valve		C.13964 (2 off)	-
Hose		C.14135 (1 off)	-
Hose		C.13965 (1 off)	C.13704
Adaptor plate		-	C.13254

FOR CONVERTING FROM DISC WHEELS TO WIRE SPOKE WHEELS ONLY

Requirements:-

Kit C (Part number 7391)

PRICES.

	Retail Price.
Kit A (Part number 7389) (including the individual items required)	£100
Kit B (part number 7390) (including the individual items required)	£80
Kit C (Part number 7391)	£83

Extras

Fully chrome wire wheels - extra cost per wheel £7. 19. 6d.

2.4 Litre model only.

If converting from disc wheels to wire spoke wheels it will be necessary to fit the following additional parts:-

5 inner tubes (if existing tyres are tubeless type) £1. 8. 0d.each

2 rear wheel valances (cut-out type) £4. 2. 0d.each

Index Reference. Section L. and M.

February 1958.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.238
VARIOUS SERVICING ITEMS

DISC BRAKE MASTER CYLINDER BODY - CHANGE IN MATERIAL

Models affected.

XK.150
2.4 litre cars with disc brakes
3.4 litre cars with disc brakes

Cars fitted with disc brakes now in production have a cast iron master cylinder body replacing a body made from aluminium. In conjunction with this change an unhardened piston is fitted to the master cylinder.

The relevant part numbers are as follows:-

	2.4 litre 3.4 litre	XK.150
Brake Master Cylinder Assembly.	C.14225	C.14224.
Master Cylinder body (cast iron).	7474	7474
Master Cylinder piston (unhardened).	7475	7475

Service Procedure.

In future it is not intended to supply Aluminium master cylinder bodies (Part number 6939) or hardened master cylinder pistons (Part number 6940) from the Jaguar Spares Department. Any outstanding orders will be supplied with the cast iron body and unhardened piston.

If it is considered necessary to replace a piston in an aluminium bodied master cylinder the whole unit should be replaced with a master cylinder having a cast iron body.

Index Reference. Section L.

MASTER CYLINDER DUST EXCLUDER - RUBBER GREASE

Models affected.

XK.150
2.4 litre cars fitted with disc brakes.
3.4 litre cars fitted with disc brakes.

In the Descriptive and Maintenance Notes for Disc Brakes it is recommended that the rubber dust excluder at the end of the master cylinder be filled with Wakefield No.3 Rubber grease.

If this or no other recognised rubber grease is available the dust excluder should be assembled dry. Ordinary lubricating grease MUST NOT be used.

Index Reference. Section L.

Cont'd.....

SYNTHETIC PAINTWORK - SUMMARY OF COLOURS.

Models affected.

Cars finished in synthetic enamel.

The following is a summary of the paint colours detailed in Service Bulletins 114, 135, 185 and 205 together with the more recent additions. The reference number given for each paint colour is for Quick Air Drying Enamel.

Where there has been a change in the shade of a particular colour the date when the change took place in production is given.

	British Domolac.	Pinchin Johnson.
Dove Grey	-	J.861
British Racing Green	Q.1076	J.860
Old English White		J.863 J.863/C
Birch Grey	Q.1079 Q.1079/1 (14.5.56.)	J.865
Pastel Blue (Non-Metallic)		J.867
Lavender Grey	Q.1072 Q.1072/1 (14.5.56.)	J.871
Suede Green	Q.1080 Q.1080/1 (14.5.56.)	J.873
Black	Q.1073	J.869
Battleship Grey	Q.1075 Q.1075/1 (14.5.56.)	J.875
Pastel Green (Non-Metallic)	Q.1081 Q.1081/1 (14.5.56.)	J.877
Red	Q.1089	
Pearl Grey	Q.1129 Q.1129/1 (5.3.56.) Q.1129/2 (14.5.56.)	
Pacific Blue	Q.1132/1	
Carmine Red	Q.1190	
Arbor Green	Q.1191 Q.1191/1 (14.5.56.)	
Maroon	Q.1135 Q.1135/1 (13.6.55.) Q.1135/2 (14.5.56.)	
Imperial Maroon	Q.1229 Q.1229/1 (25.2.57.)	
Claret	Q.1230 Q.1230/1 (25.2.57)	
Sherwood Green	Q.1231	
Forest Green	Q.1232	
Cornish Grey	Q.1236	
Mist Grey	Q.1235	J.889
Indigo Blue	Q.1233	
Cotswold Blue	Q.1234	

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JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.239
VARIOUS SERVICING ITEMS

DISC BRAKE CALIPER BRIDGE PIPE - VERY IMPORTANT

Models affected.

XK.150
2.4 litre cars with disc brakes.
3.4 litre cars with disc brakes.

In the event of the removal of the bridge pipe connecting the two cylinder blocks fitted to each caliper, it is ABSOLUTELY ESSENTIAL that the pipe is refitted the correct way round.

It will be noted that one end of the pipe has an approximate right-angle bend whereas the other end has a more acute "hairpin" bend.

The end of the pipe with the "hairpin bend" MUST be connected to the INBOARD cylinder block. This is illustrated in Fig.1 in the Dunlop Disc Brake Descriptive and Maintenance Notes for the XK.150 model.

If the pipe is fitted the wrong way round the pipe will foul the road wheel.

Index Reference. Section L.

FRONT WINGS - NOSE SECTION.

Model affected.

XK.150

Further to Service Bulletin No.231 regarding Front Wing nose sections for the XK.140 model a similar condition is now available from the Jaguar Spares Department for the XK.150 model.

	Part number.
Front wing-nose section. Left Hand	~~7478~~ 7477
Front wing-nose section. Right Hand	~~7479~~ 7486

Index Reference. Section N.

Cont'd.......

$6\frac{7}{8}$" VACUUM SERVO - INTRODUCTION ON DRUM BRAKE CARS

Models affected.	R.H.Drive.	L.H.Drive
2.4 litre	909061	942677
3.4 litre	971732	987406

On cars with the above chassis numbers and onwards a larger brake servo ($6\frac{7}{8}$" diameter) is fitted in place of the $5\frac{1}{2}$" type.

In conjunction with this change a brake pedal of reduced ratio is fitted which also necessitates a change in the brake and clutch pedal housing.

The relevant part numbers are as follows:-

	R.H.Drive.	L.H.Drive
Vacuum Brake Servo ($6\frac{7}{8}$")	- C.13672 -	
Brake pedal (normal transmission and overdrive)	C.14024	C.14025
Brake pedal (automatic transmission)	C.14071	C.14025
Pedal housing	- C.14026 -	

Index Reference. Section L.

Amendment to Service Bulletin No.228.

If satisfactory travel of the handbrake lever cannot be obtained by using a .006" (.15 mm) feeler gauge to adjust the handbrake a .004" (.10 mm) feeler can be used.

Amendment to Service Bulletin No.236.

On page 2 under the headin "For Converting from Disc Wheels to Wire Spoke Wheels Only" insert (Applicable only to cars fitted with disc brakes)

Amendment to Service Bulletin No.235.

Amend the information on page 2 under "Thermostat, Modified type - Identification" as follows:-

Thermostat C.13944 Smiths number X85024/74 stamped on body	Thermostat C.3731/1 Smiths number 43570/5 or /28 stamped on body
Opening temperature 74°C.	Opening temperature 73°C

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SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.240

FRONT SUSPENSION - PROGRESSIVE BUMP STOPS.

Models affected.	Commencing chassis numbers. R.H.Drive.	L.H.Drive.
2.4 litre	909536	942729
3.4 litre	972037	987685

On cars with the above chassis numbers and onwards, plus certain individual cars prior to these numbers, progressive bump stops are fitted to the front suspension.

This type of bump stop takes the form of a tapered rubber block attached to turret of the front suspension cross member and a bump stop plate fitted to the lower wishbone levers.

Interchangeability.

The progressive type of bump stop can be fitted in place of the previous arrangement if desired, but should only be carried out at the customers request and will be on a chargeable basis except in special circumstances.

Procedure.

The necessary welding should preferably take place with arc welding equipment but if this is not available and gas welding equipment is used, suitable asbestos or metal shields should be placed around the front suspension coil springs to protect them from the flame.

Jack up the car, remove the front wheels and place supports under the chassis side members. Jack up under the lower mounting of the shock absorber. Disconnect the top ball joint from the upper wishbone levers taking care not to lose or transpose the castor shims. Allow the stub axle carrier to fall outwards but do not permit the brake flexible hoses to become stretched.

1. Remove the bump stop cups from the flange at the bottom of the front suspension cross member turret. File the underside face of the flange flat and smooth. Clear the two holes already drilled in the flange.

2. Offer up the bump rubber bracket C.13917 to the front suspension cross member turret. To provide an accurate location two dimples or holes are formed in the bracket, which should register with the two holes drilled in the turret flange.

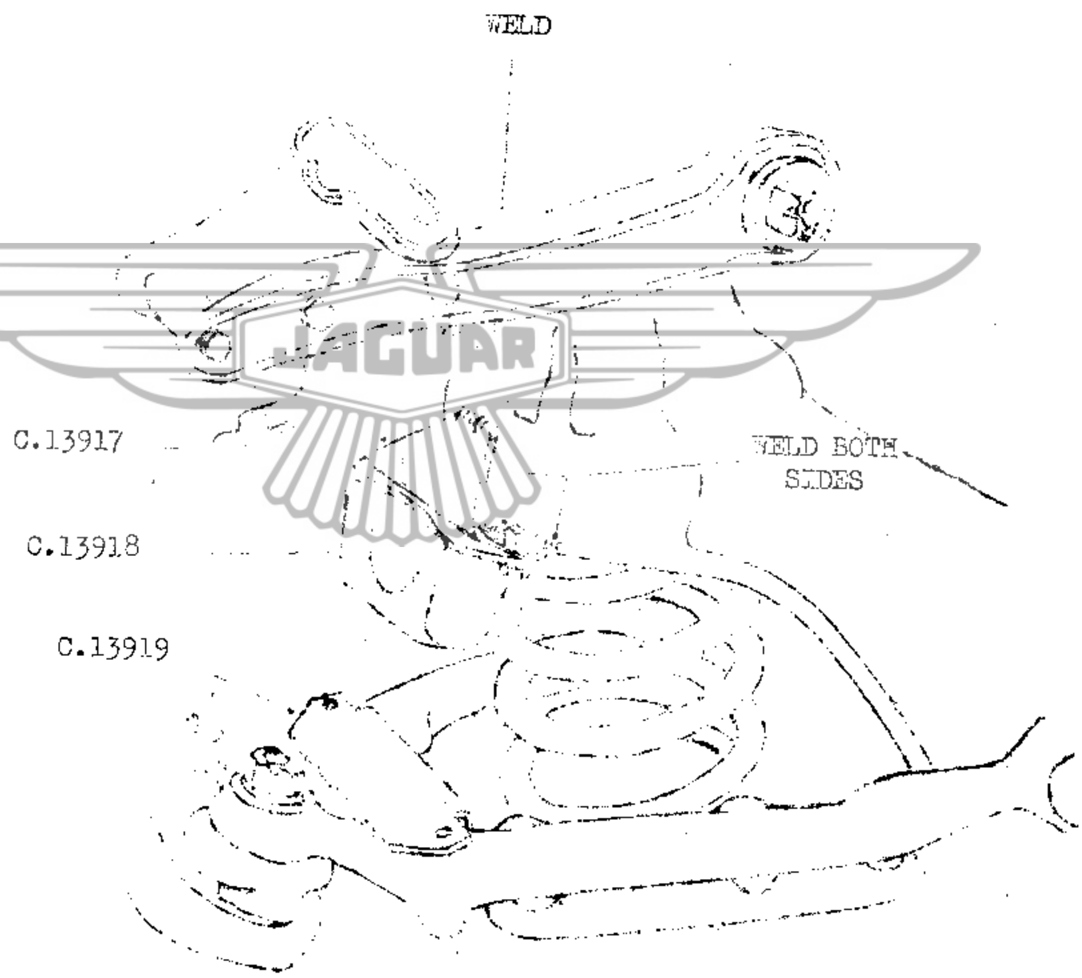
3. Clamp the bracket in position and weld to the front suspension cross member turret as shown in the sketch.

4. Secure the bump rubber C.13918 to the bracket with two 5/16" x ¾" bolts and self locking nuts. (Bolt part no. UFS.131/6R Nut. C.8667/2).

5. Remove the two existing bump stop rubbers from the lower wishbone levers. Cut a [illegible]" x 45° chamfer at the top of the holes from which the bump rubbers were removed.

6. Fit bump stop plate C.13919, in place of the bump stops and secure with the existing self-locking nuts. The lip of the plate is fitted inwards. (see sketch).

7. Repeat for the other side.



Index Reference.   Section J.

March, 1958.

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO. 241

MODIFICATION TO OVERCOME HANDBRAKE CROSS CABLES FOULING BODY.

Models affected.

2.4 litre cars fitted with disc brakes
3.4 litre cars fitted with disc brakes

If complaints are received of the handbrake cross cables fouling the rear wheel arch when the car is heavily laden, the following modification can be carried out on a guarantee basis.

This modification was introduced in production at the following chassis numbers:-

	R.H.Drive.	L.H.Drive.
2.4 litre	910118	942854
3.4 litre	972401	988216

Parts required.

7492	Inner pad carrier assembly. Right hand	1
7493	Inner pad carrier assembly. Left hand	1
7494	Operating Lever	2
6926	Clevis pin	2
J.105/11.5S	Clevis pin	2
FW.105/T	Plain washer	2
L 102/4U	Split pin	2
L.103/7U	Split pin	2
6925	Setscrew securing Handbrake to Caliper	2
6932	Tab washer	2
C.13871	Handbrake cross cable	1
C.13872	Handbrake cross cable	1
	Handbrake Compensator Bracket - as detailed below for various models.	
C.14258	2.4 litre - Right hand drive	1
C.14259	2.4 litre - Left hand drive	1
C.14260	3.4 litre - Right hand drive	1
C.~~12461~~ 14261.	3.4 litre - Left hand drive	1
7481	Luggage compartment floor-patch plate	1

Modification to Caliper Handbrake.

It is necessary to replace each inner pad carrier and lever with the modified type supplied.

Disconnect the handbrake cross cable from the handbrake lever.

Unscrew the adjuster bolt completely to separate the inner and outer pad carriers.

Tap back the tab washers and remove the setscrew securing the inner pad carrier to the caliper.

Remove the inner pad carrier. When fitting the new carriers note that they are handed; the top end of the friction pad should conform with the periphery of the brake disc.

Cont'd.....

Fit the new inner pad carrier to the caliper using a new tab washer and setscrew if necessary. Lubricate the setscrew with zinc base grease on assembly. Attach the handbrake lever to the inner pad carrier as follows:-

Place the lever against the inner carrier. Hold the locknut firmly against the outer face of the trunnion and screw in the adjuster bolt until three or four threads engage the locknut.

Align the holes in the lever and pivot seats, fit the pivot pin and lock it with the split pin.

Note: The above procedure is described and illustrated under "Relining the Handbrake" in Disc Brake Descriptive and Maintenance Notes for the XK.150 model.

Do NOT fit the pivot pin connecting the lever to the inner pad carrier until the adjuster bolt has been screwed a few turns into the locknut otherwise the return spring will not be preloaded.

Repeat for the other rear brake.

Fitting the modified Compensator Bracket.

Disconnect the fork end at the front end of the handbrake cable.

Remove the self-locking nut which secures the handbrake compensator to the bracket attached to the rear axle. Remove the two setscrews securing the bracket to the rear axle. Replace the existing bracket with the modified type supplied.

Secure the bracket to the rear axle with the existing setscrews and attach the compensator to the bracket.

Fit the two cross cables supplied so that the fixed fork ends are connected to the compensator on the rear axle.

Adjust the handbrake and handbrake cables as follows:-

Screw in the handbrake adjuster bolt at each rear brake until the handbrake pads are in hard contact with the brake discs.

Fully release the handbrake lever. Remove the clevis pin securing the fork end to the operating link at the front of the main cable. Slacken the locknut and adjust the position of the fork end so that with the clevis pin refitted there is no slack in the main cable and the two cross cables. It is, however, important to ensure that the cables are not under tension.

Unscrew the adjuster bolt and insert a .004" (.10 mm) feeler gauge between the face on one handbrake pad the disc. Screw in the adjuster bolt until the feeler gauge is just nipped. Withdraw feeler gauge and check disc for free rotation. Repeat for the other side.

Modification to Luggage Compartment Floor.

To provide adequate clearance for the handbrake compensator in its new position it is necessary to cut out one of the longitudonal depressions in the trunk floor and weld in the patch plate provided.

It will be noted that there are six depressions in the trunk floor; for Left hand drive cars the patch plate should be fitted to the third depression from the left and for right hand drive cars the patch plate should be fitted to the third depression from the right - see sketch.

Using the patch plate as a template mark out the portion to be cut out. Cut out the portion marked so that when the plate is welded in position it will be flush with the surrounding metal.

Cont'd.....

If there is already a small patch plate welded in the depression this can be cut out to allow the patch plate supplied to be fitted.

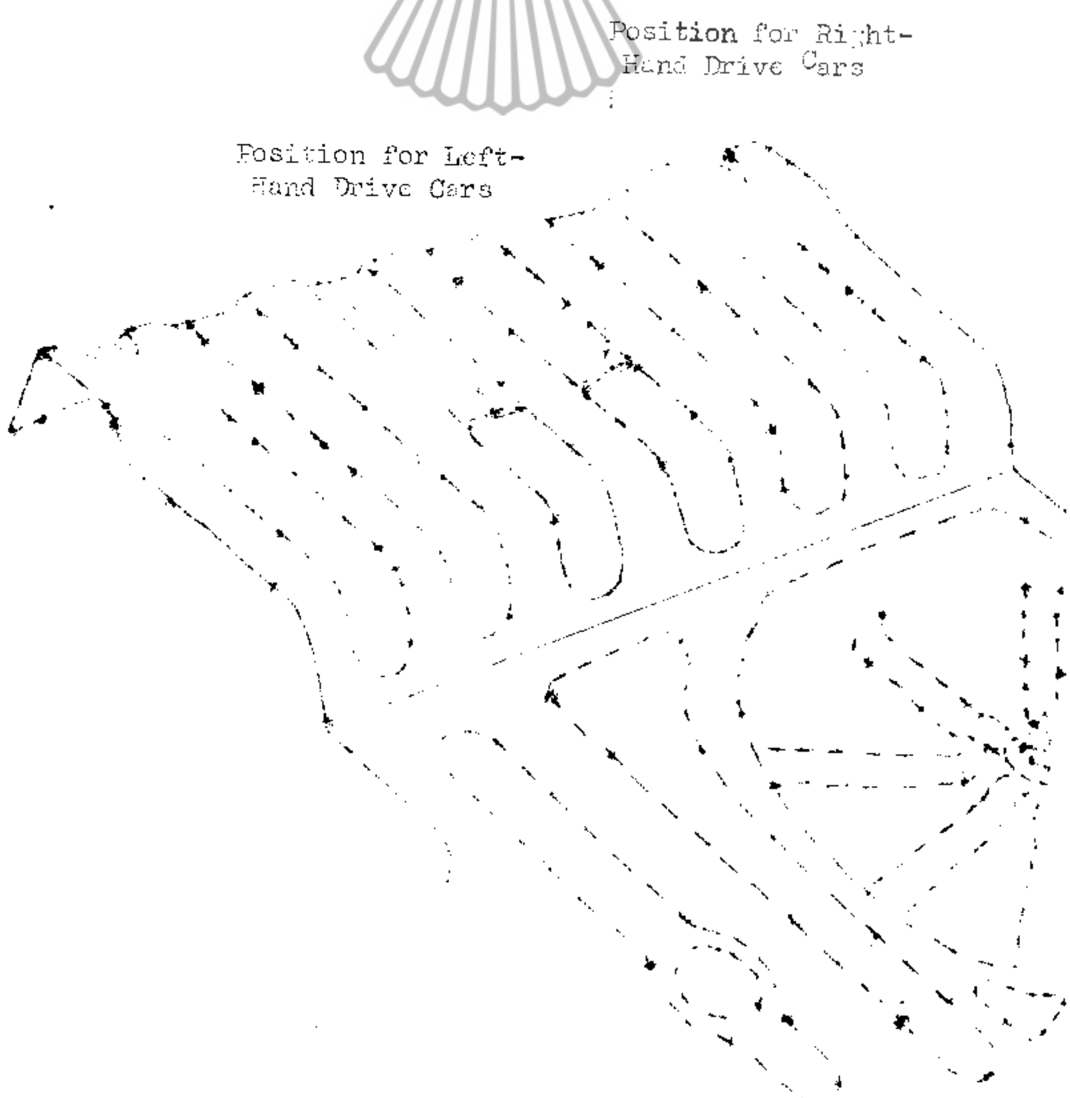
Note: On Right-hand drive cars it will facilitate the use of a hacksaw if the spare wheel cover plate and spare wheel are removed.

Modification to Wheel Arch.

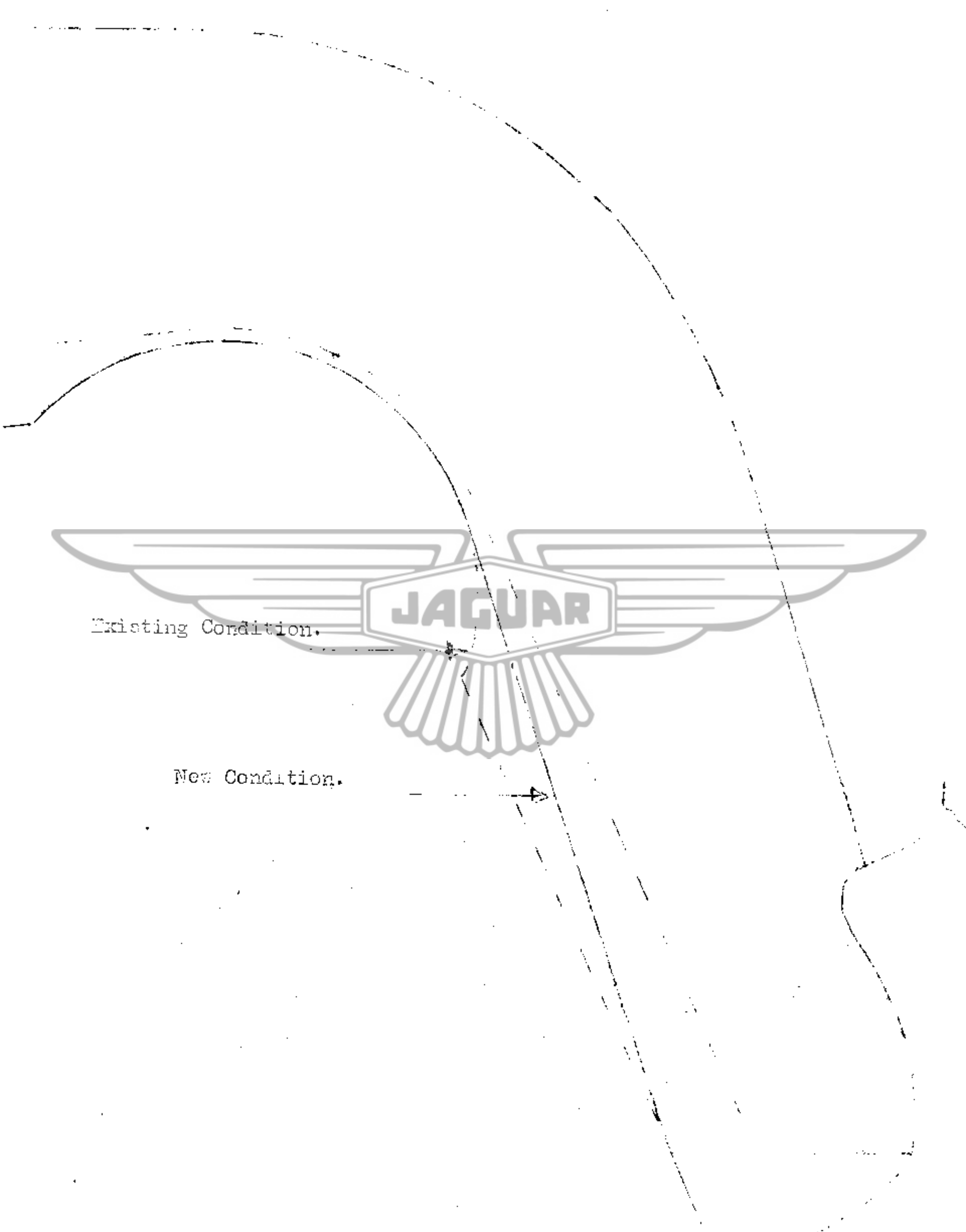
The flange of the chassis side member should be knocked back with a mallet flush with the box section as illustrated in the following sketch.

Note: It is IMPORTANT to carry out the above two body modifications otherwise fouling will take place between the handbrake compensator and trunk floor, and also between the handbrake cross cables and the wheel arches.

MODIFICATION TO LUGGAGE COMPARTMENT FLOOR.



MODIFICATION TO WHEEL ARCH.



Index Reference. Sections L and N.

March, 1958

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO. 242.

VARIOUS SERVICING ITEMS

WHEEL HUBS - OVER LUBRICATION.

Models affected.

All models.

Attention is drawn to the importance of not over-lubricating wheel hubs provided with grease nipples. Failure to observe this precaution will cause grease to find its way into the brake drum or on to the brake disc. Indications of when sufficient lubricant has been applied are as follows:-

FRONT WHEEL HUBS.

Disc Wheel Hubs.

Escape of grease from hole in hub end cap.

Wire Wheel Hubs.

Escape of grease past the outer hub bearing which can be observed through the bore of the splined hub.

REAR WHEEL HUBS.

Escape of grease through hole in the top of axle tube above grease nipple.

Index Reference. Sections H and J.

SPRAYING REAR SPRINGS - PRECAUTIONS.

Models affected.

Cars fitted with disc brakes.

When spraying rear springs with penetrating oil, every precaution must be taken to avoid oil getting on to the brake discs and friction pads. All lubrication bay operators must be informed of the importance of this instruction.

Index Reference. Section K.

Cont'd.......

HYDRAULIC FLUIDS FOR CLUTCH AND BRAKE SYSTEMS - IMPORTANT.

It is MOST IMPORTANT that the following revised recommendations regarding Brake Fluids are absorbed and strictly adhered to. All Distributors and Dealers service staff must be acquainted with these instructions.

DRUM BRAKES.

Model.	Preferred Fluid.	Alternative Fluids.
Mark V111 Mark V11 Mark V	Wakefield Crimson Hydraulic Brake Fluid.	Lockheed No.102 Heavy Duty Brake Fluid. Delco Special No.11 Brake Fluid Chrysler MS 3511 Brake Fluid. WAGNER 21B.
2.4 litre 3.4 litre XK.120 XK.140	Lockheed No.102 Heavy Duty Brake Fluid.	Wakefield Crimson Hydraulic Brake Fluid Delco Special No.11 Brake Fluid Chrysler MS 3511 Brake Fluid. WAGNER 21B

DISC BRAKES.

XK.150 2.4 litre 3.4 litre	Wakefield Crimson Hydraulic Brake Fluid	Lockheed No.102 Heavy Duty Brake Fluid. Delco Special No.11 Brake Fluid. Chrysler MS 3511 Brake Fluid. WAGNER 21B

CLUTCH OPERATION

Model.	Preferred Fluid.	Alternative Fluids.
Mark V111 XK.150 Mark V11	Wakefield Crimson Hydraulic Brake Fluid.	Lockheed No.102 Heavy Duty Brake Fluid. Delco Special No.11 Brake Fluid. Chrysler MS 3511 Brake Fluid. WAGNER 21B
2.4 litre 3.4 litre	Lockheed No.102 Heavy Duty Brake Fluid.	Wakefield Crimson Hydraulic Brake Fluid. Delco Special No.11 Brake Fluid. Chrysler MS 3511 Brake Fluid. WAGNER. 21B

NOTE

In countries where the above fluids are unobtainable use only a recognised brake fluid guaranteed to conform to the S.A.E. Specification 70 R.1.

IMPORTANT.

In the event of deterioration of the rubber seals and hoses due to the use of incorrect fluids, all the seals and hoses must be replaced and the system thoroughly flushed and refilled with one of the above fluids.

Index Reference. Section L.

MAY, 1958.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.245.

VARIOUS SERVICING ITEMS.

RELAY VALVE - MODIFICATION

Models affected.

Models affected	Commencing Engine numbers
Mark VIII Automatic transmission	N.A. 1958
3.4 litre Automatic transmission	K.E. 7052
XK.150 Automatic transmission	V. 3208

On automatic transmission cars with the above engine numbers and onwards a modification to the valve block is incorporated to eliminate the possibility of a jerk when a closed throttle downshift between intermediate and low gear takes place.

The modification entails removing and dispensing with the Relay valve spring (item F. Fig. 22 in the Automatic Transmission Supplement), and inserting a slug (Part number 20-687) between the Relay valve plunger (F) and the cover (B). (Some cars are fitted with a double coil spring washer instead of a slug).

This has the effect of cutting off the hydraulic flow to the low band servo so that only the forward band is in operation for automatic Low in the "D" (Drive) position.

Service Procedure

If complaints are received of a jerk being experienced on a closed throttle downshift between the intermediate and low gears, the above modification can be carried out.

Index Reference   Section FF.

OIL CONTROL PISTON RINGS.

Models affected.

Mark VII
XK.140
Mark VIII
3.4 litre
XK.150

Note that the "Maxilite" oil control ring Part number C.11956 is **not** fitted to piston assemblies fitted in production or supplied for service replacement although shown in the Spares Parts Catalogues and Service Bulletin No.184.

The piston ring fitted to production and service replacement piston assemblies is the "Maxigroove" type - Part number C.5832.

The "Maxilite" oil control ring C.11956 is supplied only when piston rings are ordered separate from pistons.

Index Reference   Section B

DISC BRAKE ADAPTOR PLATE BOLTS - CORRECT ASSEMBLY

Models affected

All cars fitted with disc brakes.

Note that it is important that the bolts securing the adaptor plate to the rear axle tube are fitted the correct way, that is, with the head of the bolt toward the brake disc. If the bolt is fitted the reverse way the end of the bolt may foul the bolts securing the brake disc to the hub.

Index Reference Sections H and L.

REAR ROAD SPRINGS - CHANGE IN CAMBER

Models affected	Commencing chassis numbers. R.H.Drive.	L.H.Drive.
2.4 litre	910309	942922
3.4 litre	972599	988372

On cars with the above chassis numbers and onwards Rear springs Part number C.10791/1 are fitted replacing Rear spring C.10791. The difference between these two springs is in the free camber and the details are as follows:-

	C.10791.	C.10791/1.
Free camber	3.45" (87.5mm)	3.45" to 3.7" (87.5 to 94 mm)

Interchangeability

The latest type spring, C.10791/1 is interchangeable with the previous type C.10791 fitted prior to above chassis numbers but they must be fitted in pairs.

Existing stocks of C.10791 should be used up on cars prior to the above chassis numbers.

Index Reference Section K

SERVO RETURN SPRING - ASSEMBLY

Models affected

Mark V11
Mark V111.

Clayton Dewandre servo units fitted to later Mark V11 and Mark V111 cars are fitted with the piston return spring the reverse way to that illustrated on page L.20 of the Mark V11 and XK.120 Service Manual.

When reassembling any Mark V11 or Mark V111 servo unit the piston return spring should be fitted in the latest manner that is, with the smaller diameter end towards the piston.

Index Reference Section L

MAY, 1958.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 246.

MODIFICATION TO DISC BRAKE MASTER CYLINDER.

Models affected

2.4 litre cars fitted with disc brakes.
3.4 litre cars fitted with disc brakes.
XK.150 cars fitted with disc brakes.

To deal with cases where a long brake pedal action is sometimes experienced on the first application of the brake pedal when the car has been standing, but normal pedal action is obtained on the second action of the pedal the following modification has been introduced in production commencing with chassis numbers:-

	Right-hand drive	Left-hand drive.
2.4 litre	910970.	943035.
3.4 litre.	973377.	988746.
XK.150 Open 2 seater.	-	830438.
XK.150 Drop head coupe.	827072.	837434.
XK.150 Fixed head coupe.	824420.	835566.

and certain individual cars prior to these numbers.

IDENTIFICATION

Externally the Master Cylinder remains unchanged but is identified by a cable clip bearing the following relative new part numbers, fitted to the barrel of the Master Cylinder between the flange fitting and the outlet boss.

XK.150.	C.14580	(VBM 3248)
2.4/3.4 litre.	C.14579	(VBM 3249)

INTERNAL MODIFICATION

The following parts become redundant:-

Part Number.

6950	Seal	Item 9, Plate C on page 21 of the Disc Brake Spare Parts Catalogue.
6949	Bush	Item 10, " " " "
6952	Valve	Item 7, " " " "
6941	Spring Support	Item 6, " " " "

and are replaced by the following new parts:-

Dunlop Part Number.

VBO 3541	Seal
VBO 3539	Valve
VBO 3540	Spring Support

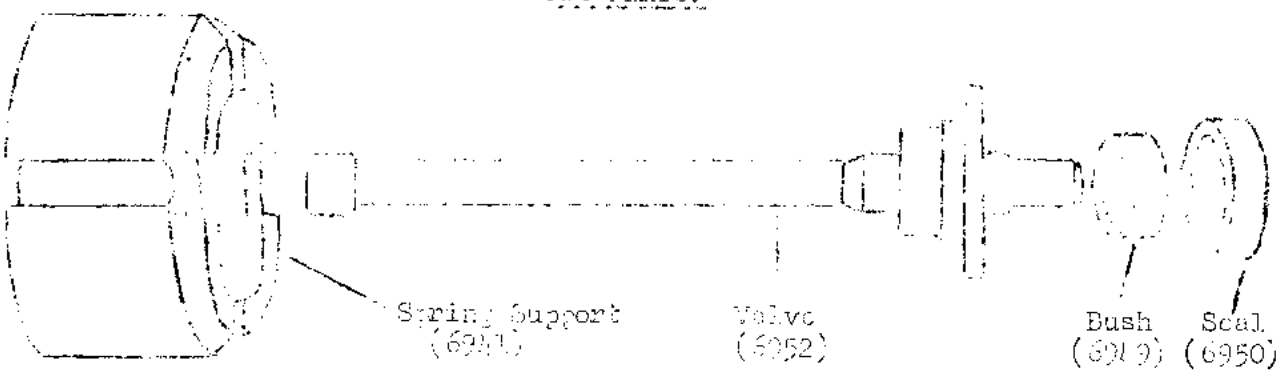
Note: A separate bush for the seal is no longer used. The drawings on the next page show the difference between the old and the new parts. The differences between the old and new parts are easily recognisable except in the case of the spring supports between which there is no visible difference. The old type spring support must not, in any instance, be refitted.

Cont'd....

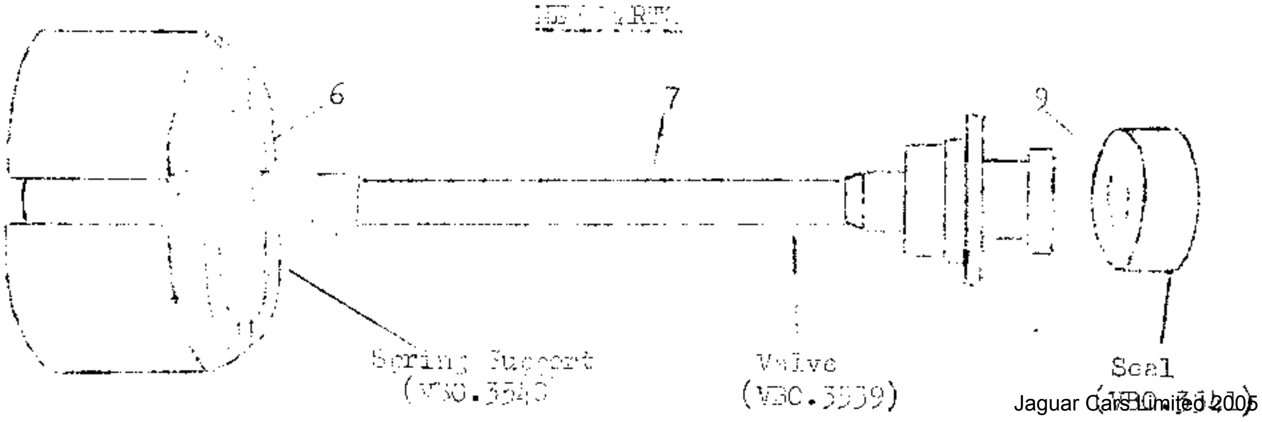
INTRODUCTION OF A MODIFYING KIT – MASTER CYLINDER
(Refer to Plate C on page 21 of the Disc Brake Spares Catalogue)

(1) Withdraw the dust excluder (14) at the push rod end of the master cylinder and with suitable pliers remove the circlip (13).
(2) Remove the push rod (11) and the washer (12).
(3) Withdraw all internal components and dismantle the assembly comprising items (4) to (8) inclusive by disengaging the valve (7) via the key slot in the spring support (6).
(4) Discard the valve seal (9), bush (10), valve (7), rear end spring support (6) and 'O' ring (3).
(5) Clean the cylinder body and all remaining components with methylated spirit or hydraulic brake fluid. Examine the cylinder bore for damage and scoring. If there is evidence of these defects the master cylinder must be replaced by a new unit.
(6) Using the new components (6), (7) and (9) shown in the sketch below reassemble items (4) to (9) inclusive in the order shown and retain them by engaging the valve (7) in the central bore of the spring support (6). NOTE: The old and new spring supports item (6) are almost identical in appearance but it is essential that only the new support is used for this modification.
(7) Lubricate the new 'O' ring (3) with hydraulic brake fluid and fit it to the piston (2).
(8) Slide the internal components into the bore of the cylinder body, position the washer (12) and the push rod (11) and retain them with the circlip (13).
(9) Fill the dust excluder with the special Dunlop rubber grease provided in the modification kit. NOTE: No other grease must be used for this purpose. Reseat the dust excluder around the end of the master cylinder, ensuring that the lip registers properly in the groove.
(10) Fit the appropriate identification clip around the master cylinder body, at a point between the attachment flange and the connection bosses.

OLD PARTS.



NEW PARTS.



SERVICE ACTION - EXPORT

All Distributors will be supplied with a small stock of modified Master Cylinders -

Part Number.

C.14580	XK.150.
C.14579	2.4 litre/3.4 litre

together with a supply of Master Cylinder Repair Kits Part Number 7660.

In every case when a report of long pedal action after standing is received the Master Cylinder is to be changed immediately for the modified type.

It is also considered desirable that all Master Cylinders of the original type not having a cable clip bearing the new part number should be changed as soon as is practicable. This operation is to be carried out on a guarantee basis irrespective of the age of the car.

The Distributor must withdraw from his Dealers all stocks of the following Master Cylinders -

Part Number.

C.13100 and C.14224	XK.150.
C.13675 and C.14225	2.4/3.4 litre.

and proceed as follows:-

1. All Master Cylinders having an aluminium body (Part numbers C.13100 and C.13675) are to be scrapped and a claim submitted for these units.

2. All Master Cylinders having a cast iron body (Part numbers C.14224 and C.14225) are to be reconditioned by the Distributor incorporating the modified parts included in Master Cylinder Repair Kit Part number 7660 which contains:-

	Dunlop Part Number
Dust Excluder	VBO.1869
'O' Ring	VBO.2417
Valve	VBO.3539
Seal	VBO.3541
Spring Support	VBO.3540
Tube of Rubber grease	VBO.3554
Identification Cable clip	VBO.3552 and VBO.3553
Fitting Instruction Sheet	-

Spare Parts Replacement

All stocks of the following parts held by Dealers are to be returned to their Distributor for credit.

Part Number.

6950	Seal
6949	Bush
6952	Valve
6941	Spring Support

These parts, or the new parts that replace them, will no longer be supplied as individual replacements parts. The new parts will form part of a new Master Cylinder Repair Kit - Part number 7660.

The Distributor is to scrap out these parts including their own stocks and submit a guarantee claim for the parts scrapped.

Cont'd....

Parts Ordering

Distributors are requested to place orders for the quantity of Master Cylinder Repair Kits, Part number 7660 they require for their territory and any additional stock of Master Cylinders in excess of those forwarded.

Labour Allowance

An allowance of 2 hours will be made for removal of an original type Master Cylinder and the fitting of a modified type including bleeding the brakes. All such claims are to be endorsed "Fitting of Modified Master Cylinder - Reference Service Bulletin No.246."

IMPORTANT

1. Ensure that whenever modified parts are fitted to an original type Master Cylinder that the relative identification clip is fitted. Two cable clips are included with each Master Cylinder Repair Kit 7660. The one for the XK.150 model bears the number C.14580 (VBM.3248); the one for the 2.4 and 3.4 litre model bears the number C.14579 (VBM.3249).

2. When refitting the Master Cylinder on an XK.150 model check the alignment of the Master Cylinder push rod and ensure that on cars having two clevis pin holes in the brake pedal that the clevis pin is fitted in the upper hole. (see Service Bulletin No.229).

(H)

July, 1958.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.248

VARIOUS MISCELLANEOUS ITEMS

THORNTON LIMITED SLIP DIFFERENTIAL - PRECAUTIONS.

Models affected

Cars fitted with Thornton "Powr-Lok" differential

1. On a car fitted with a Thornton Powr-Lok differential the engine must NOT be run with the car in gear and one wheel off the ground otherwise, owing to the action of the differential, the car may drive itself off the jack or stand.

   If it is desired to turn the transmission by running the engine with the car in gear both wheels must be jacked up clear of the ground.

2. Note that when withdrawing an axle shaft it is possible for the axle shaft spacer to be drawn out of the differential and to fall into the axle tube which will be evident when attempting to replace the axle shaft.

   If this should happen the spacer can be removed with a length of magnetised rod. The spacer can be replaced as follows:-

   Insert the spacer into the end of a length of tubing in which it is a tight fit.

   Pass the tubing into the axle tube and enter the spacer in its bore in the differential.

   Pass a long rod down the centre of the tubing until it contacts the spacer.

   The tubing can now be disengaged from the thrust button by holding the rod firmly and pulling on the tubing.

   If both axle shafts have been removed do not attempt to fit both spacers and then the axle shafts. Fit one spacer and an axle shaft to the same side, before fitting the other spacer and axle shaft.

3. If a Thornton powr-lok differential is fitted to an existing rear axle the filler plug will foul the differential case.

   A special cover plate is available for use with a Thornton Powr-lok differential under the following part numbers.

Cover plate only.	4 HA-010-1
Cover plate with filler plug.	4 HA-064-3

   If a special cover plate is not available, the end threads of the filler plug can be cut off to obtain at least 1/16" (1.5 mm) clearance between the end of the plug and the differential case.

Index Reference. Section H.

COIL SPRING PACKING PIECE.

Models affected.	Commencing chassis numbers.	
	R.H.Drive.	L.H.Drive.
2.4 litre	911033	943054
3.4 litre	973493	988794

On cars with above chassis numbers and onwards a packing piece may be fitted at the top of the coil spring to compensate for slight manufacturing variation in the fitted lengths of the springs.

The packing pieces are in 1/8" (3.2 mm) and 1/4" (6.4 mm) thicknesses and are fitted in accordance with the following details:-

Colour code of spring.	Thickness of packing piece.
2.4 litre	
White	1/4" (6.4 mm) Pt. number C11874
Blue	1/8" (3.2 mm) Pt. number C11874/1
Green	No packing piece fitted.
3.4 litre	
Red	1/4" (6.4 mm) Pt. number C11874
Yellow	1/8" (3.2 mm) Pt. number C11874/1
Purple	No packing piece fitted.

In service, if the coil springs are removed for any reason on a car prior to above chassis numbers, packing pieces can be fitted in accordance with the above details.

Index Reference. Section J.

HEATER RHEOSTAT SWITCH

Models affected.	Commencing chassis numbers.	
XK.150	R.H.Drive	L.H.Drive.
Open 2 seater	-	830439
Fixed Head Coupe	824420	835366
Drop Head Coupe	827072	837434

On cars with the above chassis numbers and onwards a rheostat switch is fitted to allow the heater motor speed to be controlled.

The switch is positioned adjacent to the revolution counter and is marked 'Heater, Fast-Slow'.

The switch is off when rotated fully anti-clockwise. Rotation clockwise switches on the motor at its maximum speed, further rotation brings the rheostat into operation and the motor speed progressively falls until the knob reaches the end of its travel. The motor is wired through the ignition switch and will be automatically switched off with the ignition.

Index Reference. Sections O and P

Amendment to Service Bulletin 239

Amend the part numbers under 'Front Wing - Nose Section' as follows:-

	Part number
Front wing - nose section. Left-hand	7479
Front wing - nose section. Right-hand.	7480

July, 1958.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO.249

VARIOUS SERVICING ITEMS

PANHARD ROD - ADJUSTMENT

Models affected

2.4 litre
3.4 litre

After setting the panhard rod to the dimension giving on page K8 of the "Rear Suspension" section, a further check should be carried out to ensure that the rear wheels are central in relation to the front wheels. The procedure is as follows:-

Place a straight edge across one rear tyre and check the distance to the flange of the chassis side member at the point at which the rear spring centre clamping plate is bolted; repeat for the other side. The dimension at each side should be the same; if not, re-adjust the panhard rod as necessary. Note: the rear tyres must be of the same type and set at the same pressure when carrying out this check.

The point of the chassis side member flange at which the dimension should be taken is between the two bolts which secure the rear spring centre clamping plate.

Index Reference.   Section K ✓

OVERDRIVE MANUAL SWITCH.

Models affected

2.4 litre
3.4 litre
~~Mark VIII~~

The clear plastic manual switch and relay has now been superseded by a metal switch, similar in appearance to the Intermediate Speed Hold switch fitted to Automatic transmission cars.

No relay is fitted with the later type switch and it is important that the earlier type switch is not used to replace the later type as the switch may burn out due to the absence of a relay in the circuit.

Index Reference.   Sections F and P. ✓

BRAKE LININGS - EXAMINATION FOR WEAR.

Models affected.

All models.

Please note that the period for examining the brake linings or friction pads for wear is being reduced from every 10,000 miles (16,000 km) to every 5,000 miles (8,000 km).

This applies to either cars fitted with drum or disc brakes.

Index Reference.   Section L. ✓

Cont'd....

N.D.V. SUPPORT BRACKET.

Models affected.

2.4 litre
3.4 litre

Please note that the chrome plated bracket to which the No Draught Ventilator hinge is attached, is not supplied as a separate item under the following part numbers.

N.D.V. Support bracket.	Left-hand	BD.9653
N.D.V. Support bracket.	Right-hand	BD.9654

Index Reference. Section N.

DISC BRAKE BRIDGE PIPE.

Models affected

Cars fitted with disc brakes.

Reference Service Bulletin number 239, note that to assist in the correct fitting of the caliper bridge pipe an identification tag is now fitted marked "Inner top".

Index Reference. Section L.

REAR SPRING NYLON INTERLEAF.

Models affected		Commencing chassis numbers. R.H.Drive.	L.H.Drive.
Mark VIII		764370	781166
XK.150	Open 2 seater	-	830960
	Fixed Head Coupe	824651	835671
	Drop Head Coupe	827168	837573

On cars with the above chassis numbers and onwards the rear springs are fitted with full length nylon interleaving between the top and second leaves.

The relevant part numbers are as follows:-

	Mark VIII	XK.150
Rear spring with nylon interleaf	C13109/1	C14473
Nylon Interleaf	C.13109/2	C13109/2

Service Procedure.

If complaints of rear spring squeak are received on cars equipped with spring having rubber buttons, a nylon interleaf can be fitted between the top and second leaves but the following points should be noted.

1. On the Mark VIII model a rubber button is fitted between the top and second leaves at the rear end of the spring. When fitting a nylon interleaf this button should be discarded.

2. On the XK.150 model it will be necessary to cut 2" (51 mm) off the front end of the interleaf before fitting.

Index Reference. Section H.

July, 1958.

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO. 250.

VARIOUS SERVICING ITEMS.

LOSS OF DRIVE IN "D" (DRIVE) AND REVERSE

Models affected	Cars affected prior to transmission numbers
Mark VIII Automatic Transmission	JB8 3302
2.4 litre Automatic Transmission	J2B 1522
3.4 litre Automatic Transmission	J3B 3619

If a complaint is received of loss of drive in the "D" (Drive) and R (Reverse) positions on automatic transmission cars prior to the above numbers the most likely cause of the trouble is that the two low brake drum plate dowels (E.Fig.116 in the Automatic Transmission Service Manual) have become displaced due to a faulty snap ring.

The actual symptoms are as follows:-

No drive in Automatic Low in the "D" (Drive) position.

No drive in the "R" (Reverse) position.

Drive possible in the "L" (Selected Low) position.

The car can be driven if desired by starting off in the "L" position and then selecting "D" when the car has reached a speed of approximately 15 m.p.h. (24 k.p.h.). If the car is stopped for any reason this procedure will have to be repeated.

To rectify this trouble, it will be necessary to remove the transmission unit and withdraw the main shaft assembly as described on page 67 of the Automatic Transmission Service Manual.

Remove the rear bearing and forward brake drum as described in paragraphs 9-11 on page 70. Collect the two dowels if they have become displaced; the dowels can be refitted if they are not damaged.

Remove the low brake drum plate snap ring (as described in paragraph 15 page 70).

Discard the existing snap ring and fit the dowels and a new snap ring (Part number J20-350). Check that the snap ring is a good fit in its groove and that the gap between the ends of the ring is narrower than the diameter of one of the dowels.

This rectification should be carried out on a guarantee basis and the claim endorsed "Reference Service Bulletin Number 250".

Note: The only other fault which will give similar symptoms to those listed above is a faulty reverse free-wheel.

If the dowels are found to be in position and the snap ring is secure, the reverse free-wheel can be examined at the same time without further dismantling.

Index Reference. Section FF./

Cont'd.....

REAR SPRING - MODIFIED TYPE.

Models affected.	Commencing Chassis Numbers. R.H.Drive.	L.H.Drive.
XK.150 Open 2 seater	-	830960
Fixed Head Coupe	824551	835671
Drop Head Coupe	827168	837573

On cars with the above chassis numbers and onwards a modified Rear spring (Part number C.14476) replaces Rear spring Part number C.13006.

The modified type of rear spring C.14476 has a thicker top leaf than the previous type, and a front spring eye of different design. A full length nylon interleaf is fitted between the top and second leaves - see Service Bulletin No.249.

Interchangeability.

Rear spring C.14476 is interchangeable with Rear Spring C.13006 in pairs.

Index Reference. Section K.

CLUTCH RELEASE BEARING.

Models affected.

Mark V11
Mark V111
XK.120
XK.140
XK.150
2.4 litre
3.4 litre

To ensure adequate clearance between the back of the clutch release bearing and the gearbox front oil seal cover to allow the necessary clearance between the release bearing and the clutch to be obtained use only Clutch release bearing Part number 2590 (BB 48443).

This release bearing can be easily identified by the presence of two grooves machined in the lugs of the release bearing cup.

Index Reference. Section E.

Amendment to Service Bulletin No.249

Under "Overdrive Manual Switch" delete Mark V111 model.

September, 1958.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 251.

VARIOUS SERVICING ITEMS.

PRESSURE "BUILD-UP" IN HYDRAULIC SYSTEM

Models affected
XK.150
2.4 litre cars fitted with $6\frac{7}{8}$" Lockheed vacuum servo.
3.4 litre cars fitted with $6\frac{7}{8}$" Lockheed vacuum servo.

The $6\frac{7}{8}$" Lockheed servo is fitted to all cars with disc brakes and also to cars equipped with drum brakes on and after the following chassis numbers:-

	R.H.Drive.	L.H.Drive.
2.4 litre	909061	942677
3.4 litre	971732	987406

A number of complaints of brake drag or binding, caused by a slow pressure build-up in the hydraulic system, have been traced to insufficient clearance between the servo piston rod and the slave cylinder piston (Item E and H, Fig.40 in the "Brakes" section of the 2.4/3.4 litre Service Manual).

The trouble will be indicated by a reduction of brake pedal travel, or varying pedal travel, which returns to normal after the car has been left standing.

CORRECTIVE ACTION.

The correct method of adjustment of the push-rod is described and illustrated on page L.43 of the 2.4/3.4 litre Brake section but entails partial dismantling of the slave cylinder.

The simple method to overcome pressure build-up is as follows:-

Remove the servo unit from the car.
Remove the end cover (six nuts and bolts).
Slacken the locknut at the end of the piston push rod.
Unscrew the push rod one complete turn and tighten the locknut.
Re-fit the end cover. Re-fit the servo unit and bleed the hydraulic system.

Carry out a road test making frequent applications of the brake pedal, to ensure that no brake drag exists.
If pressure "build-up" is still present, increase the clearance between the push-rod and piston by unscrewing the push rod a further half a turn.

Index Reference.   Section L

Cont'd........

OIL BATH AIR CLEANER - INTRODUCTION.

Models affected.	Commencing Chassis Numbers. R.H.Drive.	L.H.Drive.
2.4 litre	911658	943149

On cars with the above chassis numbers and onwards plus certain individual cars prior to these numbers, an oil bath air cleaner (Part number C.14213) is fitted as standard. Air is drawn into the air cleaner through the short pipe which runs forward to the radiator. The large diameter pipe located under the left-hand front wing is retained to assist the under bonnet ventilation.

The air cleaner is fitted on top of the cylinder head and the maintenance instructions are as follows:-

The periods at which maintenance should be carried out will vary according to the conditions under which the car is operated. For normal conditions every 2,500 miles (4,000 kms) can be taken as the proper cleaning periods, but in dusty territories more frequent cleaning, as often as 1,000 miles (1,600 kms) or less, may be necessary.

Unscrew the wing nut and remove the top cover. Spring back the three clips and lift out the filter element. Washer the element by swishing up and down in a bowl of paraffin and allow to drain thoroughly.

Remove the three set bolts securing the oil base to the support brackets. Lift off the oil base, empty out the oil and clean out the accumulated sludge. Fill the oil base with engine oil to the level indicated by the arrow. It is unnecessary to re-oil the filter element as this is done automatically when the car is driven. Ensure that the top cover gasket is in good condition and re-assemble the filter.

Index Reference. Section C.

60 WATT HEADLAMP BULBS - INTRODUCTION.

Models affected.	Commencing Chassis Numbers. R.H.Drive.
2.4 litre Home and R.H.Drive Export	910846
3.4 litre Home and R.H.Drive Export.	973206

On cars with above chassis numbers and onwards modified headlamps incorporating 60 watt bulbs are fitted.

The part numbers are as follows:-

	Part Number
Headlamp complete	C.14237
Bulb. 60 watt (Lucas No.404)	C.8904.

Interchangeability.

1. The complete headlamp C.14237 is interchangeable with the previous type C.8808.

2. The 60 watt bulb cannot be fitted to headlamp C.8808.

Index Reference. Section P.

September, 1958.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 252.

VARIOUS SERVICING ITEMS.

FRESH AIR HEATING EQUIPMENT.

Models affected.	Commencing chassis numbers. R.H.Drive	L.H.Drive.
XK.150.		
Open Two Seater		831140
Fixed Head Coupe	824585	835719
Drop Head Coupe	827194	837628

On cars with the above chassis numbers and onwards fresh air heating and ventilating equipment replaces the Re-circulating equipment.

The following are the revised instructions:-

The car heating and ventilating equipment consists of a heating element and an electrically driven fan mounted on the engine side of the scuttle. Air from the heater unit is conducted:-

(a) To a built-in duct fitted with two doors situated under the instrument panel.

(b) To vents at the bottom of the windscreen to provide demisting and defrosting.

FRESH AIR is introduced into the system by opening the air intake in the left-hand front wing and switching on the fan.

Temperature Control.

The lever controlling the flow of water from the engine cooling system to the heating element is situated at the top of the instrument panel.

When the lever knob is placed in the Cold position, the supply of hot water from the engine is completely cut off; placed in the fully Hot position the maximum possible amount of hot water from the engine is allowed to pass through the heater element. By placing the lever knob in intermediate positions the temperature of the air from the heater can be varied between these two extremes.

Fan switch

The heater fan switch situated at the bottom left of the instrument panel is off when rotated fully anti-clockwise. Rotation clockwise switches on the motor at its maximum speed; further rotation brings a rheostat into operation and the motor speed progressively falls until the knob reaches the end of its travel. The motor will be automatically switched off with the ignition if the fan switch is inadvertently left on.

The following directions for heating the car interior in cold weather and ventilating the car interior in hot weather are given as a guide but it will be appreciated that the degree of heating can be regulated by the controls.

Cont'd........

Fresh air is introduced into the system by opening the door in the left-hand front wing. The lever operating the door is situated in the driving compartment forward of the left-hand door; push the lever forward to open the intake door, pull the lever rearward to close the door.

Note: The air intake must always be open when using the heating and ventilating equipment.

COLD WEATHER

To obtain car heating, demisting and defrosting.

(a) OPEN air intake (in left-hand front wing).
(b) Set temperature control to the DESIRED POSITION.
(c) Switch ON fan (to required speed).
(d) OPEN heater doors.

To obtain rapid demisting and defrosting.

(a) OPEN air intake (in left-hand front wing).
(b) Set temperature control to HOT.
(c) Switch ON fan (at maximum speed).
(d) CLOSE heater doors.

HOT WEATHER

To obtain ventilation and demisting.

(a) OPEN air intake (in left-hand front wing).
(b) Set temperature control to COLD.
(c) Switch ON fan (to required speed).
(d) OPEN heater doors.
(e) OPEN ventilator (in right-hand front wing).

Index Reference. Section O.

AIR CLEANER MAINTENANCE.

Models affected

All

As it has been found that Distributors and Dealers have not been carrying out maintenance of air cleaners, attention is again drawn to the importance of carrying out this service at the recommended periods. (see Service Bulletin Nos. 229 and 251 for maintenance instructions for the oil bath type of air cleaners).

Failure to carry out periodic maintenance of air cleaners will cause high petrol consumption, reduced performance and premature engine wear.

Index Reference Section C

IMPORTANT NOTICE. It has come to our notice that some of the instructions contained in certain of our Service Bulletins are not being carried out. Particular attention is called to the following Service Bulletins the instructions in which must be observed.

Service Bulletin Number	Subject.
241	"Modification to overcome Handbrake cross cables fouling body".
242	"Hydraulic Fluid for Clutch and Brake Systems-Important".
246	"Modification to Disc Brake Master Cylinder."

November, 1958

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 255

VARIOUS SERVICING ITEMS

GIRLING HYDRAULIC DAMPERS - MODIFIED TYPE

Models affected.	Commencing Chassis Numbers	
	R.H. Drive	L.H. Drive
2.4 litre - Front	911522	943124
Rear	912637	943269
3.4 litre - Front	973987	989137
Rear	975162	990176

On cars with the above chassis numbers and onwards modified hydraulic dampers are fitted giving consistent damping at all operating temperatures.

The part numbers are as follows:-

Front	C.14586	2 off
Rear	C.14587	2 off

Interchangeability

The new dampers are interchangeable with the previous types, but must be fitted in pairs to either front or rear.

Index Reference   Sections J and K.

REAR CALIPER ADAPTOR PLATE BOLTS

Models affected.

2.4 litre cars with disc brakes.
3.4 litre cars with disc brakes.
XK.150

Disc brake cars now in production are fitted with a revised arrangement for attaching the adaptor plate to the rear axle.

The original arrangement of bolts, shakeproof washers and nuts is superseded by longer bolts and self-locking nuts.

The part number of the new bolts and nuts are as follows:-

Model		Part number	No. off per car
2.4/3.4 litre	Bolt.	7755	8
XK.150	Bolt.	7757	8
All	Nut - self locking	7756	8

Index Reference   Section L.

9 to 1 COMPRESSION ENGINES - FUEL REQUIREMENTS.

Models affected

All cars fitted with 9 to 1 compression engines.

It is important that only super grade fuel with a minimum octane

/Cont'd.....

rating of 98 (Research method) is used with engines having 9 to 1 compression ratio pistons (indicated by /9 after the engine number).

If, of necessity, the car has to be operated on lower octane fuel do not use full throttle otherwise detonation may occur with resultant piston trouble.

Index Reference Section B.

12 BLADED FAN - INTRODUCTION

Models affected.	Commencing Chassis Numbers	
	R.H. Drive	L.H. Drive
2.4 litre	915349.	943118

On cars with the above chassis numbers and onwards a 12 bladed fan is introduced.

The fan cowl fitted with the previous type 4 bladed fan is dispensed with, but a fan shield is fitted at the top of the radiator.

The part numbers are as follows:-

12 bladed fan.	C.12391.
Fan shield.	C.14732.

Index Reference Section D.

SELECTOR LINKAGE ADJUSTMENT

Models affected

Mark VII Automatic Transmission.
Mark VIII Automatic Transmission.

If the selector linkage is found to be persistently in need of adjustment and to disengage from the "D" position under hard acceleration or heavy braking the most likely cause of the trouble is slackness or softening of the engine mounting rubbers.

In this case new engine mountings should be fitted all round and the manual selector linkage re-adjusted as described on page 22 of the Automatic Transmission Service Manual.

Index Reference Section FF.

January, 1959

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO. 257

VARIOUS SERVICING ITEMS

BRIDGE TYPE CALIPERS WITH QUICK CHANGE PADS

Models affected	Commencing Chassis Numbers R.H. Drive	L.H. Drive
2.4 litre cars with disc wheels	913144	943331
2.4 litre cars with wire wheels	913234	943343
3.4 litre cars with disc wheels	975688	990694
3.4 litre cars with wire wheels	975783	990795
XK.150 Open 2-Seater	820004	831712
XK.150 Drop Head Coupe	827236	837836
XK.150 Fixed Head Coupe	824669	835886

On cars with the above chassis numbers and onwards bridge type calipers with quick change pads are fitted.

The servicing instructions are as follows:-

Every 5,000 miles (8,000 km)

Friction Pads - Examination for Wear

At the recommended intervals, or if a loss of braking efficiency is noticed, the brake friction pads (2 per brake) should be examined for wear; the ends of the pads can be easily observed through the apertures in the brake caliper. When the friction pads have worn down to a thickness of approximately a ¼" (7 mm) they need renewing.

Friction Pads - Renewal

To remove the friction pads, unscrew the nut from the bolt attaching the friction pad retainer to the caliper and extract the bolt. Withdraw the pad retainer.

Insert a piece of strong cord (or wire) through the hole in the metal tag attached to the friction pad and withdraw the pad by pulling on the cord.

To enable the new friction pads to be fitted it will be necessary to force the pistons back into the cylinder blocks by the use of Special Tool 7840 or by means of suitable levers.

Before doing this, it is advisable to half empty the brake supply tank otherwise forcing back the friction pad will eject fluid from the tank with possible damage to the paintwork. When all the new friction pads have been fitted, top up the supply tank to the recommended level.

Insert the new friction pads into the caliper ensuring that the slot in the metal plate attached to each pad engages with the button in the centre of the piston.

Finally, refit the friction pad retainer and secure with the bolt and nut. Apply the footbrake a few times to operate the self-adjusting mechanism, so that normal travel of the pedal is obtained.

/Cont'd....

The new part numbers are as follows:-

XK.150 and XK.150 'S'

C.14874	R.H. Front Caliper Assembly.
C.14875	L.H. Front Caliper Assembly.
C.14876	R.H. Rear Caliper Assembly.
C.14877	L.H. Rear Caliper Assembly.
7654	Friction Pad Assembly.

2.4 and 3.4 litre

C.14874	R.H. Front Caliper Assembly.
C.14875	L.H. Front Caliper Assembly.
C.14894	R.H. Rear Caliper Assembly.
C.14895	L.H. Rear Caliper Assembly.
7654	Friction Pad Assembly.

Index Reference Section L.

½" FAN BELT - INTRODUCTION

Models affected	Commencing Engine Numbers
XK.150	V.5733
XK.150 'S'	VS.1523
3.4 litre	KF.2501

On cars with the above engine numbers and onwards a ½" (12.5 mm) fan belt is fitted; the pulleys are modified to suit.

The part numbers are as follows:

C.14535	Fan Belt.
C.14588	Fan Pulley.
C.14589	Crankshaft Pulley.
C.14590	Dynamo Pulley.

Index Reference Section B.

CALIPER PISTON RETRACTOR TOOL

Models affected

Disc brake cars fitted with quick change pads.

When replacing friction pads it is necessary to force back the pistons into the caliper before the new pads can be fitted. A special tool (Part No. 7840) to carry out this operation is now available from the Jaguar Spares Department, price 13/3d.

Index Reference Section L.

JANUARY, 1959.

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO. 258

VARIOUS SERVICING ITEMS.

BRAKE VACUUM RESERVOIR - INTRODUCTION

Models affected	Commencing Engine Numbers
2.4 litre	B.C. 8075
3.4 litre	K.F. 2501

On cars with the above engine numbers and onwards a vacuum reservoir is incorporated in the vacuum line between the inlet manifold and the servo.

The vacuum reservoir tank is located underneath the right-hand front wing forward of the wheel. The tank has a vacuum check valve attached, to which the hoses are connected as follows:-

Hose from inlet manifold - to longer check valve connection.

Hose to servo - to shorter check valve connection.

Inlet Manifold

The vacuum check valves originally fitted to the 2.4 litre and 3.4 litre models are now discontinued, and the hose to the inlet manifold is now taken to an adaptor at the rear of the manifold which also incorporates a connection for the windscreen washer pipe.

The re-designed inlet manifold for the 3.4 litre model also incorporates a six branch distribution arrangement for the auxiliary starting carburetter.

The part numbers of the main items are as follows:-

No. off.		
1	Vacuum Reservoir	C.14681
1	Check Valve.	C.14693
1	Adaptor at rear of inlet manifold.	C.14715
1	Hose - Manifold to Vacuum Reservoir	C.14714
1	Hose-Vacuum Reservoir to Servo	C.14963
1	Inlet Manifold (2.4 litre)	C.14893
1	Inlet Manifold (3.4 litre)	C.14651/A.

Index Reference   Section L.

PETROL FILTER-INTRODUCTION

Model affected	Commencing Engine Number
3.4 litre	KF.2501

On cars with the above engine number and onwards a petrol filter of the glass bowl type is fitted. The filter is fitted to the right-hand wing valance and the maintenance instructions are as given in Service Bulletin 227 for the 2.4 litre model.

Index Reference   Section C.

/Cont'd....

UPPER WISHBONE BALL JOINT

Models affected	Commencing Chassis Numbers R.H. Drive	L.H. Drive
2.4 litre with drum brakes	912622	943267
2.4 litre with disc brakes	912744	943288
3.4 litre	975232	990270
XK.150 Open 2-seater	820004	831698
XK.150 Fixed Head Coupe	824668	835882
XK.150 Drop Head Coupe	827235	837831
Mark 1X	770220	790196

On cars with the above chassis numbers and onwards modified upper wishbone ball joints are fitted. These modified ball joints have a larger diameter ball and an increased angle of movement. In the case of the 2.4 litre and 3.4 litre models the ball joint bolt hole centres in the upper wishbone levers and packing piece are increased from 1.11/16" (4.28 cm) to 1¾" (4.44 cm).

The new part numbers are as follows:-

Number per car	Part Number
2 off Upper Wishbone Ball Joint	C.14434
4 off Upper Wishbone levers (2.4 and 3.4 litre only)	C.14436
2 off Packing Piece (2.4 and 3.4 litre only)	C.4740

Interchangeability

(i) On the Mark 1X and XK.150 models upper wishbone ball joint C.14434 is interchangeable with the previous type, but it will also be necessary to fit grease nipple C.9048, Self-locking nut C.8737/5 and Plain washer C.791.

(ii) On the 2.4 litre and 3.4 litre models the upper wishbone ball joint C.14434 is not interchangeable with the previous types fitted.

Index Reference Section J.

SPARKING PLUGS - CHANGE FROM N.8 to N.5 TYPE

Models affected

All

The Champion N.5 (old designation N.A.8) sparking plug is now fitted to all current production engines for which the N.8 (N.8.B) type was originally specified. Engines prior to this change must have N.5 sparking plugs fitted when replacement becomes necessary.

It is also recommended that this change takes place on non-current production engines originally equipped with N.8 or N.8.B plugs.

Index Reference Sections B and P.

JANUARY, 1959.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 259.

VARIOUS SERVICING ITEMS.

60 WATT HEADLAMP BULBS - INTRODUCTION ON L.H. DRIVE CARS

Models affected	Commencing Chassis Numbers L.H. Drive
2.4 litre	943324
3.4 litre	990610

On cars with the above chassis numbers and onwards modified headlamps incorporating 60 watt bulbs are fitted.

The part numbers are as follows:-

	Part Number
Headlamp complete	C.14238
Bulb. 60 watt (Lucas No. 406)	C.8905

Interchangeability

1. The complete headlamp C.14238 is interchangeable with the previous type C.8809
2. The 60 watt bulb cannot be fitted to headlamp C.8809.

Index Reference   Section P.

AIR INTAKE LEVER SEALING RUBBERS

Models affected

XK.150 cars with fresh air heater (see Service Bulletin No. 252).

Cars now in production are fitted with a sponge rubber seal (Part No. BD.16680 - 2 off) at the top and bottom of the air intake lever situated at the left-hand side of the driving compartment.

These seals are fitted to prevent the ingress of cold air when the air intake is opened for operation of the heating system.

The seals are affixed to the air vent box with rubber solution and contact each other along the whole of their lengths.

Index Reference   Section O.

/Cont'd....

72 SPOKE WIRE WHEELS

Model affected	Commencing Chassis Numbers	
	R.H. Drive	L.H. Drive
3.4 litre cars fitted with wire wheels	975230	990262

On cars with the above chassis numbers and onwards 72 spoke wire wheels are fitted, replacing 60 spoke wire wheels.

The new part numbers are as follows:-

72 spoke Wire Wheel (painted)	C.14766
72 spoke Wire Wheel (chrome plated)	C.14802

60 spoke and 72 spoke wheels should only be fitted to individual cars in complete sets.

Index Reference   Section M.

POWER STEERING INNER COLUMN AND VALVE ASSEMBLY

Models affected

Mark V111 cars fitted with power steering.
Mark 1X model.

The 'O' ring (Item 16 plate CC in the Mark V111 Spares Catalogue) is now superseded by an oil excluding sleeve, retaining washer and circlip.

The original type of inner column and valve assembly will be serviced with the later type incorporating the oil excluding sleeve; the orginal part numbers for this assembly (7566 for L.H. Drive and 7565 for R.H. Drive) will be retained.

Index Reference   Section I.

GUM DEPOSIT ON INLET VALVES

Models affected

All

If allowed to stand for any length of time, some present day fuels have a tendency to form gum which may be deposited on the inlet valves when the engine is started after a period of storage; this may cause sticking valves.

It is therefore suggested, that in cases where a car is likely to be stored for any length of time, the fuel should be drained from the petrol tank and carburetters. A small quantity of oil should also be injected into each cylinder.

Index Reference   Section B.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO.261

BRAKES - MAINTENANCE AND RECTIFICATION

IMPORTANT

The following information is given to ensure more satisfactory brake maintenance and to simplify the handling of complaints.

Contents

BRAKE MAINTENANCE

1. Ensure that only the brake fluids specified in Service Bulletin No. 242 are used.
2. Check the brake fluid level in the Reservoir on every occasion a customers car is in your hands for service and if the level is low investigate as detailed below.
3. Check for brake lining or friction pad wear whenever you carry out regular maintenance service and advise the owner if re-lining is necessary immediately or in the near future.
4. Fully bleed the hydraulic system and refill with new brake fluid whenever a brake re-line or overhaul is carried out.
5. Check the condition of the rubber brake hoses and the rubber servo hose connections when carrying out a brake re-line or overhaul.

RECTIFICATION

BRAKE FLUID LEVEL

If the brake fluid level in the reservoir is found to be low always make a careful check to find out WHY before topping up.

/Cont'd...

There will be a progressive reduction in level consistent with lining or pad wear due to the increased fluid volume contained in the wheel cylinders but if the fluid level has dropped to any extent carefully check the following points for fluid loss.

1. Push rod end of brake master cylinder.

   If any trace of fluid is found on the push rod, pull back the rubber boot and observe whether there is evidence of brake fluid leaking past the master cylinder piston seal. If this condition exists fit a replacement master cylinder or overhaul the existing unit.

2. Apply and maintain full pressure at the brake pedal and carefully examine all brake connections and wheel cylinders for fluid loss. Note in the case of drum brake cars, when checking the wheel cylinders, pressure at the pedal should be maintained for some minutes and the drums then removed for inspection of the wheel cylinders.

   If when pressure is maintained on the brake pedal the pedal progressively sinks, examine all connections and wheel cylinders and if no fluid loss is found, the loss of pressure should be traceable to the master cylinder recuperation seal or main seal. Fit a replacement master cylinder or overhaul the existing unit. Fully bleed the system and repeat the above pressure check.

If low fluid level is found and the foregoing checks do not reveal reason for fluid loss but fluid level is low enough to suggest loss is definitely occurring, measure the fluid level in the reservoir. Leave car standing without engine being run for 12/24 hours and re-check level. If level has dropped, remove brake servo (without having re-started engine) dismantle servo and examine for evidence of brake fluid having entered the servo vacuum cylinder or the servo operating valve chamber. If brake fluid is found, fit a replacement servo or replace all the seals in the servo unit.

LONG BRAKE PEDAL TRAVEL - RECTIFIED BY BLEEDING BRAKES

This complaint can only be due to air getting in the hydraulic system. If you deal with a car on which the brake pedal has to be pumped when the car is stationary to obtain a normal brake pedal action but bleeding the system produces normal brake pedal action, do not release the car until you have traced the reason for air getting into the hydraulic system.

Possible causes are:-

(a) Air entry past servo piston rod seal (for Mark Vll and Mark Vlll Clayton-Dewandre servos see Service Bulletin No.260)

(b) Air entry past servo plunger seal.

(c) Air entry past wheel cylinder seals.

(d) Air entry past master cylinder main seal (in this case bleeding will probably be difficult).

(e) Air in hydraulic system due to brakes having being overheated and the fluid vapourised.

LONG PEDAL TRAVEL - SELF RECTIFIED WHEN CAR HAS BEEN STANDING

This complaint arises due to severe overheating of the brakes and boiling of the brake fluid - self rectified when fluid cools, and can be due to:-

/Cont'd...

(a) Servo vacuum piston not fully returning and in this case all four brakes will show signs of having being overheated.

(b) Insufficient free movement on master cylinder push rod, again all four brakes with show signs of overheating.

(c) Automatic Transmission cars only.
Fault in anti-creep pressure switch (at rear of transmission unit) holding rear brakes on. Rear brakes only will show signs of overheating.

(d) Car has been driven with hand brake on - rear brakes only will show signs of overheating.

Note: In the event of the brakes having been overheated the wheel cylinder piston seals should be examined. In the case of disc brake cars overheating of the wheel cylinder piston seals will result in loss of interference and long pedal action ON ROAD

LONG PEDAL TRAVEL ON ROAD AND WHEN STATIONARY - NOT CORRECTED BY BLEEDING

This complaint is only likely to occur on drum brake cars for the following reasons:-

Girling Brakes (Mark V11 and Mark V111)

(a) Rear brakes not in adjustment.

(b) No friction between front brake self adjuster friction pads and brake shoe webs.

(c) Front brake shoes incorrectly set up relative to drums (see Service Bulletin No.256), or drums badly out of round.

Lockheed Brakes

(a) Rear brake self adjusters not operating.(2.4/3.4 litre only)

(b) Front brake self adjuster ratchet broken and/or no friction on self adjustment friction pads.

(c) Front brake shoes incorrectly set up relative to drums or drums badly out of round.

LONG PEDAL TRAVEL ON ROAD BUT NORMAL PEDAL TRAVEL WHEN STATIONARY

Disc Brakes

(a) Excess play in front hub bearings.

(b) Excess end float of rear axle shafts.

(c) Excess run out on discs.

(d) Shake back on wheel cylinder pistons (due to insufficient interference between piston seal and wheel cylinder bore - see note under heading "Long pedal travel - self rectified when car has been standing")

Note: If excess disc run out is found check the hub flanges for run out and for dirt between the hub flange and disc mating faces.

Also note when checking Mark lX rear discs for run out or when setting the calipers relative to the discs, the disc should be securely bolted to the hub flange using suitable distance pieces under the wheel nuts.

Lockheed Drum Brakes

(a) Insufficient friction or broken ratchet on front brake self adjusters.

/Cont'd...

(b) Hydraulic check valve in end of servo (Part No.6466) not maintaining residual line pressure.

Girling Drum Brakes

Insufficient friction on front brake self adjuster friction pads.

Heavy Pedal Action - (sometimes wrongly described by owners as fade).

1. Servo connecting hose-vacuum pipe to inlet manifold take off - collapsed.
2. Vacuum check valve stuck or incorrectly assembled.
3. Servo performance low - sluggish piston or no interference between piston leather and vacuum cylinder.
4. Long brake pedal travel resulting in maximum servo point being passed before full braking effort obtained. (see foregoing paragraph on Long Pedal Travel).

EXCESS BRAKING ON FRONT WHEELS

Disc Brake Cars

Rear brake pads sticking in calipers (check by inserting feeler gauge between pad and disc and note if the feeler is nipped when the brakes are applied).

Drum Brake Cars

(a) Rear wheel cylinder seized. (b) Rear brake shoes fitted incorrectly.

BRAKES HANGING ON

(a) Brakes drag on all four wheels and do not release when the engine is switched off - Servo piston sticking in vacuum cylinder.
(b) Brakes drag on all four wheels but release when engine is switched off - Servo plunger valve sticking.

BRAKES PULLING, LOCKING OR KNOCKING ON BRAKE APPLICATION

The above complaints can be due to:-

(a)

Disc Brake Cars

Slackness of the bolts searing the brake caliper and/or the bolts securing the caliper adaptor plate to the stub axle carrier or rear axle flange.

Drum Brake Cars

Slackness of the bolts searing the brake backplate to the stub axle carrier or the rear axle flange.

(b) Grease or oil on the friction pads - clean off grease or oil from the brake disc with petrol or trichloreythelene.

(c) On the Mark V11, Mark V111 and Mark 1X models slackness of the bolts securing the lower wishbone brackets to the chassis frame. Slackness of the rear spring 'U' bolts.

(d) On the 2.4/3.4 litre models, slackness of the rear spring centre bolts.

WHISTLE FROM ENGINE

An elusive whistle noticed at approximately 1200 r.p.m. on a small throttle opening but not reproduced when car is stationary or coasting in neutral with engine switched off will be traced to an air leak at the servo diaphragm chamber joint face (Lockheed 6⅞" Servo only)

Index Reference Section L.

APRIL, 1959.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 262

VARIOUS SERVICING ITEMS

STEERING UNIT AND IDLER - MODIFIED TYPE

Models affected	Commencing Chassis Numbers R.H. Drive	L.H. Drive
2.4 litre	914564	943496
3.4 litre	976917	991866

On cars with the above chassis numbers and onwards a re-designed Steering box and Idler assembly is fitted.

The steering unit is lower geared than the previous type and gives approximately $4\frac{1}{4}$ turns from lock to lock. The hole centres in the steering drop arm and in the idler lever are reduced from $5\frac{7}{8}$" (14.92 cm) to $5\frac{1}{2}$" (13.97 cm).

The part numbers of the main items are as follows:-

	Part Number
Steering Unit RHD	C.14845
Steering Unit LHD	C.14846
Steering Drop Arm	C.14847
Steering Idler Assembly	C.14887
Steering Idler Lever	C.14848

Interchangeability

It is important that only the correct drop arm and idler lever are fitted with the new steering unit.

The above parts are not individually interchangeable with the previous types fitted.

Index Reference   Section I

FOULING OF CLUTCH PEDAL

Model affected

XK.150

If fouling of the clutch pedal is experienced, the most likely cause is that the clutch over-centre spring bracket is contacting the split pin end of the clevis pin which secures the brake master cylinder fork end to the brake pedal.

In this event the position of the clevis pin should be reversed so the head of the pin is facing the clutch pedal linkage.

Index Reference   Section E

/Cont'd...

LEAD INDIUM BIG END BEARINGS - INTRODUCTION

Models affected	Commencing Engine Numbers
2.4 litre	BE.1116
3.4 litre	KF.6219
XK.150	V.6709
Mark V111	NA.3386

On cars with the above engine numbers and onwards lead indium big end bearings are fitted.

The part number is as follows:-

12 halves Big-end bearing C.5893

Interchangeability

The lead-indium bearings are interchangeable with the previous white metal type in complete sets.

Section Reference Section B

11 PLATE BATTERY - INTRODUCTION

Models affected	Commencing Chassis Numbers R.H. Drive	L.H. Drive
3.4 litre	976364	991361
Cars for U.S.A. and Canada commenced at	-	990336

On cars with the above chassis numbers and onwards a 11 plate battery replaces the 9 plate type.

The details are as follows:-

	Jaguar Part Number	Lucas type	Capacity
9 plate battery	C.8792	GTW9A	57 amp. hr. at 20 hr rat
11 plate battery	C.14886	BV.11A	72 amp. hr. at 20 hr rate

Index Reference Section P ✓

NOISE FROM REAR WHEEL ARCHES

Models affected.

Later Mark V111 models
Early Mark 1X models

If a rubbing noise is experienced from the rear when the car is fully laden, it may possibly be due to the sliding roof rear drain tubes in the rear wheel arches fouling the tyres. If so, the drain tubes should be shortened so that they clear the tyres.

Index Reference Section N ✓

APRIL. 1959.

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 263

VARIOUS SERVICING ITEMS

POWER STEERING BANJO AND BANJO BOLT

Models affected	Commencing Chassis Numbers R.H. Drive	L.H. Drive
Mark IX	770927	790559

On cars with the above chassis numbers and onwards a modified banjo bolt C.15273 (Item CG.13 in the Mark VIII Spares Catalogue) is fitted at the top end of the steering unit to obtain greater depth of thread engagement. With the introduction of this bolt, banjo C.13857 originally fitted for Right-hand drive cars only, is now also specified for Left-hand drive cars.

Interchangeability

For replacement purposes -
Use Banjo bolt C.15273 with aluminium banjo C.13857.
Use banjo bolt C.1506 with phosphor bronze banjo C.1505.

Index Reference   Section I ✓

MECHANICALLY OPERATED OVERDRIVE

Models affected	Commencing Chassis Numbers R.H. Drive	L.H. Drive
XK.150 'S' Open 2-seater	-	831963

Cars with the above chassis numbers and onwards are fitted with a mechanically operated overdrive. The operating lever is mounted forward of the normal gearshift lever and will only allow the overdrive to operate on top gear.

To engage overdrive from top gear pull the lever rearward; to change down from overdrive to top gear push the lever forward. If a change is made direct from overdrive to third gear the lever will automatically disengage from overdrive.

Index Reference   Section F ✓

KNOCK-ON HUB CAPS - GERMANY ONLY

Models affected

All models fitted with wire wheels.

Cars now in production are fitted with special knock-on hub caps to comply with German safety regulations. These hub caps have shorter lugs and require the use of a special tool for removal and replacement. This removal tool fits over the hub cap and has suitable lugs to allow a copper mallet to be used.

/Cont'd...

The part numbers are as follows:-

Hub cap - right-hand	C.14891
Hub cap - left-hand	C.14892
Hub cap remover	C.14927

Index Reference Section M ✓

DISC BRAKE HANDBRAKE SETTING

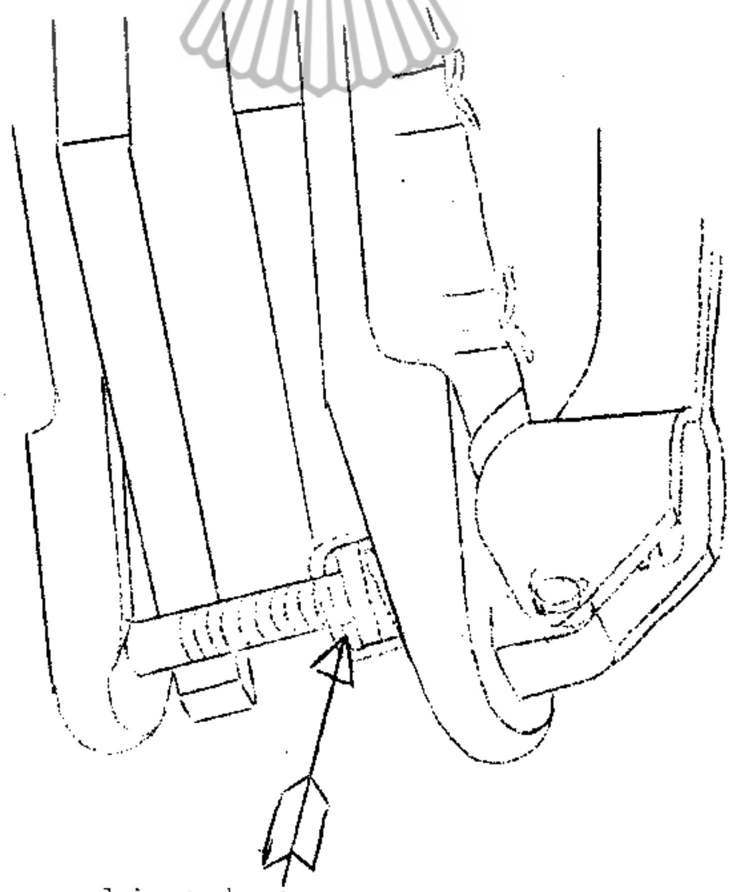
Models affected

All models fitted with disc brakes.

If complaints are received of the handbrakes being in need of frequent adjustment the following procedure should be carried out.

Check that there is a gap between the square spring retaining nut and the spring cage through which the adjuster bolt is screwed. If not, unscrew the adjuster bolt and proceed as follows:-

Prior to screwing the adjuster bolt into the self locking nut, insert a screwdriver between the square spring retaining nut and the spring cage to partly compress the spring. Hold the locknut firmly against the trunnion and ensure that the adjuster bolt engages the threads of the locknut at the first turn. After screwing in the adjuster bolt three or four turns the screwdriver can be released from the spring cage and the normal adjustment carried out.



Insert screwdriver here

Index Reference Section L ✓

MAY, 1959

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO. 265

VARIOUS SERVICING ITEMS

QUICK CHANGE FRICTION PADS - CHANGE IN MATERIAL

Models affected		Commencing Chassis numbers R.H. Drive	L.H. Drive
2.4 litre	- disc wheels	914891	943531
	- wire wheels	915136	943568
3.4 litre	- disc wheels	977498	992317
	- wire wheels	977791	992531
Mark 1X		771535	790835

On cars with the above chassis numbers and onwards Mintex M33 material friction pads are fitted in place of Ferodo DS5 pads.

The part numbers are as follows:-

	2.4 and 3.4 litre	Mark 1X
Friction pads (8 off)	7937	-
Friction pads - front (4 off)	-	7936
rear (4 off)	-	7937

The use of Mintex M33 pads alters the part numbers of the caliper assemblies as follows:-

Front caliper assembly	- right hand	C.15648	C.15657
	- left hand	C.15649	C.15658
Rear caliper assembly	- right hand	C.~~14894~~ 15646	C.15655
	- left hand	C.~~14895~~ 15647	C.15656

Identification

In production Mintex M33 friction pads are identified by red and white stripes across the width of the pads.

Interchangeability

Mintex M33 pads are interchangeable with Ferodo DS5 quick change square type pads in complete car sets.

Note: Ferodo DS5 pads will continue to be used on the XK.150 model.

Index Reference Section L

AIR CLEANER - PAPER TYPE

Models affected		Commencing Chassis numbers R.H. Drive	L.H. Drive
XK.150 'S'	Open 2-seater	820039	832076
	Fixed Head Coupe	824864	836187
	Drop Head Coupe	827355	838246

Cars with the above chassis numbers and onwards are fitted with a single paper air cleaner in place of three wire mesh type elements. To gain access to the paper element, remove the cover box from the rear of the valance underneath the right-hand front wing.

/Cont'd...

SERVICE BULLETIN NO.265

Unscrew the two self-locking nuts which secure the air cleaner cover plate. Remove the cover plate when the paper element can be withdrawn taking care not to lose the distance pieces from the studs.

The maintenance instructions are as follows:-

Every 2,500 miles (4,000 km)

Remove the paper element and blow out the accumulated dirt with compressed air. Take care not to perforate the paper with the air line nozzle.

Every 10,000 miles (16,000 km)

Renew the paper element. (Part number C.15258)

Index Reference Section B

OIL FILTER CHANGING

Models affected

All models

It has come to our notice that oil filter elements are not being cleaned and changed at the recommended periods.

The importance of carrying out this service cannot be overstressed. Under conditions conducive to oil dilution and sludge formation more frequent changing of the element than the normal 5,000 miles is advised.

With a worn engine or when the car is used mainly for low speed, stop-start city driving the filter element should be changed every 2,500 miles.

NEVER CHANGE THE ENGINE OIL WITHOUT EITHER CLEANING OR CHANGING THE OIL FILTER ELEMENT.

Index Reference Section B ✓

WHEEL BALANCING WITH WHEELS ON CAR

Models affected

All models

If balancing equipment is used which dynamically balances the road wheels on the car, the following precaution should be observed.

In the case of the rear wheels always jack both wheels off the ground otherwise damage may be caused to the differential.

This is doubly important in the case of cars fitted with a Thornton "Powr-Lok" differential as in addition to possible damage to the differential, the car may drive itself off the jack or stand.

Index Reference Sections M and H ✓

MAY, 1959

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 266

VARIOUS SERVICING ITEMS

OIL FILTER BLANKING PLATE

Models affected	Commencing Engine numbers
2.4 litre	BE.1582
3.4 litre	KF.7140
XK.150	V.6861

On cars with the above engine numbers and onwards the blanking plate C.12803 originally fitted between the oil filter and cylinder block is no longer used.

In conjunction with this change the following modifications are incorporated.

(1) Cylinder Block

The oil filter joint face on the cylinder block is modified as follows:-

(a) The oil feed drilling for the centre main bearing is now threaded and blanked off with a grub screw.

(b) The hole originally drilled completely through the crankcase is no longer drilled.

(2) Oil Filter

(a) Shorter oil filter bolts are fitted.

(b) Only copper washers are fitted under the bolt heads.

(c) Only one gasket C.13091 is used between the filter and cylinder block.

(3) Oil Sump

The joint face flange of the sump is cut-a-way to clear the oil filter head casting.

The new part numbers are as follows:-

Part number		No. off
C.15950	Cylinder block - 2.4 litre	1
C.15951	Cylinder block - 3.4 litre XK.150	1
NB131/35D	Oil filter bolt	1
NB131/13D	" " "	2
NB131/25D	" " "	1
C.15964	Oil sump 2.4 and 3.4 litre	1

Interchangeability

CYLINDER BLOCK

2.4 litre

The new cylinder block C.15950 can be used to replace cylinder block C.8611 on engines with a pressed steel sump which have an external return pipe from the oil pressure relief valve.

3.4 litre and XK.150

The new cylinder block C.15951 is interchangeable with cylinder

/Cont'd...

block C8610/1 when used on the 3.4 litre and XK.150 models.

Note: The new cylinder block is NOT interchangeable with cylinder block C.8610/1 when used on Mark V11, Mark V111 and XK.140 models that is, engines with a vertical oil filter.

OIL SUMP

The new sump C.15964 can be used to replace pressed steel sumps C.9155 and C.12386 fitted to the 2.4 litre and 3.4 litre models but if it is required to fit an early type sump to engines after the above engine numbers it will be necessary to file the edge of the sump flange to clear the oil filter head casting.

Index Reference Section B

CHECKING AUTOMATIC TRANSMISSION FLUID LEVEL - REVISED INSTRUCTIONS

Models affected

All cars fitted with Automatic Transmission

To obtain a more accurate reading, the following method of checking the automatic transmission fluid level is now recommended.

1. Remove the cover plate from beneath the floor carpet to expose the dipstick. Clean the area around the dipstick hole.

2. With the car on a level floor, set the hand brake firmly. Set the selector lever in the P position and start engine. With the footbrake applied move the selector level to L and raise the transmission fluid temperature by running the engine at 800 r.p.m. for 2 or 3 minutes.

3. Remove the dipstick and wipe it dry. With the foot still on the brake and the selector lever at L run the engine at its normal idling speed and check the fluid level. Add sufficient fluid to bring the level up to the "Full" mark on the dipstick. DO NOT OVERFILL. The space between the "Full" and "Low" marks on the dipstick represents approximately one pint.

Index Reference Section FF

SHELL AND B.P. AUTOMATIC TRANSMISSION FLUIDS - NEW SPECIFICATION

Models affected

All cars fitted with Automatic Transmission

The two following new automatic transmission fluids are now in production.

Shell, Donax T6 - AQ/ATF/844A

BP Energol ATF Type A Suffix A - AQ/ATF/1020A

These two fluids are much lighter in colour than the previous type fluids being similar colour to engine oil. They can, however, be mixed with the other Automatic fluids that we recommend.

Index Reference Section FF

MAY, 1959

JAGUAR

SERVICE AND SPARES ORGANISATION

SERVICE BULLETIN NO.267

25 AMP DYNAMO AND NEW VOLTAGE/CURRENT REGULATOR

Models affected	Commencing Chassis numbers	
	R.H. Drive	L.H. Drive
2.4 litre	913953	943437
3.4 litre	977762	992494
XK.150 Open 2-seater	-	832088
Drop Head Coupe	827273	838259
Fixed Head Coupe	824900	836222
Mark 1X	771237	790713

On cars with the above chassis numbers and onwards a 25 amp output dynamo and voltage/current regulator with a revised current setting are fitted.

The details are as follows:-

	2.4 litre	3.4 litre	XK.150	Mark 1X
Dynamo				
Jaguar part number	C.15256	C.15255	C.15255	C.15254
Lucas type	C45-PV-6	C45-PVS-6	C45-PVS-6	C45-PVS-6
Lucas part number	22489D	22496A	22496A	22528D
Voltage/current regulator				
Jaguar part number	C.15257	C.15257	C.15257	C.15257
Lucas type	RB.310	RB.310	RB.310	RB.310
Lucas part number	37297.F	37297.F	37297.F	37297.F

The revised current setting of the new voltage regulator is as follows:-

24 to 26 amperes at 4,000 dynamo r.p.m.

Interchangeability

(i) The new voltage/current regulator is not interchangeable with the previous type fitted.

(ii) The new 25 amp dynamo can be used to replace the previous type fitted.

Index Reference Section P

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 268

VARIOUS SERVICING ITEMS

ELECTRIC REVOLUTION COUNTER - INTRODUCTION

Models affected	Commencing Chassis numbers R.H. Drive	L.H. Drive
2.4 litre	915214	943590
3.4 litre	977860	992652
XK.150 Open 2-seater	820043	832088
Fixed Head Coupe	824905	836233
Drop Head Coupe	827373	838272
Mark 1X	771820	791072

On cars with the above chassis numbers and onwards plus certain individual cars prior to these numbers an electrically operated revolution counter replaces the cable operated type.

The revolution counter instrument is energised by a small generator driven from the rear of the inlet camshaft. As the generator drive and mounting at the rear of the cylinder head is different to that for the right-angle cable drive, the cylinder head, inlet camshaft, inlet camshaft cover and gasket are modified to suit the new arrangement.

The details are as follows:-

	2.4 litre 3.4 litre	Mark 1X	XK.150
Electric Rev. Counter Instrument with Clock	C.14993	C.14995	C.14994
Harness for Electric Revolution Counter	C.15268	C.15268	C.15269
Revolution Counter Generator	C.14996	C.14996	C.14996
Driving Jaw	C.14989	C.14989	C.14989
Plate Washer	C.15918	C.15918	C.15918
Lock Washer (3 off)	C.15919	C.15919	C.15919
'O' Ring	C.14990	C.14990	C.14990
Setscrews (3 off)	C.14992	C.14992	C.14992
Cylinder Head	C.14955(2.4 litre) C.14956(3.4 litre)	C.14958	C.14956(XK.150) C.14957(XK.150'S')
Inlet Camshaft Cover	C.14987	C.14987	C.14987
Inlet Camshaft Cover Gasket	C.14988	C.14988	C.14988
Neoprene Sealing Ring	C.14991	C.14991	C.14991
Rear Bearing Cap	C.14984	C.14984	C.14984
Inlet Camshaft	C.14986(2.4 litre) C.14985(3.4 litre)	C.14985	C.14985

Interchangeability

Note that the new inlet camshafts detailed above are interchangeable with the previous types but the earlier type camshafts must NOT be fitted to cars with an electric revolution counter.

Index Reference   Sections B and P

CHANGING BRAKE DISCS

Models affected

Cars fitted with disc brakes

There have been a number of cases of brake discs having been changed in the mistaken belief that they have been cracked. On examination the suspected crack has been found to be a grinding mark or a corrosion mark at a point where the handbrake pad has stopped against the disc.

/Cont'd...

Of the discs returned to us for examination not one has been found to be cracked.

Index Reference Section L

REAR SPRING INTERLEAVING

Models affected

Mark V111
Mark 1X
XK.150

If on cars with nylon interleaved rear springs (see Service Bulletin No. 249) it is found that the interleaving has a tendency to work out from between the spring leaves, the ends of each rear spring should be bound with plastic or similar tape from the spring eyes to a point just short of the adjacent clip.

Index Reference Section K

CLUTCH SLAVE CYLINDER BRACKET - STRENGTHENED TYPE

Models affected	Commencing Chassis numbers R.H. Drive	L.H. Drive
Mark 1X	771823	791081
XK.150 Open 2-seater	820043	832069
Fixed Head Coupe	824903	836227
Drop Head Coupe	827379	838273

On cars with the above chassis numbers and onwards a stronger type of clutch slave cylinder bracket is fitted. The new part numbers are as follows:-

	Part number
Mark 1X	C.15706
XK.150	C.15709

Service Procedure

If, on cars prior to the above numbers, a case of the clutch not disengaging is experienced when the normal pedal adjustment is correct, an examination should be made to ascertain if the clutch slave cylinder mounting bracket is flexing when the clutch pedal is fully depressed.

If this is found to be so, a strengthened type of bracket should be fitted.

Index Reference Section E

Addition to Service Bulletin No. 255

With the introduction of the 12-bladed fan on Home market 2.4 litre cars add the following commencing chassis number under the heading "12-bladed Fan - Introduction" -------- R.H. Drive 915349

Amendment to Service Bulletin No. 265

Amend the part numbers of the Rear caliper assembly for the 2.4 and 3.4 litre models to read as follows:-

Rear Caliper Assembly - right hand C.15646 and not C.14894
- left hand C.15647 C.14895

OCTOBER, 1959

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO.269

VARIOUS SERVICING ITEMS

$6\frac{7}{8}$" VACUUM SERVO - DIFFERENCE BETWEEN DRUM AND DISC BRAKE TYPE

Models affected

Cars fitted with $6\frac{7}{8}$" diameter servo.

It will be noted that the $6\frac{7}{8}$" servo unit used in conjunction with drum brakes varies from the unit used with disc brakes.

The only difference between the two servo's is that units used in conjunction with drum brakes incorporate a check valve (item 53a, Plate AW in the 2.4 litre Spare Parts Catalogue) and a rubber seat in the adaptor at the end of the slave cylinder whereas units for use with disc brakes do not have these parts fitted.

Note: On early units the check valve was incorporated in a separate housing as shown in Fig.39 of Section L - 2.4/3.4 litre Service Manual.

Index Reference   Section L

REAR AXLE NOISE DIAGNOSIS

Models affected

All models

There have been several instances of noise attributed to the rear axle, having in actual fact been due to one of the following causes.

1. Wind noise from roof-rack.

   Re-test with rack removed.

2. Tread noise from non-standard tyres.

   Re-test with standard tyres fitted.

3. Noises being conducted through sliding roof drain tubes (in rear wheel arches). Mark V11, V111 and 1X models

   Re-test with drain tubes blanked off with corks. (Remove corks after test).

Index Reference   Section H

POWER STEERING RESERVOIR DIPSTICK

Models affected

Mark V111 and Mark 1X cars fitted with power-assisted steering

The reservoir dipstick fitted to early power-assisted cars is marked "Use 10 W oil". This should be disregarded and only one of the recommended Automatic Transmission fluids used in the system.

Index Reference   Section I

/Cont'd...

POWER STEERING UNIT - TOP OIL SEAL REPLACEMENT

Models affected

Cars fitted with power-assisted steering

When removing the top end plate of the steering unit to replace the oil seal it is ESSENTIAL that the flange of the top adjustable ball race (Item 18, Plate CC of the Mark V111 Spare Parts Catalogue) is not allowed to lift otherwise the loose balls which form the upper ball race will drop into the box.

When refitting the top end plate, cover the serrations of the input shaft with cellulose tape or thin paper in order not to damage the lip of the seal.

Remove all traces of the tape or paper after the top end plate has been secured.

Index Reference   Section I

FLUID LEAKAGE FROM AUTOMATIC TRANSMISSION UNIT

Models affected

Cars fitted with Automatic Transmission

Cases of fluid leakage from the transmission brought to our notice, have in most instances been caused by incorrect servicing such as neglecting to observe torque specifications or instructions regarding the use of new gaskets and washers.

As even slight leakage is likely to be accentuated by the high pressures under operational conditions, a considerable amount of fluid will be lost in a very short time. It is emphasized that any loss of fluid in excess of two pints (1 litre) will cause slip of the friction bands and clutches with risk of serious damage to the transmission.

It is imperative, therefore, that any cases of fluid loss reported is rectified without delay.

Index Reference   Section FF

HIGH SETTING THERMOSTATS

Models affected

2.4 litre
3.4 litre
Mark 1X
XK.150

Special high temperature thermostats are available for countries where extreme winter conditions prevail. The details are as follows:

	Part Number	Opening Temperature
2.4 litre, 3.4 litre	C.13944/1	80/85° C.
Mark 1X, XK.150	C.12867/1	80/85° C.

Index Reference   Section D

OCTOBER, 1959

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO. 270

VARIOUS SERVICING ITEMS

$6\frac{7}{8}$" SERVO - INTRODUCTION OF CUP SPREADER

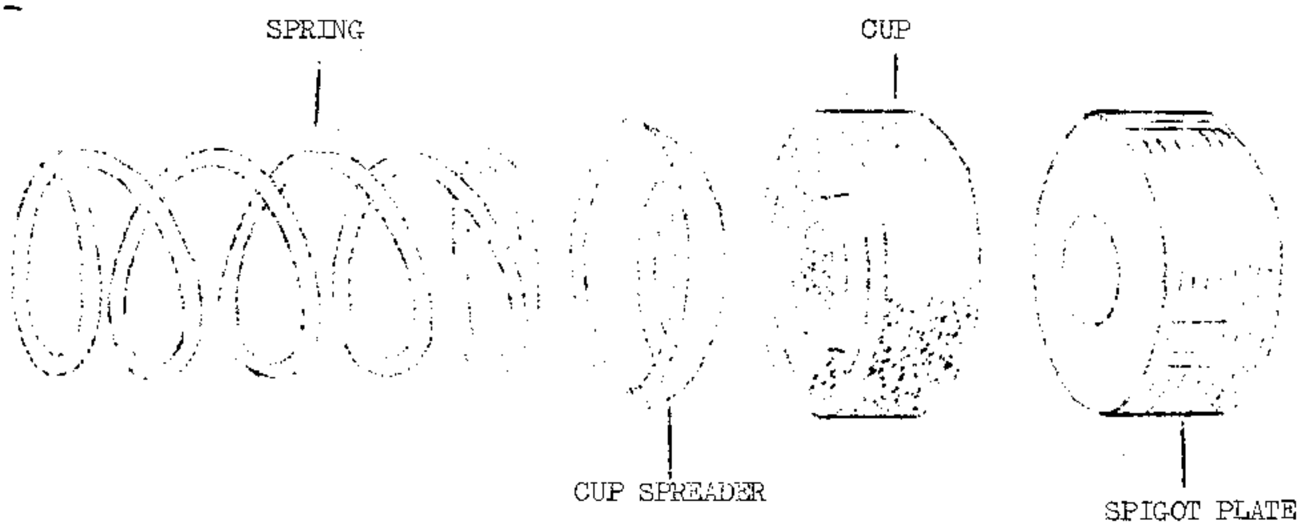
Models affected

Cars fitted with $6\frac{7}{8}$" diameter servo unit

Current production servo units are fitted with a cup spreader in the slave cylinder.

This cup spreader (Part No. 7896) will be included in future repair kits and should be incorporated in all servo units undergoing overhaul.

The spreader is fitted between the cup and spring (Items 60 and 49 in Fig.41 of Section L, 2.4/3.4 litre Service Manual) with the concave side towards the spring. (See sketch).



Index Reference   Section L

SERVICE BULLETIN NO. 270

(2)

GIRLING HYDRAULIC DAMPER - MODIFIED TYPE

Model affected	Commencing Chassis Numbers	
	R.H. Drive	L.H. Drive
Mark 1X	772081	791442

On cars with the above chassis numbers and onwards modified hydraulic dampers are fitted at the front. These dampers are of the C.S.V. type and give consistent damping at all operating temperatures.

The part number is as follows:-

Front damper C.15999 2 off

Interchangeability

The new dampers are interchangeable with the previous type in pairs.

Index Reference Section J

HANDBRAKE ASSEMBLY - MODIFIED TYPE

Model affected	Commencing Chassis Numbers	
	R.H. Drive	L.H. Drive
Mark 1X	772085	791445

On cars with the above chassis numbers and onwards rear calipers with modified handbrakes are fitted.

The handbrakes are of a stronger section and incorporate M.34 type handbrake pads of the quick change type. A brass retractor is now fitted to each handbrake to keep the handbrake pads clear of the disc when the handbrake is in the "off" position.

The part numbers are as follows:-

Rear Caliper assembly - right hand	C.15860
Rear Caliper assembly - left hand	C.15861
Right Hand Handbrake assembly	C.15858
Left Hand Handbrake assembly	C.15859
Right Hand Inner Pad Carrier	8022
Right Hand Outer Pad Carrier	8023
Left Hand Inner Pad Carrier	8025
Left Hand Outer Pad Carrier	8026
Operating Lever	8024
Handbrake Repair Kit (set of pads and fixings)	8021

Interchangeability

The new type handbrakes are not interchangeable with the previous type.

Spares Bulletin K.16 refers.

Index Reference Section L

JAGUAR
SERVICE AND SPARES ORGANISATION
SERVICE BULLETIN No. 271
Tuning Data
2·4 litre and 3·4 litre (Mark 1) Models

2·4 litre (Mark 1) Model

COMPRESSION RATIO	TYPE OF CYLINDER HEAD	CAM LIFT	EXHAUST SYSTEM	CARBURETTER TYPE	CARBURETTER SETTINGS	DISTRIBUTOR		DISTRIBUTOR CONTACT BREAKER GAP	STATIC IGNITION TIMING	CHAMPION SPARKING PLUG TYPE & GAP	
						Jaguar Part Number	Lucas Service Number			Touring	Racing
7 to 1	Standard (Silver Top)	$\frac{5}{16}$"	Single	Solex 23 mm Choke	Main Jet 110 Air Correction Jet 200 Pump Jet 55	C8789	40557A*	.014"-.016"	4° BTDC*	L.7 (.030")	L.5 (.030")
8 to 1	Standard (Silver Top)	$\frac{5}{16}$"	Single	Solex 24 mm Choke	Main Jet 110 Air Correction Jet 180 Pump Jet 55	C11903	40528A	.014"-.016"	6° BTDC	N.5 (.030")	N. 3 (.030")
8 to 1 Stage 1 Tuning	Standard (Silver Top)	$\frac{5}{16}$"	Single Straight Through	Solex 26 mm Choke	Main Jet 120 Air Correction Jet 190 Pump Jet 60	C11903	40528A	.014"-.016"	6° BTDC	N.5 (.025")	N.3 (.025")
8 to 1 Stage 2 Tuning	Standard (Silver Top)	$\frac{3}{8}$"	Single Straight Through	Solex 26 mm Choke	Main Jet 120 Air Correction Jet 190 Pump Jet 60	7068	40591A	.014"-.016"	8° BTDC	N.5 (.025)	N.3 (.025")
8 to 1 Stage 3 Tuning	'B' Type (Light blue top)	$\frac{3}{8}$"	Twin	S.U. HD. 6 $1\frac{3}{4}$" bore	T.O. Needles.	C13428	40584A	.014"-.016"	5° BTDC	N.5 (.025")	N.3 (.025")

*Early cars were fitted with the 8 to 1 compression ratio distributor 40528A and the ignition timing set at 1° B.T.D.C.

3·4 litre (Mark 1) Model

COMPRESSION RATIO	TYPE OF CYLINDER HEAD	CAM LIFT	EXHAUST SYSTEM	CARBURETTER TYPE	CARBURETTER NEEDLES		DISTRIBUTOR		DISTRIBUTOR CONTACT BREAKER GAP	STATIC IGNITION TIMING	CHAMPION SPARKING PLUG TYPE & GAP	
					with Wire mesh air cleaner	with Oil bath air cleaner	Jaguar Part Number	Lucas Service Number			Touring	Racing
7 to 1	'B' Type (Light blue top)	3/8"	Twin	S.U. HD. 6 1¾" bore	T.L.*	S.C.	C12733	40578A	.014"-.016"	TDC	L.7 (.025")	L.5 (.025")
8 to 1	'B' Type (Light blue top)	3/8"	Twin	S.U. HD. 6 1¾" bore	T.L.*	S.C.	C12732	40576A	.014"-.016"	2° BTDC	N.5 (.025)	N.3 (.025")
9 to 1	'B' Type (Light blue top)	3/8"	Twin	S.U. HD. 6 1¾" bore	T.L.*	S.C.	C14269	40617A	.014"-.016"	TDC	N.5 (.025")	N.3 (.025")

*L.B.1. needles fitted to early cars.

Index Reference: Sections B and C

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 273

VARIOUS SERVICING ITEMS

VEHICLE OPERATION ON MOTORWAYS

The following points should be brought to the notice of owners who are likely to operate their cars on the new motorways.

Speeds

Do not maintain an engine speed in excess of 5,000 r.p.m. for any length of time.

Occasionally, release accelerator slightly and allow car to overrun for a few seconds.

Oil Pressure and Water Temperature Gauges

Occasionally check if the oil pressure and water temperature are normal, although there may be slight variations from normal after a long period of sustained high speed driving.

Tyre Pressures

Tyres should be inflated to a pressure of 6 lbs per sq. in above normal for sustained high speed driving (as already recommended in the Operating Handbooks).

Winter Grip Tyres

Although the advice of the particular tyre manufacturer should be taken on the question of maximum speeds with these types of tyre it is generally recommended that speeds in excess of 85 m.p.h. should not be maintained.

Index Reference   Section Q

CLAYTON DEWANDRE SERVO UNIT - IMPORTANCE OF FITTING PISTON ROD

Models affected

Mark VII
Mark VIII

With reference to Service Bulletin No.260 and the introduction of the new repair kit Part No. 7876, it is pointed out that the piston rod (Part No. 1771) included in the kit must be fitted in conjunction with the new seals when overhauling the unit, even if the existing piston rod appears to be serviceable.

Index Reference   Section L

STICKING FORWARD SERVO

Models affected

All cars fitted with Automatic Transmission

Symptoms

Car drives forward in Neutral, transmission drags in Reverse, normal operation in D and L selector positions.

Action

The reason for a sticking servo is not always obvious but the following action will normally effect a cure:-

(1) Ensure that there are no burrs or ragged edges on the outside diameter of the piston.

(2) If bore of servo is rough, polish with fine emery cloth.

(3) Inspect hole in centre of the steel servo plate. Ensure that the piston moves freely in the hole which should have a smooth finish.

(4) Refit servo, tightening bolts to a torque of 15/18 lbs ft.

(5) Check forward and low band adjustments.

Index Reference Section FF

OVERDRIVE OPERATION

Models affected

Cars fitted with an overdrive

In the Mark 2 Operating Handbooks it is recommended that the overdrive should not be brought into operation at high speed with a wide throttle opening. The accelerator should be momentarily released when engaging the overdrive otherwise the cone clutch may stick and cause the overdrive to remain in engagement even though switched "out" and when in gears other than top.

This also applies to other overdrive models and as the new instructions appear to contradict the previous ones they should be brought to the notice of all service personnel.

Note: If the overdrive does not disengage at anytime, do not reverse the car otherwise damage may be caused to the unit. On some occasions it may be possible to disengage the cone clutch by tapping the cast iron brake ring, which is sandwiched between the front and rear casing of the overdrive, with a block of wood.

Index Reference Section F

NOVEMBER, 1959

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 274

VARIOUS SERVICING ITEMS

LACK OF SERVO ASSISTANCE

Models affected

3.4 litre
Mark V111
XK.150

If on cars with the vacuum check valve in the underside of the inlet manifold (see Fig.17, 2.4/3.4 litre Service Manual) lack of servo assistance is experienced, the valve seal should be removed and examined for signs of swelling or hardening. If faulty, a replacement seal should be fitted.

Other causes of lack of servo assistance are:

(i) Servo breather blocked.

(ii) Vacuum hose(s) blocked.

(iii) Dry vacuum piston leather in servo unit.

Index Reference — Section L

FITTING SNOW CHAINS - PRECAUTIONS

Models affected

Cars fitted with Disc Brakes

On cars fitted with disc brakes, strap-on type snow chains must not be fitted as the straps will foul the caliper bridge pipe. However, chains which fit completely around the periphery of the tyre can be used provided that the rear wing valances are removed.

Index Reference — Section M

DRAIN HOLES IN NEW TYPE REAR LAMPS

Models affected

Cars with new type tail lamps

A certain number of 1960 cars with the new type rear lamps (with separate flasher and tail light bulbs) were sent out of the factory without the drain holes in the bottom of the lamp lens.

Cars in stock or cars coming in for servicing should be checked for having two holes drilled in the bottom of the rear lamp lens. If not so drilled, two holes should be made in the bottom of the lens as shown in the sketch overleaf.

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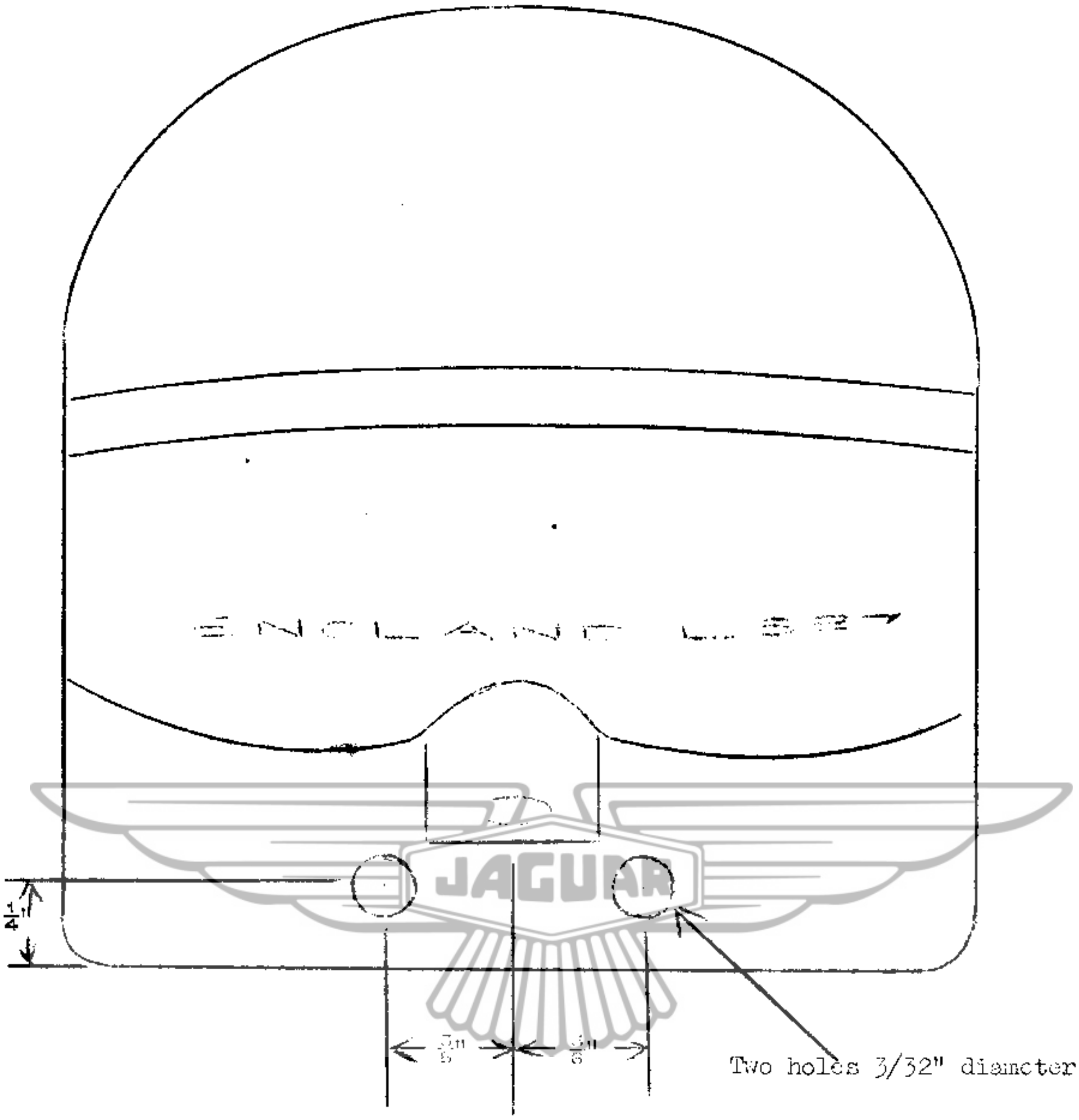

Index Reference Section P

TWIN LIP OIL SEAL - INTRODUCTION

Models affected	Commencing chassis numbers	
	R.H. Drive	L.H. Drive
Mark 1X	773282	792205

On cars with the above chassis numbers and onwards a twin lipped oil seal (Part number 8216) is fitted at the top of the power steering unit (Item 25 Plate CC in the Mark V111 Spare Parts Catalogue).

The twin lipped oil seal can be used to replace the previous type of seal 7588 but attention is drawn to the instructions given in Service Bulletin No.269 page 2. The seal must be fitted with the circular spring facing the steering unit.

A dust shield (Part number C.16396) should be fitted in conjunction with the twin lipped seal.

This is fitted over the wormshaft, concave side downwards, and should be tapped down the shaft with a tubular punch until the top face of the shield is 1.5/16" (33.5 mm) below the top of the wormshaft.

Index Reference Section I

NOVEMBER, 1959

J A G U A R

S E R V I C E A N D S P A R E S O R G A N I S A T I O N

SERVICE BULLETIN NO.275

HYDRAULIC BRAKE FLUIDS - IMPORTANT

The absolute importance of adhering to the instructions already given on the subject of hydraulic brake fluids is once again stressed and we will appreciate your bringing the following instructions to the notice of any of your staff who have anything to do with the servicing of the braking systems on Jaguar cars.

1. Use ONLY the recommended grades of brake fluids, as listed hereunder:

    Wakefield Crimson Hydraulic Brake Fluid.)
    Lockheed No. 102 Heavy Duty Brake Fluid.) Preferred fluids

    Delco Special No.11 Brake Fluid)
    Chrysler MS 3511 Brake Fluid.) Alternatives if preferred
    Wagner 21B Brake Fluid) fluids not available.

    In countries where the above fluids are unobtainable use only a recognised brake fluid guaranteed to conform to the S.A.E. Specification 70 R.1

2. Great care must be taken that any container that is used either for the purpose of topping-up the reservoir or during the bleeding operation is perfectly clean and must not have previously contained any form of mineral oil that is, engine oil or paraffin etc.,

    Containers used for these purposes must be cleaned only with methylated spirits. If this is not available, clear petrol should be used and the container thoroughly dried out and then rinsed with new brake fluid.

3. Brake fluid must in no circumstances be stored in containers which are left open to the atmosphere since the brake fluid can absorb water from the atmosphere with consequent reduction in boiling point.

4. It is preferable that brake fluid stocks should be held in small sealed containers, that is, ½ pint, 1 pint or 1 quart tins so that there is no likelihood of small quantities being used from containers that have been standing with only a small quantity in them.

5. Clean the exterior of brake units such as master cylinders, wheel cylinders with petrol and not paraffin. Bear in mind when handling such units that cleanliness is of vital importance.

6. When dismantling brake units for overhaul or seal replacement do so on a bench free from any possible mineral oil contamination. Use a shallow tray kept solely for this purpose. Clean tray after use as described in paragraph 2 and use only one of the recommended brake fluids for cleaning internal parts.

7. Before removing the reservoir filler cap carefully clean the area around the cap with a clean non-fluffy rag and avoid the possibility of dirt or fluff entering the reservoir when the filler cap is removed.

/Cont'd...

8. Please impress on your staff that a high percentage of brake troubles arise through carelessness in servicing hydraulic systems and that if the above precautions are taken the possibility of such troubles occuring can be greatly reduced.

Index Reference Section L

EXHAUST SILENCERS AND TAILPIPES

Models affected

Mark V111
Mark 1X
XK.150

Cars now in production have the tailpipes clipped to the silencers instead of being welded.

The new silencers (Part numbers unchanged) have saw cuts at the end of exit pipes which are of increased length to take the tailpipes.

The new silencers can be used to replace the previous welded type and the original tailpipe clipped to the silencer with the following parts:

Part number		No. off
C.13063	Clip	1
UFB131/22R	Bolt	1
FW105T	Washer	2
UFN131/L	Nut	1

When separating the old silencer from the tailpipe cut through the tailpipe immediately behind the point where it is welded to the silencer.

Index Reference Section M

DECEMBER, 1959

J A G U A R

S E R V I C E   A N D   S P A R E S   O R G A N I S A T I O N

SERVICE BULLETIN NO. 276

VARIOUS SERVICING ITEMS

BRAKE FLUID LEVEL WARNING LIGHT CONVERSION

Models affected

2.4 litre Mark 1 cars with disc brakes
3.4 litre Mark 1 cars with disc brakes

This conversion is made available following a number of requests from Mark 1 2.4 litre and 3.4 litre owners for a similar brake fluid level warning device to that fitted to the Mark 2 models. This conversion does not incorporate the handbrake warning and it is suggested that as a check on the bulb, the float pin on the top of reservoir filler cap should be occasionally depressed when the bulb should light up.

Parts required:-

	Jaguar Part No.	Lucas Part No.
Warning light	C.16178	-
Escutcheon	C.16183	-
Bracket	C.16184	-
Filler cap	C.16177	-
"Lucar" connectors (female) 2 off	8193	54942078
Insulating sleeve 2 off	8194	54190042
Double snap connector (2.4 litre only)	3570	851868
Bullets	3585	900269

Modification to Glovebox

Remove the glovebox on the drivers side of the car (described on page P.40 of Section P, 2.4/3.4 litre Service Manual).

Make a 1.9/32" (32.5 mm) hole in a suitable position to take the warning light.

Fit the warning light bracket (C.16184) into the hole just made and secure with two wood screws.

From the rear of the escutcheon scrape off the word "Handbrake" and fill in with black cellulose.

Fit the warning light holder to the bracket and secure with the bezel and escutcheon from the front face of the glovebox.

Remove the existing filler cap from the brake fluid reservoir. If the fluid level is higher than 1¼" from the top of the filler neck drain the fluid by disconnecting pipe until the level is at this figure; this will allow for displacement of the float attached to the new filler cap. Fit the new filler cap and float (C.16177) to the existing reservoir.

Note: It may be necessary to lower the reservoir in its clip to ensure clearance between the filler cap and the bonnet.

Electrical Connections

Remove the dash casing.

1. On the 2.4 litre model fit a double snap connector in place of the single connector which feeds the mixture control warning light.

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