Pearson's Illustrated Car Servicing Series for Owner Drivers

Rover 60 75 80 90 95 100 105 110 3-litre & 2000

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ROVER 60, 75, 80, 90, 95, 100, 105, 110, 3-LITRE AND 2000

Illustrated Car Servicing Series for Owner Drivers

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With 110 Illustrations

By

V. H. WATSON

NEWNES BOOKS

Published for Newnes Books by the Hamlyn
Publishing Group Ltd., Hamlyn House,
42 The Centre, Feltham, Middlesex
Printed in Great Britain by Richard Clay (The Chaucer Press), Ltd.,
Bungay, Suffolk

PREFACE

THIS book is intended as a practical guide for owner drivers and garage mechanics when carrying out normal maintenance, general running adjustments and repair operations on all Rover cars produced since 1948. This range of cars includes the 60, 75, 80, 90, 95, 100, 105R, 105S, 110, 3-litre Marks I–III, 2000, and 2000TC (twin carburetters).

Chapter 1 outlines the routine-maintenance attentions required by the various units and systems installed on the car; later chapters contain further details of how these adjustments and maintenance procedures are carried out. Chapter 2 includes engine major overhaul, engine lubrication and ignition timing, whilst the dismantling procedure for engine top overhaul (decarbonizing and valve grinding) is contained in Chapter 3.

Succeeding chapters cover carburetters, cooling system, clutch, gearbox, brakes, steering gear, suspension and rear axle; electrical wiring diagrams are also given.

By careful planning of the book, needless repetition of servicing operations for all the many models has been avoided. Where differences occur in the components and repair procedures, they are clearly indicated.

The treatment given to the maintenance and general adjustments, which become necessary from time to time, will enable the Rover owner to tackle these jobs with complete confidence and economy, while the mechanic will have at his finger-tips comprehensive servicing information on repair work.

CONTENTS

Chapter 1

ROUTINE MAINTENANCE

OWING to the wide range of models covered in the instructions which follow – 1948–67 – it is inevitable that intervals expressed in either time or mileage for attention to any particular point will vary quite considerably. This is especially true between early models and models of more recent date and design. Such differences are clearly indicated.

ENGINE

Oil Level

It is good practice to check sump oil level daily, a true reading will then be assured if this is done before starting the engine. All dipsticks are marked 'H' and 'L', high and low, and the object should be to ensure that the level is between these two points and never higher than 'H'. It is bad practice to 'top up' the level in small quantities as this frequently leads to overfilling. In any case, the total quantity is generous, thus allowing a considerable drop below the 'H' mark before replenishment becomes essential. In fact, with an engine in good condition, the oil-change point can often be reached without it having become necessary to 'top up' at all.

There is one exception to this; if a long fast run is contemplated, replenish to the 'H' mark before starting the journey to avoid the necessity to do so en route.

The sump capacity is as follows.

Model	*Imperial pints*
75, 80, 90, 95, 100, 105 and 110	15
60 and 3-litre	10
2000SC	8
2000TC	9

Should it be necessary to add oil after an engine has been running, allow five minutes with the engine stationary on level ground before taking a reading.

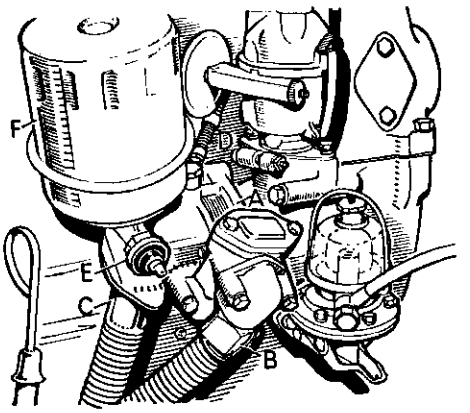
Most of the models under review are fitted with an oil-level gauge on the instrument panel, but this will only give an approximate reading.

Engine Oil Changes

All models call for an engine oil change every 5,000 miles or every four months, whichever comes first; this figure assumes normal road conditions and a temperate climate, so where dust conditions are bad this figure should be reduced to 3,000 miles. Also, where conditions involving short runs with frequent stopping and starting prevail, adopt the lower figure.

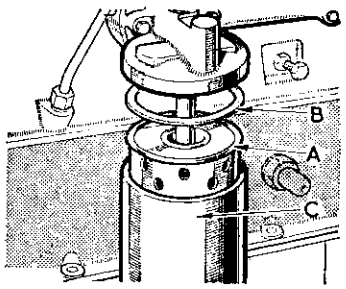
The drain plug is located on the right-hand side of the sump on all models. Carry out the operation when the engine is hot, this will facilitate complete draining.

Special Note for Model 2000TC. – This model is fitted with an oil cooler, which requires draining when the engine oil is changed. The drain plug is located in the bottom of the engine coolant radiator on the right-hand side.



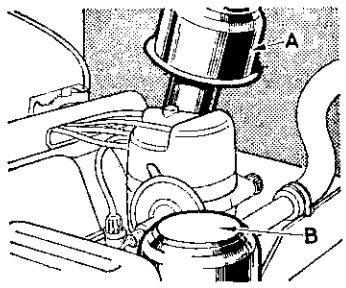
1. LOCATION OF EXTERNAL OIL FILTER, OIL PUMP AND FITTINGS – MODEL 2000

A. Oil-pump housing
B. Oil-suction connection
C. Oil-pressure supply
D. Timing-chain oil feed
E. Oil-pressure indicator switch
F. External oil filter



2 (*left*). ENGINE OIL FILTER – 3-LITRE

A. Oil-filter element
B. Washer
C. Container



3 (*right*). LOCATION OF ENGINE-BREATHER FILTER (A) AND OIL-FILLER CAP (B) – 3-LITRE

Engine Oil Filters

Oil filters vary widely from one model to another, and full instructions concerning them are given on pages 15 and 16. The internal filters need to be cleaned only at engine overhaul, but the external filters must receive attention at 5,000-mile intervals, i.e. at the same time as the oil change.

Filters used on all models prior to 1954 and all Model 2000 are sealed units and cannot be cleaned, so discard the unit and fit a replacement.

All other models use a replaceable element; discard this and fit a new one, taking care to use the new rubber washer supplied with each new element, and where appropriate a new gasket also.

Finally, after the new unit has been fitted, run the engine and check carefully for oil leaks. Then recheck oil level, because the new filter will have absorbed up to one pint of oil – correct as required.

Engine-breather Filter

All models are fitted with an oil-wetted gauze-type of engine breather, and Model 60 has, in addition, a similar filter on the oil-filler pipe. These should be cleaned at 5,000-mile intervals (10,000 miles on 3-litre Mark III and 2000) as follows. Remove the filter, wash the gauze element in petrol, dip in clean engine oil, and after allowing surplus oil to drain away, refit with (*a*) the slot to the front on Models 60 and 80, (*b*) the slot to the rear on models other than those listed under (*a*) except Model 2000 which cannot be fitted wrongly. The side filter on Model 60 is fitted with the slot to the rear.

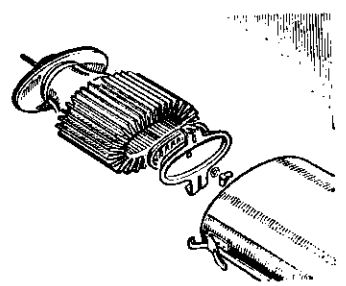
FUEL SYSTEM

Air Cleaner

If excessive engine wear is to be avoided, strict attention should be paid to the servicing of air cleaners. Several different types are in use and each is dealt with below.

Oil-wetted Gauze Type. – These will be found on Model 60 and early 75, and are located in the rear end of the air-intake silencer. Every 6,000 miles, remove the silencer complete and wash the gauze in petrol. Rewet the gauze with clean engine oil, allow to drain and refit.

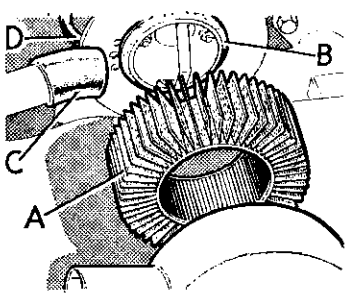
Oil-bath Type. – These air cleaners are fitted to Models 75 (late), 80, 90, 100 and 105 and should receive attention every 3,000 miles. They are attached to the rear of the air-intake silencer, and can be removed after releasing retaining hose clips. Lift off the top cover and extract filter element. Clean out oil and sludge from oil bath and refill with clean engine oil to mark on side of container (approximately one pint). Clean the element in paraffin and replace.



4 (*left*). REPLACEABLE PAPER-ELEMENT AIR CLEANER – MODEL 110 AND 3-LITRE

5 (*right*). REPLACEABLE PAPER-ELEMENT AIR CLEANER – MODEL 2000SC

A. Element
B. Sealing washer
C. Extension tube
D. Air-balance pipe



Replaceable-element Type. – Air cleaners used on Models 110, 2000 and 3-litre have replaceable paper elements. Under reasonable conditions, the element should be renewed every 10,000 miles, but this mileage interval should be reduced accordingly under dusty, tropical or unsurfaced road conditions.

In each case, the element is removed from its casing, discarded and a new element fitted. Ensure that the sealing washers are correctly located and are sound (see Figs. 4–6).

S.U. Carburetter Piston Damper

Every 10,000 miles (5,000 miles on 3-litre Mark III and 2000), unscrew the cap on top of the carburetter suction chamber, withdraw the piston damper and top up the hollow piston rod with SAE 20 oil. Fill to within $\frac{1}{2}$ in. from the top of the tube and replace the cap and damper securely.

Fuel Filters

On all models a thimble-type filter is fitted at the intake point on the carburetter float-chamber cover. There is also a similar filter on the underside of the body of S.U. single-type electric petrol pumps. In the double-entry pump used on Models 95, 110 and 3-litre Mark II and III, two filters are fitted inside the pump body. These filters should be removed and washed in petrol every 20,000 miles.

In addition, on all models except early 75, there is a glass sediment bowl in the fuel line between the petrol pump and carburetter (mounted on top of AC mechanical pump fitted to Models 80 and 2000).

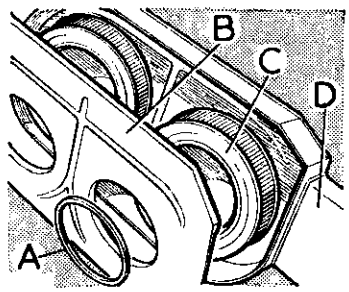
The sediment bowl should be cleaned every 20,000 miles or more frequently if an appreciable amount of foreign matter can be seen in the bowl. The bowl can be removed after releasing a knurled nut and swinging a wire clip to one side. Removal of the bowl will disclose a wire-gauze filter; clean the gauze in petrol, remove sediment from the bowl and replace, ensuring that the sealing washer is correctly located and is sound.

S.U. Electric Petrol Pump

Apart from filter cleaning already described, the electric fuel pump requires no attention apart from occasional checking to see that the electrical leads are tight. A replacement unit can usually be obtained on an exchange basis.

AC Mechanical Petrol Pump

The mechanical fuel pumps fitted to Models 80 and 2000 require little maintenance, apart from cleaning the filter screen regularly as described above and removing sediment from the pump chamber. The pumps are not interchangeable.



6. REPLACEABLE PAPER-ELEMENT AIR CLEANER – MODEL 2000TC

A. Washer for carburetter flanges
B. Cleaner lid
C. Elements
D. Cleaner case

A replacement unit can usually be obtained on a reconditioned-exchange basis.

To remove the pump on Model 80, disconnect the fuel pipes at pump and remove the self-locking nuts securing pump to cylinder block. On Model 2000, also disconnect and take out the battery with tray and remove the rear bolt securing pump to auxiliary drive housing from beneath the car.

When replacing the pump, renew the gasket.

COOLING SYSTEM

The cooling system should be checked daily and topped up as required to the bottom of the filler neck, using, if possible, soft water. If an abnormal quantity of water appears to have been used, check for leaks at hose joints or the possibility of the radiator-cap washer being damaged or the cap not being fully engaged.

When anti-freeze mixtures are used, adhere to recommended brands; this is most important, especially where aluminium cylinder heads are used.

At the end of each winter, drain the system and flush through by inserting a water hose in

the filler neck with cylinder and radiator drain taps open and the engine running at about 1,000 r.p.m. Refill with fresh soft water.

Fan-belt Tension

This should be checked at intervals of 10,000 miles and adjusted as required. Do not over-tighten the belt; it is correct if the belt can be depressed by thumb pressure $\frac{1}{2}$–$\frac{3}{4}$ in. at a point midway between the fan and crankshaft pulleys. On all models, except 3-litre fitted with power steering, slacken the dynamo pivot bolts and the adjusting bolt – this latter bolt passes through a slot in the dynamo-retaining strap. Move the dynamo in or out as necessary and retighten bolts.

On some models, obvious on examination, it will be necessary to remove the air cleaner to obtain access to the adjusting point.

On 3-litre models fitted with power steering, the procedure is different, because separate belts are used for the water pump and dynamo. It becomes first necessary to drain and remove the radiator. Adjust the fan belt by slackening the two bolts securing a jockey pulley to the front cover, pivot the jockey pulley to obtain correct tension ($\frac{1}{2}$–$\frac{3}{4}$ in.) and re-secure jockey pulley. Adjust the dynamo belt in a similar manner by pivoting the dynamo as described above. Replace the radiator.

CLUTCH

Models 3-litre and 2000 use hydraulic clutch control and the fluid-reservoir level should be checked at intervals of 3,000 miles. Top up as may be required to the bottom of the filler neck on Model 2000 and to the mark on the reservoir body on the 3-litre. Any heavy loss of fluid should be investigated as it may be due to leakage at such points as the master cylinder, slave cylinder or fluid pipes.

Clutch-pedal Free Travel

Information concerning this adjustment will be found on page 43.

GEARBOX (MANUAL) AND OVER-DRIVE

Oil Level

Check the oil level every 3,000 miles (5,000 miles on 3-litre Mark III and 2000). On all models except 2000, the oil filler and dipstick is accessible through an inspection hole on top of the gearbox cover after turning back the carpet and removing a large rubber plug from the cover. Replenish as necessary to the 'H' mark on the dipstick. On Model 2000 no dipstick is provided, and access to a filler/level plug is obtained through an inspection hole on the side of the gearbox cover; top up to the bottom of the filler-plug hole.

Overdrive Oil Level

On most models an overdrive is an optional extra, consequently there is no fixed rule as to when it is fitted. This does not apply to Models 75, 95 and 2000 as it was never fitted to these cars. On all models except 3-litre, a separate dipstick and filler plug is provided. Check and replenish as necessary when dealing with the gearbox.

Gearbox and Overdrive Oil Change

The oil should be changed every 10,000 miles on all cars except Model 2000 where the interval should be 20,000 miles. If an overdrive is fitted, remove the drain plug from both units. The oil filter should also be removed from the overdrive plug hole, cleaned and refitted. Then replace both drain plugs and refill. Recheck the oil level after a short run and top up if necessary.

GEARBOX OIL CAPACITY

Model	*With or without overdrive*	*Imperial pints*
60, 75, 90	Without	$3\frac{1}{2}$
60, 90, 105	With	$5\frac{1}{2}$
80, 95, 100, 110	Without	3
80, 95, 100, 110	With	5
2000	Without	$1\frac{3}{4}$
3-litre	Without	3
3-litre	With	3 in box, $1\frac{1}{2}$ in o/drive *

* Gearbox and overdrive each have separate drain and refill points.

AUTOMATIC TRANSMISSION

Checking Fluid Level

Under normal circumstances, the fluid level of the automatic transmission should be checked every 5,000 miles, but if the gear-change is

behaving in an erratic manner an earlier check is called for. This is because the condition described may be due to a fluid leak from joints or oil seals, thus affecting correct working. To check the level, proceed as follows:

Stand the car on level ground, engine idling and selector at 'P'. Withdraw the dipstick; this is located under the bonnet adjacent to the screen-washer reservoir on Model 2000, and under the gearbox-tunnel carpet on the 3-litre. The dipstick is marked 'H' and 'L', (high and low), and the difference between the two marks represents one pint.

In addition to this, the 2000 dipstick is marked Hot on one side and Cold on the other; in such instances, take the reading on the Hot side if the *transmission* is hot, and the reading on the cold side if the *transmission* is cold. As accuracy of level reading is important, strict observance of these points is essential. With the engine still idling, add fluid as necessary, *but do not* overfill.

If the quantity of fluid required is significant check for oil leaks.

Changing Transmission Fluid

This is not normally necessary on Model 2000 or on the 3-litre after 1966 unless the automatic gearbox has been dismantled for any reason. On the 3-litre prior to 1967, a fluid change should be made every 20,000 miles.

With the car on level ground and at normal running temperature, remove the dipstick, the drain plug from the left-hand front of the fluid sump and the cover plate from the torque-converter housing. Rotate the torque converter until the second drain plug is at the bottom, and remove plug. Remove also the square-headed plug located at the bottom of the reverse-servo housing. Allow the fluid to drain away – *Caution*: it may be hot enough to scald – and replace plugs.

Add 10 pints of fresh fluid through the dipstick hole, start the engine and run for at least one minute to transfer fluid to the converter and then, with engine still running, add more fluid to reach the 'H' mark on the dipstick – approximately a further five pints.

Warning. – Do not overfill the transmission and observe absolute cleanliness.

BRAKES

The adjustment procedure for the various braking systems is dealt with in Chapter 8.

Brake-servo Air Cleaner

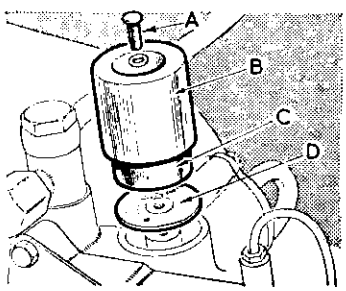
On all models where a brake servo is fitted, except Model 2000, renew the air filter at 12,000-mile intervals (20,000 miles on 3-litre Mark III).

Hydraulic Brake Fluid

The level of the brake fluid should be checked every 3,000 miles or every month, whichever comes first. The correct level is to the rib on the reservoir on all models except 2000 fitted with a plastic reservoir. On this latter type fill to the top of the four verticle ribs on the inside of the filter.

On Models 95, 110, late 3-litre and 2000 a brake fluid-warning lamp is mounted on the facia panel. This operates only when the ignition is switched on, and illuminates when the fluid level is low or when the handbrake is applied. Should the lamp fail to illuminate when the handbrake is applied, check the bulb for failure and replace if necessary. Should the

A. Screw.
B. Cover
C. Filter
D. Rubber washer



7. BRAKE-SERVO AIR FILTER WITH SCREW-TYPE FIXING – LATER 3-LITRE

lamp illuminate while the handbrake is free, check the fluid level immediately.

Always check the operation of the fluid-level safety switch when checking fluid level. To do this, with ignition 'on' and handbrake 'free', unscrew the reservoir lid and lift cap about one in. when the warning lamp should glow; if it does not, check the operation of the float unit and wiring.

STEERING

Steering Box

The oil level in the steering box (not power steering) should be checked every 5,000 miles (10,000 miles on Model 2000). To do this, remove the filler plug on the top-cover plate of the box and replenish as necessary to the bottom of the plug hole.

Power-steering units are lubricated by the operating fluid, and this is contained in an independent reservoir. Check the fluid level by means of the dipstick every 1,000 miles and replenish as required.

For adjustment to the steering box, see Chapter 9.

Steering Ball Joints

These are pre-packed on initial assembly and should require no further lubrication during the life of the ball joint. This only applies, however, if the rubber boot remains sound and in position.

Check each boot at 5,000-mile intervals to ensure that they are tight and sound. At the same time check the joint for wear by moving the joint assembly vigorously up and down and if any appreciable movement is detected replace the joint.

If the boot is damaged or displaced, remove the ball end and boot, clean all parts and apply a recommended grease, reassemble using a new boot and springs as required. Fill the boot with recommended grease.

FRONT SUSPENSION

Shock Absorbers

The front and rear shock absorbers are sealed units and require no attention. Faulty units should be replaced.

Swivel-pin Lubrication

All Models except 3-litre and 2000. – On these models an oil reservoir is built into the stub-axle assembly for the lubrication of the front swivel pins. This reservoir should be replenished at 9,000-mile intervals and to do this first remove the air-release plug from the top of each swivel pin and the filler plug from the stub-axle reservoir. Add oil until it reaches the bottom of the filler hole and then replace both plugs. Low-pressure equipment or a suitable funnel may be used for this operation and time allowed for air to escape via the vent at the top.

3-litre Models. – Every 5,000 miles check the rubber boots on the front-suspension ball swivels and ensure that they are sound and are not displaced; if such should be the case, replace the ball joint.

On early 3-litre, these joints require to be lubricated every 12,000 miles, and as this must be done on the rebound, jack up the front of the car and remove wheels. Remove the two plugs from each of the four ball swivels – one at the top and one at the bottom. Screw in a $\frac{1}{4}$-in. UNF straight nipple into the lower hole of the top joint, and a $\frac{1}{4}$-in. cranked nipple into the lower hole of the bottom joint.

Using a hand gun, pump oil in steadily until it is seen to seep from the top hole. Remove nipples, replace plugs and repeat for the other three joints. *Never* use a power gun or the seals will be damaged. On later 3-litre models these joints are pre-packed and require no further attention other than checking the rubber boot.

2000 Models. – The ball joints fitted at the top and bottom of the swivel column and at the outer end of the bottom-link strut (radius rod) are pre-packed with lubricant on initial assembly. Check these joints as described under Steering Ball Joints.

Wheel Hubs

Front hubs on all models and rear hubs also on Model 2000 should be checked at 10,000 miles for signs of lubricant leakage. Signs of leakage are usually fairly apparent if present, especially on the inside of the wheel rim; on the 2000 further evidence may be found on the dust shield (front) and on the flange adjacent to the drive shaft (rear wheels).

Instructions on rebuilding front and rear hubs are given in Chapters 10 and 11 respectively.

PROPELLER SHAFTS

On all models prior to 1959, lubrication nipples are fitted to the three universal joints and one nipple at the sliding portion of the rear shaft. On all models after 1959, the universal

joints are sealed and require no attention, but the sliding-joint nipple remains.

At 5,000-mile intervals, apply a suitable lubricant using a hand gun – a power gun may rupture the oil seals. Under dusty tropical conditions more frequent attention is desirable.

REAR AXLE

Check the final-drive oil level every 5,000 miles and replenish as necessary to the bottom of the filler-plug hole. Access to this is gained from underneath the car. (20,000 miles on Model 2000.)

Drain and refill the final drive every 10,000 miles (20,000 miles on Model 2000). To do this, remove the drain plug from underside of differential casing, drain and refill to the correct level. The oil capacity is three Imperial pints for all models except 2000 which is 2½ pints.

REAR SUSPENSION

On all models except 2000, periodically check the nuts securing the rear axle to springs and on later cars the rubber mountings fixing the springs to the body. These checks can be made when changing the axle oil.

De Dion Tube – Model 2000

At 10,000-mile intervals check the De Dion tube oil level and replenish as necessary to the filler-plug hole. If significant topping up is required, check for oil leaks at the drain hole in either elbow or from underneath the rubber boot. As this must be done from underneath the car, ensure at the same time that the boot is sound and has not been displaced.

WHEELS AND TYRES

For long tyre life and general safety, the tyre pressures should be checked weekly, when the tyres are cold, using an accurate tyre gauge. The recommended pressures are given below.

Model		*Tyre pressure (lb/sq. in.)*	
		Normal use	*Fully laden*
60	Front	25	28
	Rear	24	30
75, 80, 90, 95, 100, 105	Front	28	30
	Rear	24	30
110	Front	28	22
	Rear	26	26
3-litre Mk. I and IA	Front	24* 22†	26* 24†
	Rear	22* 20†	30* 28†
3-litre Mk. II and III	Front	26*	26*
	Rear	26*	30*
2000	Front	26	26
	Rear	28	32

* With 6·70 × 15 tyres. † With 7·10 × 15 tyres.

For sustained high-speed driving, increase tyre pressures by 4 lb/sq. in. for 3-litre and 2000TC and by 6 lb/sq. in. for other models.

Wheel Balance

It is most important that tyres and wheels are kept in balance; this is especially true where high speeds are used and on models fitted with independent suspension. When new tyres are fitted or when existing tyres are removed for attention, consult your garage and arrange for them to be rebalanced.

Interchange of Road Wheels

On all models except 2000 interchange road wheels diagonally every 3,000 miles in order to equalize tyre wear, and at the same time check for tread or side-wall damage.

On Model 2000 interchange near side to off side, but *never* front to rear.

ELECTRICAL SYSTEM

A 12-volt electrical system is used with positive-earth return on early models and negative-earth return on 3-litre Mark III, 2000 from vehicles serial suffix D, 2000 automatic and 2000TC.

The generator is a two-brush machine, the charging rate being controlled by a compensated voltage control regulator on Models 60, 75, 90, 105 and by a current–voltage control regulator on 80, 95, 100, 110, 200 and 3-litre.

Battery

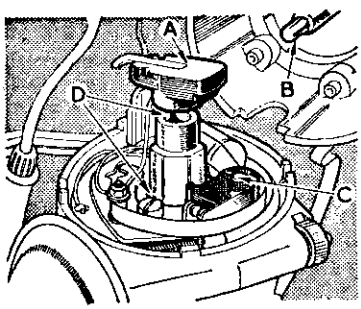
The 12-volt battery is located under the rear seat on early models, in the boot on 3-litre and under the bonnet on Model 2000.

At intervals of 3,000 miles or every month, whichever comes first, check the acid level in the battery and top up as necessary to the top of the separators, using distilled water; in hot climates more frequent attention may be necessary. On some Model 2000's an Exide battery is used,

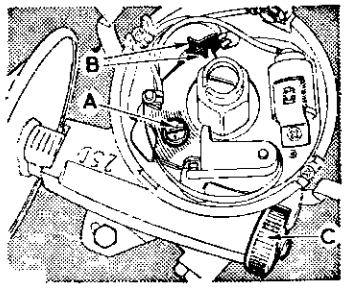
and instructions for topping up the acid level will be found printed on the battery cover.

Every 6,000–10,000 miles ensure that the battery-terminal connections are tight. Scrape and clean off any corrosion and smear the terminals with petroleum jelly.

To check the contact-breaker points, remove the distributor cap and rotor arm and then turn the engine until the fibre heel on the moving point is on the high point of one of the cam lobes. Push the moving point as far open as possible and inspect the condition of the contact faces. If these faces are dirty or pitted, the contact-breaker points should be removed and refaced. Badly pitted points should be renewed.



8 (*left*). DISTRIBUTOR LUBRICATION
A. Rotor arm
B. Carbon brush
C. Contact-breaker lever pivot
D. Lubricate at this point



9 (*right*). DISTRIBUTOR CONTACT POINTS
A. Securing screw for adjustable contact
B. Adjuster slot for contact points
C. Micrometer adjusting screw (octane selector)

Sparking Plugs

Only sparking plugs as recommended by the makers (see table below) should be used; this is especially important with the later high-performance engines.

Inspect and clean the plugs every 5,000 miles and change them at 10,000-mile intervals. The correct sparking-plug gap is 0·029–0·032 in. (0·023–0·027 in. all 2000 models).

Model	*Champion sparking-plug type*
60, 75, 90 and 105	N8
80 and 100	N8*
110 with 8·8:1 comp. ratio	N4‡
95, and 110 with 7·8:1 comp. ratio†	N5§
3-litre	N5
2000SC and Automatic with 9:1 comp. ratio	N9Y
2000SC with 7·5:1 comp. ratio†	N5
2000TC	N6Y

* Or Lodge CLN-H. ‡ Or Lodge HLN. § Or Lodge HBLN.

† Low-compression ratio engines will only normally be found in areas where high-octane petrol is not available, i.e. certain export countries.

Distributor

The distributor should be lubricated and the contact-breaker points checked every 6,000 miles on all models except 3-litre Mark III and 2000 where the distributor should be lubricated every 10,000 miles and the points checked at 5,000-mile intervals.

After inspection, release the moving point so that the fibre heel is in contact with the high point of the cam lobe and check the contact-breaker point gap; this should be 0·014–0·016 in. To adjust the gap, slacken the fixed-contact screw and adjust to the correct figure. Retighten the locking screw and recheck the point setting. Then clean the rotor arm and distributor cap with a soft cloth and replace.

To lubricate the distributor (with the rotor arm and distributor cap removed), lightly smear the cam with clean engine oil and add a few drops of thin oil to lubricate the cam bearing and distributor shaft. Apply a few drops of thin oil through the hole in the contact-breaker base plate to lubricate the automatic-advance weights. Also lubricate the moving contact-breaker pivot post with a drop of engine oil.

Dynamo

The bronze-bush rear bearing (commutator end) of the dynamo should be lubricated every 12,000 miles (5,000 miles on 2000) by adding two drops of engine oil through the lubrication hole in the centre of the end plate. Do not over-lubricate this point, as excess oil may reach the armature commutator and dynamo brushes so affecting the charging rate. This maintenance attention is not required to the 3-litre Mark III dynamo.

Chapter 2

ENGINE

THE engines used on all models covered in this book can be divided into three groups as follows:

Group 1. Models 60, 75, 90, 95, 100, 105, 110 and 3-litre. All these cars have a six-cylinder engine, except the 60 which has a four-cylinder power unit.

Group 2. Model 80 with a four-cylinder engine.

Group 3. Model 2000 with a four-cylinder engine.

The principal difference in design that exists between the three groups lies in the valve arrangement and the combustion layout. All engines in Group 1 use overhead *inlet* valves operated by push rods and cam followers, and side *exhaust* valves operated by rockers from the camshaft. The cylinder-block top face is inclined at an angle of 22°, and the detachable head, carrying the inlet valves, is inclined to suit. The piston crown is of special design to conform with the sloping face of the cylinder block.

The four-cylinder Model 80 engine (Group 2) is fitted with the conventional flat-top cylinder block and overhead inlet and exhaust valves operated by push rods.

The four-cylinder Model 2000 engine (Group 3) has a flat-top cylinder head, no combustion space being provided; a hemispherical combustion space is incorporated in the piston crown. The overhead valves are directly operated by a chain-driven overhead camshaft.

Various complications occur in the carburation system and these are dealt with separately (see Chapter 4).

ENGINE LUBRICATION

All Models except 2000

A by-pass lubrication system is used up to 1954 and a full-flow system from 1955. A gear-type oil pump draws oil through a gauze suction strainer in the sump and delivers oil to all bearings via an external oil filter.

The cylindrical gauze strainer on Models 75, 90 and 105 screws into the sump and registers with the pump intake. On these models, the strainer must be extracted before the sump is removed. On all other engines it is necessary to remove the sump to gain access to the strainer. The strainer needs cleaning only after long mileage intervals.

Model 2000

On Model 2000 a rather more complicated system is used. A rotor-type pump is mounted externally on the right-hand side of the cylinder block and this is connected to the oil system by external suction and pressure pipes. The oil is lifted from the sump via an internal oil filter and is delivered to an external oil filter of the full-flow type.

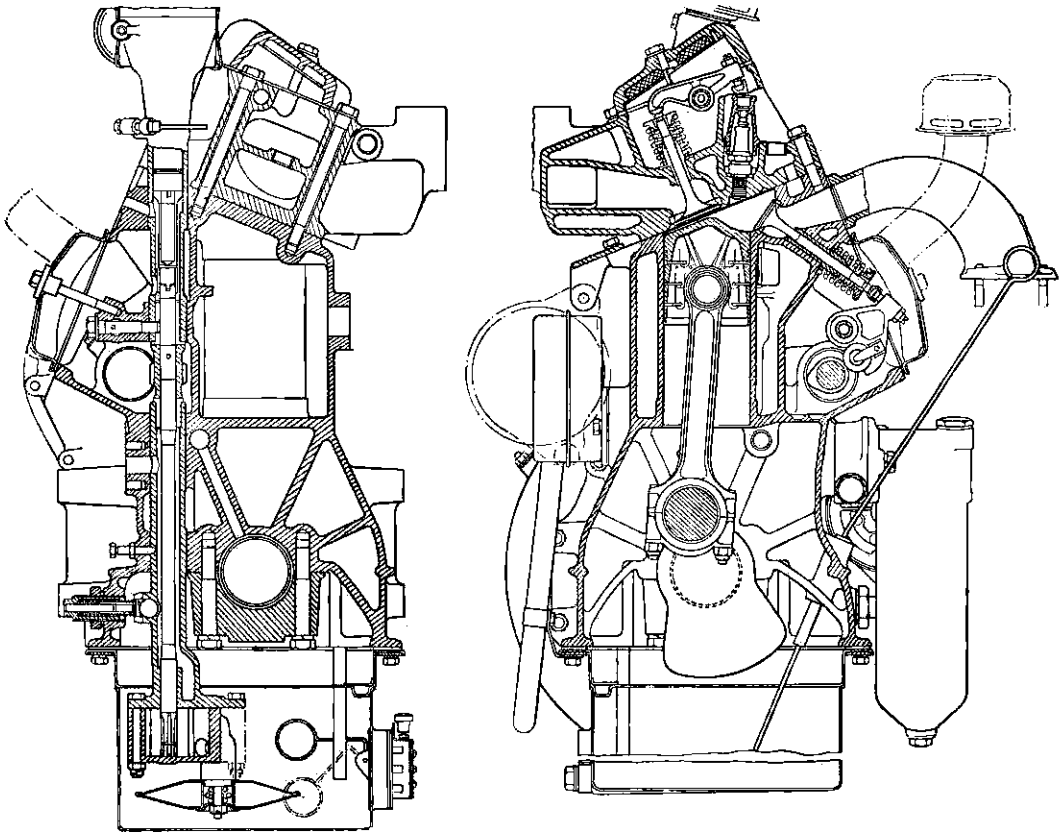
With this system it is absolutely essential that the oil cannot drain back into the sump when the engine is stationary, and to prevent this happening a non-return valve is fitted in the entry point in the external filter. The external filter is also fitted with the usual safety valve which operates if the element becomes choked, thus maintaining full flow.

From the external filter oil is piped to all necessary points, including the two timing-chain tensioners. The top tensioner has an additional oil filter in the form of a small nylon mesh cylinder inserted in the oil way.

The internal filter is of the wire-gauze type and is bolted to the bottom face of the crankcase inside the sump. This generally only requires cleaning when carrying out an engine overhaul.

Renewing External Filter

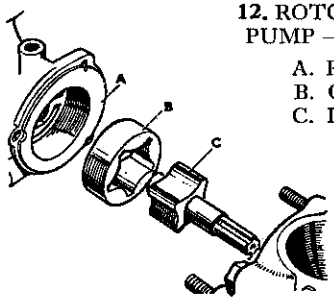
When replacing the filter, use only the type specified, this is *essential* for Model 2000. After



10 and 11. CROSS SECTIONS OF MODEL 100 AND 3-LITRE ENGINE
Engines of Models 60, 75, 90, 95, 105 and 110 are basically similar.

replacement, refill the sump with new oil, run the engine for 10 minutes and check for oil leaks. Recheck oil level and top up as required.

Group 1 *Engines up to* 1954. – The by-pass filter fitted to these engines cannot be dismantled and must, therefore, be renewed from time to time.



12. ROTOR-TYPE OIL-PUMP – MODEL 2000
A. Pump body
B. Outer rotor
C. Inner rotor

Group 1 *Engines from* 1955. – To renew the element of a full-flow filter, remove the container and element complete by releasing one bolt (*a*) at the bottom on Models 60, 75, 90, 105 and early 3-litre, and (*b*) at the top on Models 95, 100, 110 and later 3-litres. Wash the container in petrol and replace with new element. Ensure that rubber washers are renewed and are fitted squarely in position.

Group 2 *Engines.* – On Model 80 remove the filter assembly complete from the cylinder block after disconnecting the lead to pressure switch and jacking up the front of car to obtain clearance; it is retained by two set-bolts. The element can now be removed from container after releasing bolt at base of container. Clean and reassemble, using new element, rubber washer and gasket, filter head to cylinder block.

Group 3 *Engines.* – On Model 2000, the full-flow filter is screwed into the rear of the oil-pump housing and is removed by gripping the filter casing and turning anti-clockwise. The filter is a sealed unit and must be renewed at appropriate intervals.

Nylon Mesh Filter – Model 2000

To gain access to the filter in the top timing-chain tensioner, disconnect the oil pipe to top of timing case, then insert a piece of wire and withdraw filter. Reassemble with new filter and new sealing washers.

Removing Oil Pump

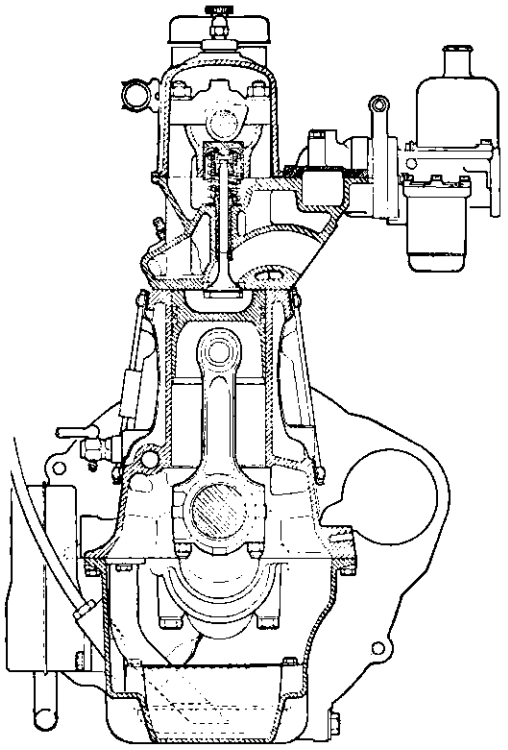
Groups 1 *and* 2 *Engines.* – The oil pumps on all these engines are basically similar, but the method of location and removal varies.

To remove the pump after sump removal on Models 60, 75, 90 and 105, first remove a single set-bolt and the oil-pressure relief valve from the outside of the crankcase and then lower the pump. On models prior to 1956 also remove the pump filter through crankcase side.

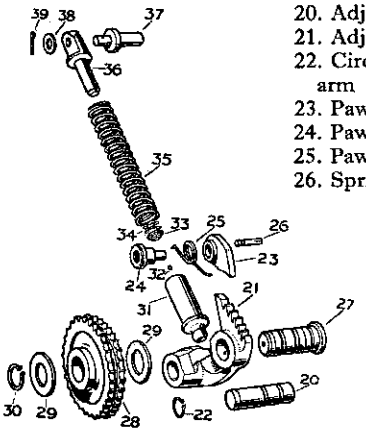
On models subsequent to 1956 (except 80), first remove the non-adjustable relief valve from the pump body and then the single pump-locating bolt and withdraw the pump.

On Model 80 extract the two securing set-bolts from inside the crankcase, and the pump complete with filter and relief valve can be withdrawn.

Group 3 *Engines.* – To remove the pump from the 2000 engine, first disconnect oil-feed pipe to top chain tensioner and the two oil pipes to cylinder block. Remove oil filter (unscrew) and disconnect pressure-switch lead. Place suitable support under engine and remove right-hand engine support. Disconnect pump from auxili-



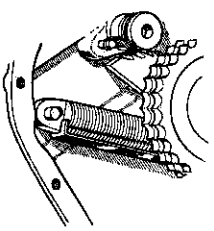
13. CROSS SECTION OF MODEL 2000 OVERHEAD CAMSHAFT ENGINE



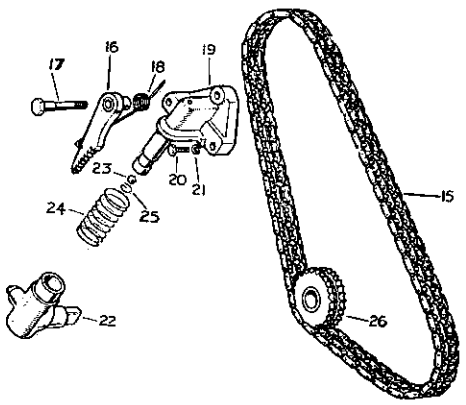
B

20. Adjuster pivot
21. Adjuster arm
22. Circlip retaining arm
23. Pawl
24. Pawl pin
25. Pawl spring
26. Spring anchor
27. Idler-wheel spindle
28. Idler wheel
29, 30. Fixings for idler wheel
31. Cylinder
32. Non-return ball
33. Spring-retaining ball
34. Retainer for ball
35. Spring
36. Piston
37. Pivot pin for piston
38, 39. Fixings for piston

14. HYDRAULIC CHAIN TENSIONER – MODELS 60, 75, 90, AND 105



15 (*above*). HYDRAULIC CHAIN TENSIONER RETAINED BY A CLIP TO ASSIST ASSEMBLY – MODELS 60, 75, 90, AND 105



16. TIMING-CHAIN TENSIONER – MODEL 80

15. Timing chain
16. Ratchet for adjuster
17. Bolt fixing ratchet and piston to block
18. Spring for ratchet
19. Piston
20, 21. Bolt and washer fixing piston to block
22. Cylinder for piston
23. Non-return valve
24. Spring for tensioner
25. Retainer for non-return valve
26. Idler wheel

ary drive (three nuts and washers) and draw pump and rotor rearwards.

Refit the pump to the engine, using new oil seals at each connection and a new nylon filter at the timing-case end.

When replacing the engine mounting note that the assembly order to the top rear stud is important – position the braided earth lead against the support bracket, followed by the fan-disc washer and then the nut – *no* spring washer at this point. Run the engine, check for leaks, both pressure and suction leads, and top up sump.

TIMING-CHAIN TENSIONER

On all models chain tension is automatically maintained by means of an hydraulic device.

Models 60, 75, 90 and 105

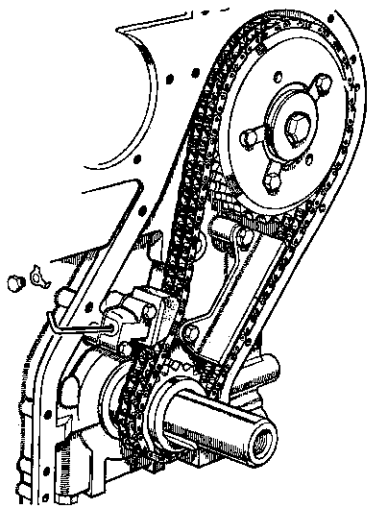
On these models, the tension device incorporates a jockey pulley (Fig. 14). Oil at full pressure reaches the ball seating in the jockey-pulley arm (21). A drilling in the ball end of the tensioner cylinder (31) enables the oil to reach the interior of the cylinder via a non-return valve (32).

On initial assembly, the cylinder and piston (36) are empty, and the pawl (23) engages in one of the slots in the ratchet, thus taking up all slack on the driving side. When the engine is started, oil under pressure is fed between the piston and cylinder, so producing tension in the chain, and as wear takes place in chain or wheel, automatic compensation follows. The non-return valve ensures that the tension is constant, otherwise the chain would 'flap'. Normally, it is never necessary to remove the tensioner assembly other than for a complete overhaul or to fit a new chain. To replace, proceed as follows:

Assembly cylinder (31), piston (36) and spring (35) and retain in relative positions with wire or a clip as illustrated in Fig. 15 – it must be assembled dry, or an air lock will result. Retain at the upper end with a plain washer (38), Fig. 14, and split pin (39) and fit the circlip (22) to the jockey-arm pivot pin (20). Finally, engage the pawl (23) in the ratchet and remove the retaining wire.

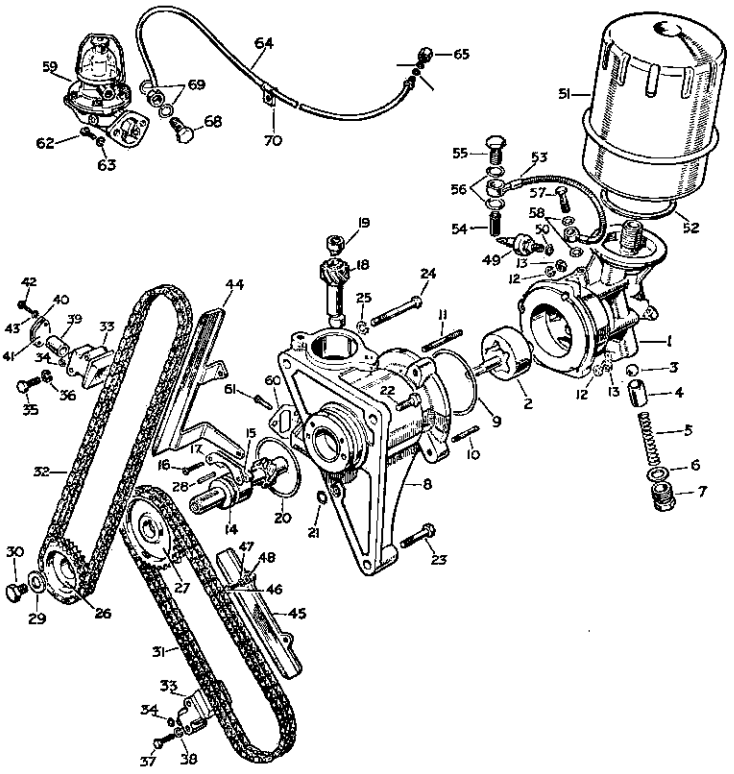
Model 80

The type of chain tensioner used on Model 80 is similar in design and application to the above, but is much easier to remove and replace.



17. ALLEN KEY IN POSITION IN TIMING-CHAIN TENSIONER – MODELS 95, 100, 110 AND 3-LITRE

1, 2. Oil-pump housing and rotors
3–7. Steel ball, plunger, spring washer and plug for oil-pressure release valve
8. Auxiliary drive housing
9. O-ring
10–13. Fixing studs, washers and nuts
14. Oil pump and distributor driving shaft
15. Thrust and locking plate for driving shaft
16, 17. Set-bolts and locker
18. Distributor and fuel-pump driving gear
19. Distributor driving dog
20, 21. O-rings
22–25. Set-bolts and spring washers
26, 27. Intermediate chainwheels
28–30. Key, retaining washer and set-bolt
31, 32. Driving chains
33–43. Tensioner assemblies
44–48. Vibration dampers, set-bolts, spring and plain washers
49. Oil-pressure switch
50. Joint washer
51. Oil filter (AC 7965022)
52. Joint washer
53. Oil-feed pipe for upper-chain tensioner
54. Oil strainer in cylinder head
55–58. Banjo bolts and joint washers
59. Mechanical fuel pump
60–63. Fuel-pump joint washer, push rod, set bolts and spring washers
64–70. Fuel pipe and fixings



18. OIL PUMP, AUXILIARY DRIVE AND TENSIONER MECHANISM – MODEL 2000

It can readily be removed complete after releasing retaining bolts (17) and (20), Fig. 16. At engine overhaul fit new bushes as necessary and maintain clearances as follows: Bush in cylinder (22) 0·003–0·005 in. interference. Bush in idler wheel (26) 0·001–0·003 in. interference. Idler wheel on steel shaft 0·001–0·003 in. clearance. Piston in cylinder 0·0005–0·001 in. clearance.

To reassemble to the cylinder block, fit the spring (24) over the piston (19), locate the cylinder body (22), compress the spring and retain in compressed position. Place the idler wheel (26) on the bearer arm and offer assembly to the engine block (two dowels). Screw in bolt (17) securing ratchet (16) and spring (18) and finally secure the assembly with two bolts (20). Allow the idler to take up chain slack.

Models 95, 100, 110 and 3-litre

On these models, the chain tensioner takes a different form (see Fig. 17). Tension is maintained by means of a spring-loaded pad on the outer run of the chain instead of the jockey pulley used on earlier models and, in addition, there is a vibration damper in the form of a friction pad on the inside of the chain on the opposite run. If it becomes necessary at any time to remove the chain or tensioner it is first requisite that the tension on the chain is relieved. To do this, first remove the plug from the body of the tensioner (see Fig. 17) and then with an Allen key ($\frac{1}{8}$ in.) retract the restraint cylinder. The tensioner body can now be withdrawn after extracting two set-bolts. The damper can also be removed (two set-bolts).

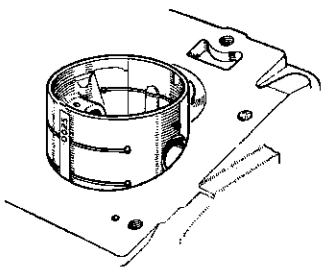
To refit the tensioner, first prepare the device by inserting an Allen key into the restraint cylinder and turning it clockwise until fully retracted.

Mount the tensioner and backplate and fit the damper pad, adjusting to minimum clearance. Turn the Allen key *clockwise* until the adjuster

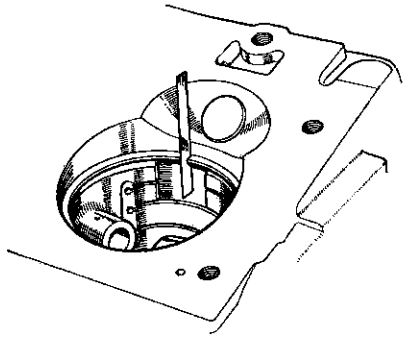
CRANKSHAFTS, CONNECTING RODS AND PISTONS

Piston Removal

On all models, cylinder head and sump removal must precede piston and connecting-rod removal. On all models, remove nuts from connecting-rod bolts; remove caps and bearing shells and ensure that these are retained in their respective pairs and with original rods. On 60, 75, 90 and 105 models, push each connecting rod upwards and turn through 90° to engage slots in cylinder block. Remove circlip retaining the gudgeon pin and withdraw pin, using an extractor. Remove rod downwards and piston upwards.



24 (*left*). CHECKING PISTON CLEARANCE



25 (*right*). CHECKING PISTON-RING GAP

On all other models, the piston complete with rod may be extracted upwards through the bore.

Fitting Pistons

When fitting pistons, standard or oversize, the cylinder-bore clearance should be in accordance with the dimension laid down in the Data section. When reboring, the block must be bored to suit the selected piston. In the absence of suitably accurate measuring equipment, a long feeler gauge of the required dimensions may be inserted against the thrust side of the bore with the piston crown downwards (Fig. 24).

Gudgeon-pin Fit

The gudgeon pins should be a slight interference fit in piston bores when cold and dry. It should be fitted by hand pressure, but must not be able to fall out of piston bore by its own weight. Pistons may be heated in boiling water to facilitate removal or fitting of pins.

When fitting oversize pins, ream pistons to suit pin.

Piston Rings

Piston rings should be checked for correct gap as shown in Fig. 25, using an old piston inserted in the bore to keep the ring square. On most models, tapered compression rings are used and they are stamped 'TOP' or sometimes 'T'. Ensure that the mark is uppermost on marked rings; where stepped scraper rings are used, these should be fitted with the larger diameter to the top.

Reboring Cylinders

Reboring presents no difficulties other than those normally associated with this operation, beyond the fact that, with the exception of Models 80 and 2000, the face of the cylinder block is not square. It is inclined at an angle of 22° and consequently a special jig block (Rover Part No. 261287 four-cylinder 60 or 261288 six-cylinder engines) will be required. This 'squares' the inclined cylinder-block face to accommodate the boring bar.

On one engine only (1954, Model 75), the upper part of the cylinder bore is chromium plated to a depth of 0·004 in.; the first cut of the boring bar must be deep enough to undercut this.

If required, cylinder liners may be fitted to all models.

Crankshaft Bearings

Shell bearings are used on all models and are all numbered for identification. They must be replaced as found unless replacements are to be

fitted. Check the bearing nip before the crankshaft is replaced; to do this, with the bearing in position, tighten both bolts and slacken off one; if the gap between block and cap is too large the joint faces may be rubbed down, if insufficient replace the shells. Where possible, it is better to practice selective assembly.

When the crankshaft has been finally installed, check the end-float; this is controlled at:

(*a*) Front main bearing on Models 75, 90 and 105,
(*b*) rear main bearing on Models 95, 100, 110 and 3-litre,
(*c*) centre main bearing on Models 60 and 80,
(*d*) No. 4 main bearing on Model 2000,

by thrust washers inserted one on either side of the appropriate main bearing, white-metal side towards the bearing (some late models use copper). Check end-float, using suitably-mounted dial gauge or feeler gauge. If it is outside the limits (see Data), fit oversize thrust washers (obtainable in 0·0025 in. variations), ensuring that the difference in thickness between a pair of washers does not exceed 0·003 in.

Note that on 1954 Model 75 only, no thrust washers are used. End-float is controlled by the front main bearing, which is flanged, and may be increased by rubbing down the end faces.

Connecting-rod Bearings

Again, all rods are fitted with shell bearings. Deal with them in the manner described for main bearings. In addition, check that side clearance when fitted to crankshaft is within limits 0·004–0·010 in.

VALVE AND IGNITION TIMING

Flywheel Markings

The flywheel markings and timing points for valve and ignition timing are visible through an aperture on the right-hand side of the clutch housing. The mark T.D.C. indicates when pistons Nos. 1 and 4 (four-cylinder engines) or Nos. 1 and 6 (six-cylinder engines) are at the top of their stroke. The mark E.P. indicates when No. 1 exhaust valve is at the peak of its lift (i.e. fully open).

The letters F.A.4 or F.A.6 on early engines indicates the firing point, i.e. contact-breaker points just opening. The F.A. (or T.D.C.) markings on all models from 1948 onwards vary slightly to allow for higher-compression ratios and the availability of high-octane fuel, and the firing point is indicated in degrees and the letters F.A. (or T.D.C.). Example F.A. 10°, i.e. 10° before top dead centre. In some instances, the marking would be 10° B.T.D.C.

On later high-compression engines, it is necessary to time the ignition to suit the octane value of fuel normally available.

Preliminary Instruction for Valve Timing

As all engines are fitted with hydraulic chain tensioners, it is very necessary to read the instructions given under Timing-chain Tensioner on pages 18–20 before attempting to retime the valves.

Valve Timing 60, 75, 90 and 105 Engines

(1) Replace the pawl-pivot pin, pawl and spring if these have been removed.

(2) Set the exhaust tappets to 0·012 in. and slacken the inlet tappet right off.

(3) Replace the camshaft chainwheel, using one of the three keyways provided and rotate the camshaft in a running direction until No. 1 exhaust valve is fully open. Use a suitably mounted dial gauge for this operation.

(4) Rotate the engine until the E.P. mark is in line with the pointer.

(5) Fit the timing chain, ensuring that there is no slack on the driving side.

(6) Hold the ratchet pawl clear and replace the jockey pulley and arm, meshing the pulley with the chain.

(7) Recheck timing, and correct if necessary, using an alternative keyway if required.

(8) When satisfied that the timing is correct, replace remaining parts of tensioner and note they must be assembled dry or an air-lock may form.

(9) Reset inlet tappets to 0·008 in. and complete front cover assembly.

Valve Timing 80 Engines

If removed, refit the crankshaft chainwheel and then turn the crankshaft in direction of ro-

tation until the E.P. mark on flywheel is in line with the timing pointer. Set the exhaust tappets to 0·010 in. and then, having fitted a dial indicator as described previously turn the camshaft until No. 1 exhaust valve is at the peak of its lift.

Fit the timing chain with no slack on the driving side; it may be necessary to remove and refit the chainwheel to obtain this condition. Refit the chain tensioner.

Recheck the E.P. mark against valve opening, adjust if necessary by means of the six irregularly spaced keyways; they allow a variation of 2° between each position.

Finally, lock the camshaft chainwheel – one set-bolt in centre.

Valve Timing 95, 100, 110 and 3-litre Engines

If the crankshaft chainwheel has been removed, replace by drifting. Set E.P. mark on flywheel as previously explained. Fit the chain to the camshaft wheel and offer up the wheel to the camshaft hub and crankshaft wheel – no slack on driving side. Ensure that the chainwheel aligns with three holes in camshaft hub and then secure with three set-bolts and lockplates. Recheck for slack on the driving side and the fully open position of No. 1 exhaust valve. Refit the chain tensioner (see page 19).

Note that the E.P. mark on 3-litre Mk. III engines is on the crankshaft damper, not the flywheel; in this case temporarily fit the damper during the timing operation.

Valve Timing 2000 Engines

Owing to the overhead-camshaft design of this engine, it is not retimed in the same way as on earlier engines. The camshaft and crankshaft locking devices referred to on page 21 ensure that the valve timing will not need resetting unless the camshaft or crankshaft have been turned independently of each other; this will only happen during complete engine dismantling. To reset the valve timing in this case a special gauge is required and, consequently, the operation is best carried out by a Rover dealer.

Ignition Timing

If the distributor has been removed for any reason, it becomes necessary to retime the ignition. The ignition-timing marks for all models are given at the end of the chapter.

Ignition Timing Group 1 Engines

Rotate the crankshaft in a running direction until the appropriate mark on the flywheel (crankshaft damper on 3-litre Mk. III) is in line with the pointer, and both valves of No. 1 cylinder are closed.

Fit the oil-pump shaft (if removed) so that when fully engaged in the oil pump, the broad segment of the driving spigot is nearest to No. 3 exhaust port (Model 60), or towards the left-hand side of the car, and the slot parallel with the centre line of the car (six-cylinder models).

The crankshaft may have to be moved slightly to allow full engagement of the shaft; in such cases reset flywheel markings.

Secure the distributor housing in position with the hollow oil-feed bolt and then fit the distributor drive-shaft.

Check contact-breaker clearance and adjust (0·015 in.) if required. Set the octane selector so that the 4th line from the left-hand side of the scale is against the face of the distributor-body casting.

Rotate the distributor spindle in the direction of the arrow until the rotor is at the firing point for No 1 cylinder. At this point, the broad segment of the driving spigot should be towards the left-hand side of the engine and the vacuum unit facing forward.

The distributor can now be mounted and secured to the engine.

Slacken the pinch-bolt at the base of the distributor body and rotate the body in the *opposite* direction to the arrow until the breaker points are just opening with the fibre-cam follower on the leading side of the cam – retighten the pinch-bolt.

As extreme accuracy in timing is essential, it is as well to recheck with the aid of the timing lamp. To do this, connect one lead of a 12-volt test lamp to the distributor L.T. terminal and the other lead to a good earth. Switch on the ignition and turn the crankshaft two complete turns in the running direction. The bulb should light up as the pointer reaches the selected position on the flywheel. If not, adjust as necessary

at the pinch-bolt, or a very small amount at the octane selector.

Ignition Timing 80 Engines

Rotate the crankshaft in running direction until the F.A. mark on the flywheel is in line with pointer and both valves on No. 1 cylinder closed. (Note 6° B.T.D.C., using premium fuel or 3° B.T.D.C. with regular fuel.)

Locate the vertical drive shaft so that with the short drive shaft entered into the splines, the narrow segment of the distributor drive shaft is towards the right-hand side of the vehicle and the slot pointing towards No. 1 cylinder. Lock the driving-gear assembly with grub screw.

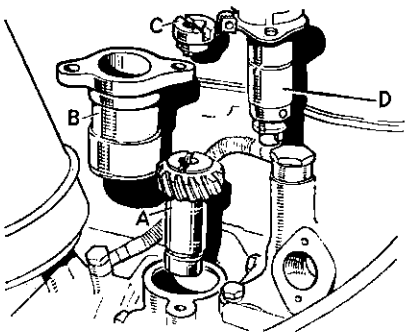
Locate and secure the adapter plate – three set-bolts – and fit a cork washer in the recess at the top.

Check and adjust the contact-breaker gap to 0·014–0·016 in. and set the octane selector so that the 4th line from the left-hand side of the scale is against the face of the distributor casting.

Rotate the distributor spindle in direction of arrow on rotor arm which is at the firing point for No. 1 cylinder: this will bring the vacuum unit facing to the rear; the narrow segment of the shaft towards the right-hand side of vehicle and the slot towards No. 1 cylinder.

Mount and secure the distributor. Slacken the pinch-bolt in base of body and rotate the distributor in the opposite direction to the arrow on rotor arm until the points are just opening with the cam followers on the leading side of cam – lock pinch-bolt.

Check with test lamp and readjust as necessary.



26. DISTRIBUTOR DRIVE DETAILS – MODEL 2000

A. Vertical drive shaft, showing the offset dog in the correct timing position
B. Internal sleeve
C. Adaptor drive dog
D. Distributor shaft

Ignition Timing 2000 Engines

Proceed to set the firing mark as described under Group 1 engines. Then place the vertical drive-shaft (*A*), Fig. 26, in mesh with the auxiliary drive-shaft and with the slot in the off-set dog more or less in line with the two distributor bolt holes, the wider side towards the timing case. Place the internal sleeve in position (apply 'Wellseal' to underside), followed by driving dog (*C*). When correctly located it should be possible to move dog from side to side. Locate sleeve-retaining bolts, but do not tighten. Place distributor in position with the rotor arm pointing to No. 1 cylinder, and engage driving dog.

Adjust the distributor in the slots so that the points are just breaking on the leading side of the cam and tighten securing bolts and clamp. Retest, using lamp as described above.

Ignition-timing Marks

Ignition-timing marks vary from one engine to another to allow for quality of petrol available and for variations in compression ratios. Note therefore that the firing point must be varied to suit fuel available as shown in the following table.

Model	*95 Octane fuel or better (degrees B.T.D.C.)*	*Octane fuel less than 95*
60, 75, 90 and early 100	10°	T.D.C.
Later 100‡	5°	T.D.C.
80	6°	3° B.T.D.C.
95, 110	6°	T.D.C.
105 (1957–58)	3°	T.D.C.
105 (1959)	10°	
3-litre	3°	2°
2000SC and automatic	4° *	2° B.T.D.C. †
2000TC	6° (100 octane fuel, minimum.)	

* With 95–97 octane fuel. † With 93 octane fuel.
‡ Engine number range 752 and 753. Also 750 and 751 with blue paint line on cylinder block.

No low-compression engines are normally in use in Great Britain, but are in use in countries where premium fuel is or was unobtainable.

ENGINE DATA

Model/Year	*Bore* × *Stroke, mm.*	*Capacity, c.c.*
Model 60 (1948–9)	69·5 × 105	1,595
Model 60 (1954–9)	77·8 × 105	1,997
Model 75 (1948–54)	65·2 × 105	2,103
Model 75 (1955–9)	73·025 × 88·9	2,230
Model 90 (1954–9)	73·025 × 105	2,638
Model 105 (1957–9)	73·025 × 105	2,638
3-litre (1959–67)	77·8 × 105	2,995
Model 80 (1960–2)	90·47 × 88·9	
Model 100 (1960–2), 95 and 110 (1963–4)	77·8 × 92·075	2,625
Model 2000 (1964–)	85·6 × 85·6	1,978

Firing Order

Four-cylinder engines	1, 3, 4, 2
Six-cylinder engines	1, 5, 3, 6, 2, 4

Oil Pressure (Hot) at 30 m.p.h.	*(lb/sq. in.)*
Model 60 (1948–49)	35–40
Model 60 (1954–59)	55–65
Model 75 (1948–54)	40–45
All models from 1955 except 2000	55–65
Model 2000	50–60

Tappet Clearance, in.

	Inlet	*Exhaust*
Models 60, 75, 90 and 105 (hot)	0·008	0·012
Models 95, 100, 110 and 3-litre (hot)	0·006	0·010
Model 80 (hot)	0·010	0·010
Model 2000 (cold)	0·008–0·010	0·013–0·015

Main Bearings

Running clearance, in.:	
All models except 95, 100 and 110	0·001–0·0025
Models 95, 100 and 110	0·0008–0·0023
Bearing nip, in.	0·004–0·006
Crankshaft end-float	0·002–0·006

Connecting-rod Bearings

Big-end running clearance, in.:	
Models 60, 75, 80, 90 and 105	0·001–0·0025
Models 95, 100, 110 and 3-litre	0·00075–0·0025
Model 2000	0·0008–0·0023
Bearing nip, in.	0·002–0·004
Big-end end-float, in.:	
Group 1 models	0·009–0·013
Model 80	0·007–0·011
Model 2000	0·004–0·010

Pistons

Clearance in bore, measured at bottom of skirt at right-angles to gudgeon pin, in.:	
Models 60, 75, 90, 105 and 2000	0·001–0·0015
Models 95, 100, 110 and 3-litre	0·002–0·0025
Model 80	0·0023–0·0028

Piston Rings

	Compression	*Scraper*
Gap, in.:		
Models 60, 75, 90, 100, 105, 3-litre, early 95 and 110	0·015–0·020	0·012–0·017
Later 95, 110 with 'Duaflex' scraper ring	0·015–0·020	0·015–0·033
Model 80	0·015–0·020	0·015–0·020
Model 2000	0·017–0·022	0·014–0·019
With chromium-plated comp.	0·019–0·024	
Clearance in groove, in.:		
Group 1 models except comp. rings of 95, 100, 110 and 3-litre		0·002–0·004
Compression rings of Models 95, 100, 110 and 3-litre		0·0018–0·0038
Model 2000		0·001–0·003

Camshaft End-float, in.

Group 1 models	0·0045–0·0065
Model 80	0·0025–0·0055
Model 2000	0·002–0·006

Tightening Torques, lb-ft.

Cylinder Head:	
Group 1 models with copper-asbestos gasket on 75 and 90	30 ($\frac{3}{8}$-in. nuts) 50 ($\frac{7}{16}$-in. nuts)
Models 75, 90 and 105 with Corgasyl corrugated steel gasket	33 ($\frac{3}{8}$-in. nuts) 55 ($\frac{7}{16}$-in. nuts)
Model 80	75
Model 2000 – at camshaft housing	55
at front of timing case	10
Connecting-rod Big-end Bearings:	
Models 60, 75, 90 and 105	40
Models 95, 100, 110 and 3-litre with machined threads	30
Models 95, 100 and 110 with rolled threads*	20
3-litre, 80 with rolled threads*	25
Model 80 with machined threads	35
Model 2000	30
Main Bearings:	
Models 60, 75, 90 and 105	80
3-litre Mk. I	75
Models 95, 100, 110, 3-litre Mk. II and 2000	65
Model 80	85
Intermediate Chainwheel – Model 2000	80

* Rolled threads are identified by a drill point at the nut end.

Chapter 3

DECARBONIZING

GENERAL instructions regarding decarbonizing are too well known to need repetition here, so only these details peculiar to Rover engines are given.

No hard-and-fast rule can be given as to when, in terms of mileage, this operation should be carried out. So much depends on the type of service, running conditions and the general condition of the engine. It is safe to say that decarbonizing and valve grinding should be carried out when a fall in performance is detected, and this condition may develop after as little as 5,000 miles or may be delayed until as late as 50,000 miles, especially if running conditions allow long and fast journeys. Also, the design of modern engines is more conducive to long life.

The instructions given are in general terms and under sub-headings to cover all models.

Removing Cylinder Head

Group 1 *Engines.* – The removal operation is quite straightforward; the amount of dismantling is small and is obvious upon examination. In all instances remove the bonnet but not the radiator. The rocker shafts may be left in position on the head and block respectively and their removal is dealt with later.

Having made all necessary removals and disconnections, such as oil leads, water hose and thermostat, remove the retaining bolts (nuts on early models) and, with the plugs still in position, turn the engine over a few times to loosen the head – it will then lift off with ease.

Finally, remove the carburetter and where applicable, the inlet manifold (integral on some models).

Group 2 *Engines.* – On Model 80, remove the rocker-shaft assembly complete from the cylinder head. Take out the push rods (keep all parts to their original positions). Loosen the securing bolts evenly and lift the head clear, complete with manifolds and thermostat.

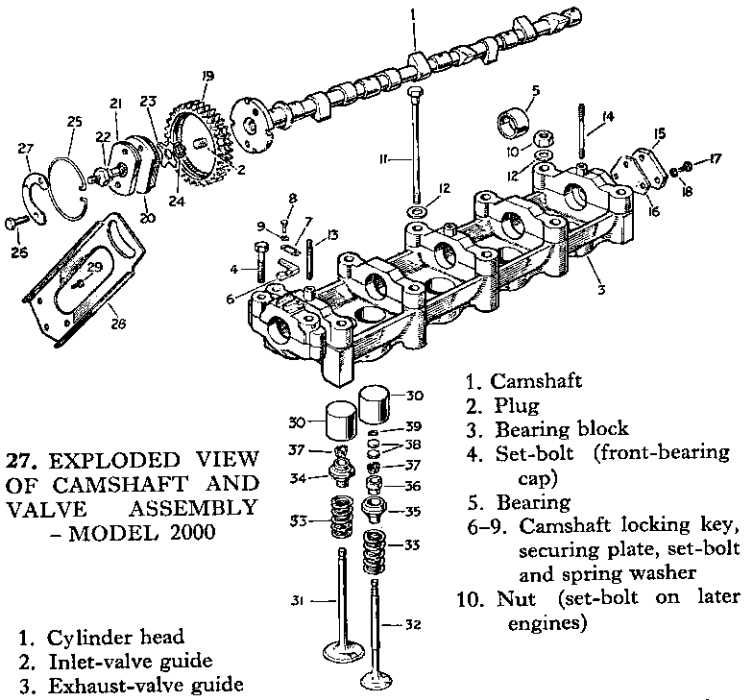
Group 3 *Engines.* – On Model 2000, first check tappet clearances and record result (see later). If the camshaft only is to be removed proceed as described on page 21, but if the head is to be removed proceed as follows: Make all necessary removals and slacken the lower fixings of the exhaust pipe. Lock the camshaft and crankshaft (see page 21) and relieve the tension on the upper chain tensioner (see page 20). Release the chainwheel from camshaft (two set-bolts) and secure wheel to support bracket as shown in Fig. 21.

When all connections that impede head removal are clear, detach cover plate (15), Fig. 27, and the ten bolts (11) securing bearing caps and cylinder head. The camshaft and bearing-block assemblies (3) will now lift off complete with bearing caps. Remove the tappets (30) and retain in original order. Lift off cylinder head. Secure against damage, the metal head gasket (in two parts) and the oil-ring seal in cylinder block at rear right-hand side; take care of the chain-tensioner piston and pad.

Notes on Tappet Adjustment – Group 3 Engines

As the 2000 engine uses an overhead camshaft and all valves are overhead, the valve clearance is 'built-in' on original assembly. Under normal circumstances, no further adjustment will be required until complete engine overhaul, or if any part or parts that could effect clearance are disturbed in any way.

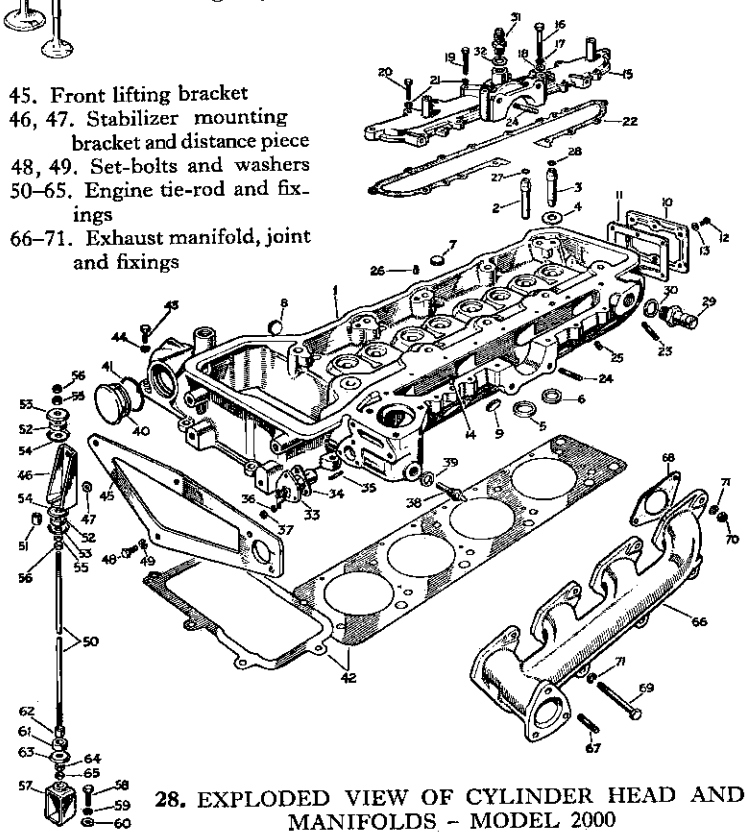
The correct clearance is 0·008–0·010 in. (inlet) and 0·013–0·015 in. (exhaust); it is achieved by selecting shims (38), Fig. 27, to the required thickness. These are available in varying gauges from 0·074 to 0·352 in., and when fitted into the counter-bore on the upper side of the spring cap (34 and 35) the thinner shim should be fitted first and followed by the larger one.



1. Camshaft
2. Plug
3. Bearing block
4. Set-bolt (front-bearing cap)
5. Bearing
6–9. Camshaft locking key, securing plate, set-bolt and spring washer
10. Nut (set-bolt on later engines)
11. Set-bolt (cylinder head)
12. Plain washer
13, 14. Top-cover studs
15–18. Rear-cover plate, joint, set-bolt and washer
19. Chainwheel
20. Splined ring
21. Clamping plate
22–24. Retaining stud, washer and circlip
25. Spring ring
26, 27. Set-bolt and lock-washer
28, 29. Chainwheel support plate and set-bolt
30. Valve tappets
31. Inlet valve
32. Exhaust valve
33. Inner and outer valve springs
34, 35. Caps for springs
36. Exhaust-cap sleeve
37. Split cones
38. Tappet-adjustment shims
39. Spring-ring retaining shims

27. EXPLODED VIEW OF CAMSHAFT AND VALVE ASSEMBLY – MODEL 2000

1. Cylinder head
2. Inlet-valve guide
3. Exhaust-valve guide
4. Valve-spring washer
5. Inlet-valve seat insert
6. Exhaust-valve seat insert
7–9. Core plugs
10–13. Rear-cover plate, joint, set-bolt and washer
14, 15. Inlet-manifold dowel and cover
16–21. Inlet-manifold fixings
22. Joint washer
23. Exhaust-manifold stud
24. Carburetter stud
25. Helicoil insert for exhaust-manifold bolts
26. Dowel for camshaft-bearing block
27, 28. Rubber rings for valve guides
29, 30. Heater outlet adaptor and washer
31, 32. Brake-servo adaptor and washer
33, 34. Thermostat switch and joint for choke-warning light
35–37. Stud, washer and nut
38, 39. Water-temperature unit and joint
40, 41. Sealing plug and O-ring
42. Gasket
43, 44. Head to block set-bolts and washers
45. Front lifting bracket
46, 47. Stabilizer mounting bracket and distance piece
48, 49. Set-bolts and washers
50–65. Engine tie-rod and fixings
66–71. Exhaust manifold, joint and fixings



28. EXPLODED VIEW OF CYLINDER HEAD AND MANIFOLDS – MODEL 2000

The following precautions should be taken if the camshaft is to be disturbed. (*a*) Check the valve clearance of every valve before commencing to dismantle and record the result on paper; (*b*) ensure that each valve set is kept complete (tappet (30), shims (38), etc.) and they are returned to the cylinder head in the same order; and (*c*) recheck valve clearance after the camshaft has been refitted and correct if necessary.

It will follow that if clearances are correct before dismantling they will still be correct after reassembly, provided all parts were replaced as found. Also if the pre-strip check revealed that one or more clearances were outside the limit, they should be corrected upon reassembly by an appropriate selection of shims.

Removing Inlet-rocker Shafts – Group 1 Engines

To remove the inlet-rocker shafts on Group 1 engines, first remove the rocker-shaft plug from the front of the cylinder head. Remove the nuts, spring washers and retaining plates securing the thrust blocks and remove the screws locating the shafts. The shaft is threaded to take an extractor, by this means, the front shaft will now come away and the rockers and springs can be lifted out. Repeat the operation to remove the rear shaft. The rockers and springs must be retained in their original order.

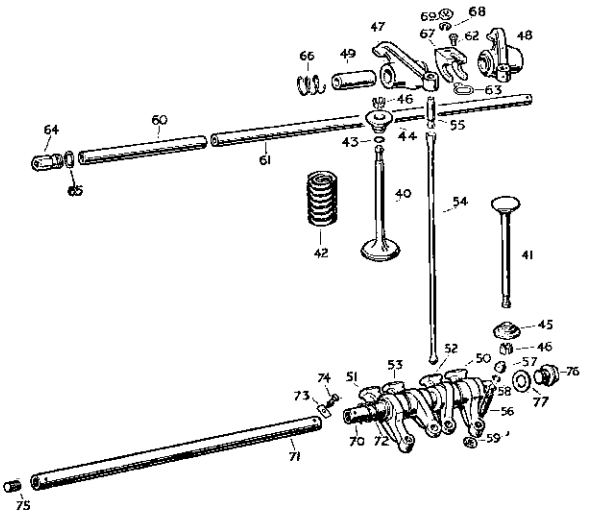
On 3-litre Mk. II, III and 110 models, first remove the inlet manifold. On these models, the rocker shaft is in one piece and is mounted in four brackets, one at either end and two at intermediate points secured to the cylinder head by set-bolts and lockers. Remove set-bolts and complete assembly will lift off, but take the precaution of tying the assembly together with string from the first to the last rocker to prevent them from flying apart when released; note also dowels fitted to support brackers.

On all models, lift out the push rods, retaining them in their original order.

Removing Exhaust-rocker Shafts – Group 1 Engines

The exhaust-rocker shafts on these engines are located in the block. If the engine is in position it will be necessary to remove the gear-change linkage and the gearbox cover.

40. Inlet valve
41. Exhaust valve
42. Valve spring
43. Rubber ring for valve guide
44, 45. Valve-spring cups
46. Split cone
47, 48. Inlet valve rockers
49. Bush for rocker
50, 51. Exhaust-valve rockers
52, 53. Inlet-cam followers
54. Inlet push rod
55. Inlet tappet screw
56–58. Exhaust tappet screw
59. Locknut for screw
60, 61. Inlet rocker shafts
62, 63. Fixing for shafts
64, 65. Plug for front shaft
66, 67. Spring and spacer for inlet rockers
68, 69. Fixings for spacers
70, 71. Exhaust-rocker shafts
72. Exhaust-rocker spring
73, 74. Shaft fixings
75–77. Plugs for shafts



29. ARRANGEMENT OF VALVE GEAR – GROUP 1 ENGINES

Drill a $\frac{5}{8}$-in. hole in the left-hand toe-board in line with the rocker shaft. This will be covered by the gearbox cover on reassembly.

Withdraw the rocker-shaft blanking plug from the rear of the cylinder block and take out the shaft-locating screws and the hollow oil-feed bolt locating the distributor housing. Using an extractor, withdraw the shaft, lift out rockers,

cam followers, springs, etc. Deal with the front shaft in a similar manner.

Removing the Valves – Group 1 and 2 Engines

Valves are retained by split collars and carry springs in pairs. The use of a valve-spring compressor is recommended.

When dealing with the exhaust valves on Group 1 engines it is not necessary to remove rocker shafts, but it is essential to slacken off the tappets to their full extent and to ensure that the valve under attention is on the back of its cam.

Removing the Valves – Group 3 Engines

On the 2000 engine, it is assumed that the head complete with camshaft has been removed. Consult Fig. 27 and note order of valve-assembly parts, and retain all parts in original order.

Lift off the tappets (30) and then on early models only remove circlip (39) retaining shims (38). Lift out shims (a magnet is useful here). Use a spring compressor and dismantle valve assembly. Note the difference between exhaust and inlet assemblies.

Valve Grinding

Assuming valve-seat refacing to be necessary, and that is by no means always so, note that exhaust seats on Group 1 engines and all seats on 2000 can only be ground, not re-cut, using the special equipment available.

On all models, reface inlet valves to 30° and exhaust to 45° and lap to their respective seats.

Refitting Rocker Shafts – Group 1 Engines

Replace the components by reversing the order of removal, noting the following:

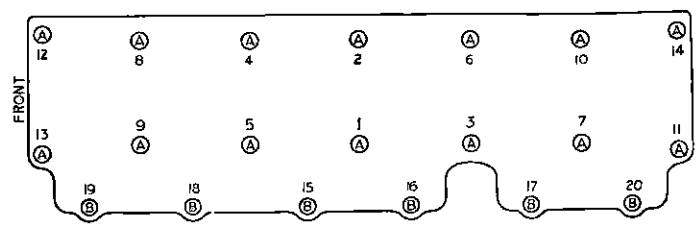
Rocker bushes should be a press fit in the rockers and rotate freely on the shafts when fitted; the bushes to be pressed in 0·010–0·020 in. below the thrust face of the rocker. When the bushes are in position (inlet), drill the two oil holes through each bush and locate the shafts so that the oil-feed holes are facing away from the inlet valves.

The exhaust-rocker shafts must be replaced with the oil-feed holes having flats facing towards the cylinder block. On Model 60, an 'F' is stamped on one end of the exhaust shafts, indicating Front. When fitting new rockers or cam followers do not wash off the special lubricant covering the working faces. This contains a special additive, zinc dithiophosphate, an essential material to aid bedding-in.

Refitting Rocker Shafts – Group 2 Engines

Model 80 has no lower rocker shaft, and the upper shaft is in two halves. They can be fitted to the cylinder head before the head is fitted to the block, but this is inadvisable, as damage to the push rods may result.

If new bushes are to be fitted to the rockers note that these are pre-drilled for oil, so take care of alignment as the bush is pressed in. Ream the bush to 0·530 in. plus 0·001 in. Align the rocker shafts with the bored ends together and slide a support bracket on to each shaft, ensuring that the locating hole in each bracket is positioned immediately above the chamfered hole in shaft – 4·75 in. from the plugged end, and then secure with locating screw and spring washer. Assemble the remaining components with the plugged ends of the shafts in the end



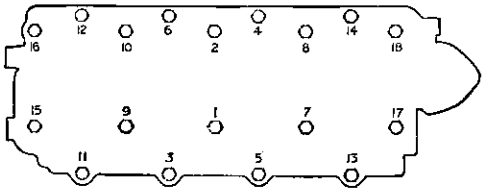
30. ORDER OF TIGHTENING CYLINDER-HEAD NUTS – GROUP 1 ENGINES

Tighten bolts (*A*) to 50 lb-ft. and bolts (*B*) to 30 lb-ft. Where a 'Corgasyl' steel gasket is fitted to later 75 90 and 105 models, tighten bolts (*A*) to 55 lb-ft. and bolts (*B*) to 33 lb-ft.

Note that on four-cylinder Model 60, there are only 12 (*A*) bolts and 4 (*B*) bolts.

brackets and the bored end of both shafts in the centre bracket.

Ensure that all push rods are correctly located in their original position and in the tappets and that the tappet-adjusting screws are slackened right off. Then offer the rocker assembly to the cylinder head. Fit the bracket securing bolts, but do not tighten. Then tighten down the cylinder-head bolts (see below).



31. ORDER OF TIGHTENING CYLINDER-HEAD NUTS – GROUP 2 ENGINES (MODEL 80)

Tighten $\frac{1}{2}$-in. bolts to 75 lb-ft. Tighten $\frac{5}{16}$-in. bolts securing rocker brackets only to 12 lb-ft.

Cylinder Head Replacement – Group 1 and 2 Engines

This operation will present little difficulty, but it is essential to remember to tighten down the head evenly and progressively and to the torque figures given in Figs. 30 and 31.

It is also important to note that a steel 'Corgasyl' gasket was fitted to 75 and 90 engines in mid-1955, and it must not be fitted to earlier engines. This type of gasket was also fitted to 60 engines in 1956, and in this instance is interchangeable with the copper–asbestos gasket formerly fitted. All steel gaskets are marked to indicate the upper side, and should be fitted accordingly, using NO jointing compound.

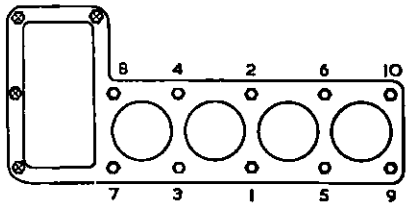
Cylinder Head Replacement – Model 2000

It is assumed that the head has been rebuilt, all valve assemblies replaced in their original order, all shims and tappets returned to their original position and a record kept of valve clearances prior to stripping.

Check that the E.P. mark on flywheel is in line with pointer with No. 4 piston at the top of its stroke and then apply flywheel lock.

Check that No. 1 exhaust-valve cam (second cam on shaft) is at the peak of its lift, i.e. pointing straight down, and apply camshaft lock, and check that the wide segment of the distributor drive dog is towards the distributor-clamp pinch-bolt. (If not, turn the engine through 360° to correct.) Replace the ring oil-seal to the camshaft feed (rear right-hand side of cylinder-block face) and replace chain-tensioner pad.

Place the two-part cylinder-head gasket in position, corrugations upwards, using 'Wellseal' compound lightly. On early engines, holes numbered (7) and (10) in Fig. 32 are fitted with studs. On later engines bolts are used at these points; in such instances fit slave studs to aid assembly. The head complete with camshaft may now be fitted. Remove the slave studs (7) and (10) on later engines and tighten the ten set-bolts (eight bolts and two nuts on early engines) in the sequence shown and to the final torque loading given in Fig. 32.



32. ORDER OF TIGHTENING CYLINDER-HEAD BOLTS – GROUP 3 ENGINES (MODEL 2000)

Tighten bolts (nuts at 7 and 10 on early engines) to 55 lb-ft.

Then tighten bolts marked with an X to 10 lb-ft.

All other parts can now be refitted and connections remade – plate at rear camshaft bracket (new gasket), camshaft wheel, release tension on top-chain tensioner and remove the camshaft and crankshaft locking devices.

Check each tappet clearance in turn, ensuring that each tappet is on the back of its cam when checking. Make a note of the exact clearance present in each case.

If any are outside the limit, remove the camshaft and correct by fitting suitable shims and refit camshaft.

All other parts and connections can again be refitted and the top cover replaced, using new gasket and Bostik, type 1776, to top side only.

Chapter 4

CARBURETTERS

ALL models are equipped with either S.U. or Solex carburetters, as indicated in the data tables. These two instruments are quite dissimilar, so they are dealt with separately from an instructional point of view.

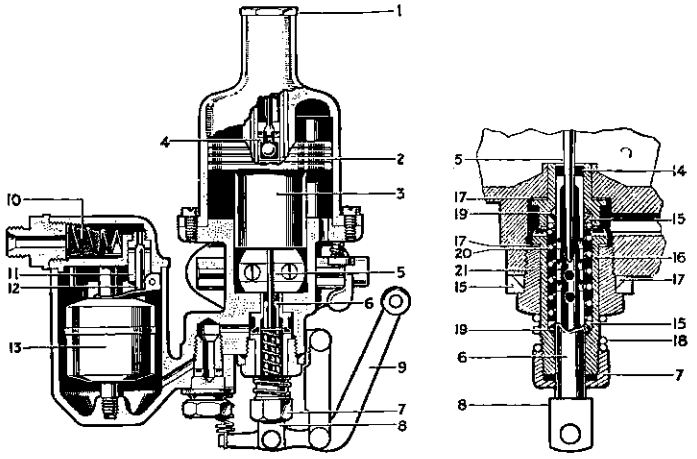
Before dealing with any instructions for adjusting carburetters, it must be made clear that it is of little use adjusting the carburetter unless the many other points that can cause an engine to run badly first receive attention. It is unusual for a carburetter to be the sole cause of bad running; make certain, therefore, that points such as tappet clearances, ignition system in general, the condition of the valves and all such items are in sound condition before attempting any carburetter adjustment.

S.U. BASIC CARBURETTER

The instructions which follow, are, first of all, based upon the H-type instrument used on some models from 1949. HD-type carburetters were introduced in 1957; these are rather more complicated, but the basic principles are the same, so very little additional instruction will be needed. The HS6-type instrument fitted to Model 2000 is generally similar to the H-type unit (see later).

The tuning of an S.U. carburetter is simplicity itself, if it is thoroughly understood that the only adjustment possible is fitting the right needle with the jet-adjusting nut set at the correct position to act as a stop for the weak position of the jet, with the idling speed set to a minimum by the throttle-stop screw. When set correctly for idling no other adjustment is provided or necessary.

The next point to remember is that should the engine run badly after having previously given good results, do not change the needle, for this cannot be the cause of the trouble.



33. SECTION THROUGH S.U. H-TYPE CARBURETTER

1. Oil-cap nut
2. Suction disc
3. Piston
4. Hydraulic damper
5. Taper jet needle
6. Jet
7. Jet-adjusting nut
8. Jet head
9. Jet lever
10. Gauze thimble filter
11. Needle seat and guide
12. Needle
13. Float
14. Top half jet bearing
15. Brass washer
16. Bottom half jet bearing
17. Packing washer
18. Adjusting-nut spring
19. Gland washer
20. Spring
21. Jet-securing nut

Having obtained a correct adjustment when the engine is running slowly and at proper working temperature, that is to say, it is made to fire as evenly as possible at minimum r.p.m., it would automatically follow that, assuming the correct needle is fitted, the adjustment will be correct throughout the speed range.

General Adjustment

Proceed as follows: Run the engine to its normal running temperature; adjust the jet to such a position that the engine idles on the correct mixture. The easiest way to do this is to screw the jet-adjusting nut up higher than its normal position and then gradually lower the nut until correct idling is obtained. This, then, will be the normal running position with the mixture control set at weak, i.e. pushed right in.

A check for correct mixture can be made by gently pushing the piston-lifting pin (introduced on carburetters from 1954) up about $\frac{1}{32}$ in. after free movement has been taken up. With the pin raised: too rich a mixture will cause engine speed to increase considerably; too weak a mixture will cause engine speed to immediately decrease; with correct mixture engine speed will increase slightly.

Fitting New Needle

Should it ever be necessary to change the needle – either through damage or wrong type fitted – remove the two screws locating the suction chamber, lift this off, followed by the piston (3), Fig. 33. At the side of the piston will be seen a set-screw; release this when the needle (5) can then be withdrawn and a new needle inserted. The needle carries its code number stamped on the butt end.

When inserting the needle, it is important that the shoulder or junction between the parallel part of the shank and the tapered working section of the needle, should coincide with the bottom of the piston rod into which it is inserted.

When replacing the piston complete with needle take care that the keyway at the side of the piston registers with the key in the carburetter body, and great care should also be taken to see that all machined faces are kept scrupulously clean.

If all the points detailed in the foregoing text are correct there still remain a number of faults which can cause the engine to run badly which are attributable to the carburetter; these are, piston sticking, dirt or water in the carburetter and flooding.

Piston Sticking

The suction piston comprises the piston which forms the choke, the needle and the suction disc; into this is inserted a hardened and ground piston rod which works in a bearing in the suction chamber.

The piston rod running in its bearing is the only part that is in actual contact with any other part. The piston and needle have a clearance fit and do not in themselves cause sticking.

A sticking piston can be ascertained in a few seconds by inserting a finger in the air intake (or using the piston-lifting pin on later carburetters) and lifting the piston upwards; it should lift quite freely and when released should return to its seat with an audible 'click'. If such is not the case it will probably be due to the piston rod being sticky or dry.

If the piston rod is sticking, remove the oil cap from the top of the chamber, pour in a few drops of paraffin and work the piston up and down a few times until free and then add a few spots of light oil. If the oil reservoir is empty, replenish the oil reservoir and work the piston.

Sometimes it is necessary to clean with petrol to remove an accumulation of soot that has been deposited as a result of being allowed to fire back through the intake under conditions of weak mixture.

Occasionally, sticking may be due to a need to re-centre the jet; should this be necessary, it indicates that some interference has taken place or that the needle is bent. When refitting check the needle for truth – if it is bent a new one will be required.

Centring the Jet

It is essential to remember that the needle, where it passes through the jet, should not actually touch the jet. As the needle is almost as large as the jet, the amount of movement necessary for correction is small.

First screw the jet-adjusting nut (7), Fig. 33, to its top position and move the jet (6) right up until the jet head is against this; then slacken

the jet-retaining nut (21) and reposition the jet, retighten the retaining nut, taking care that the parts are in the correct position.

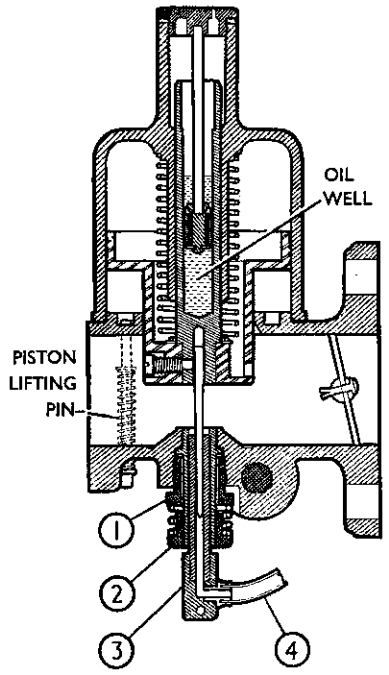
When this is done, check the piston (3) for freedom as previously explained, if not, slacken the retaining nut and try again. It may be necessary to repeat this operation several times.

If any doubt concerning the question of the needle being bent exists, assemble the piston without the needle. If all is now free, the needle is at fault.

Twin-carburetter Models

On 1949–54 Model 75, twin S.U. H4-type carburetters are fitted and these require to be synchronized. Failure to do this correctly will allow general bad running and poor performance.

Assuming that the carburetters themselves have been correctly assembled and replaced, it is first necessary to disconnect the interconnection between the carburetters, run the engine and synchronise the throttles by listening to the intake noise; the louder noise indicates the larger throttle opening. A stethoscope can readily by improvised for this, using a rubber tube. On the other hand, there are a number of proprietary instruments available which register airflow against a calibrated scale. Adjust each throttle separately until they both register the same. When that point has been reached, remake the interconnection and carry out all further adjustments on each carburetter simultaneously.



34. SECTION THROUGH S.U. HS-TYPE CARBURETTER

1. Jet-locking screw
2. Jet-adjusting nut
3. Jet head
4. Nylon petrol pipe

With the engine properly warmed up and at about 400 r.p.m., adjust the jets as previously described, and in order that they remain in step, screw the adjusting nuts right up and then lower each by the same amount; about ten flats will be found to be correct. If one differs from the other it will mean that one carburetter is weaker or stronger than the other.

Finally, replace the intake manifold and set the cold-start control. This control should be set so that when it is right home on the dashboard it still has $\frac{1}{16}$ in. possible movement, this ensures that it really is right home. To do this slacken the inner-cable clamp on the jet-operating lever, then with the control protruding $\frac{1}{16}$ in. at the dashboard and the jet hard up against the adjusting nut at the carburetter end, tighten the cable clamp.

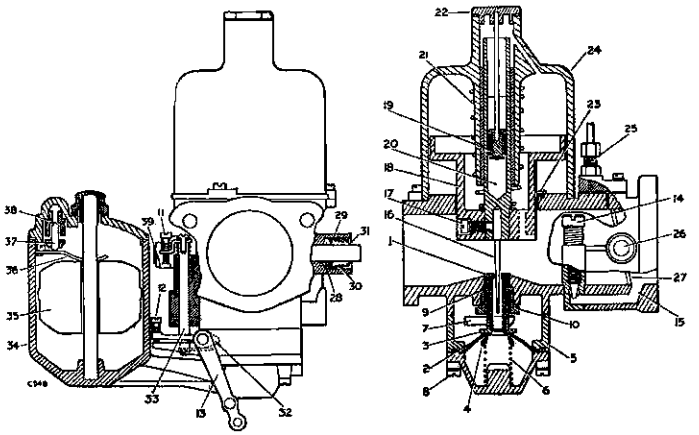
Where a choke-warning light is fitted and bearing in mind that there are two carburetters to contend with, it is first necessary to set the lower cable clamp to give a fast idling speed of 800–900 r.p.m., then pull out the control until the warning light just comes on. Tighten the centre cable clamp in this position so that it is touching the underside of the wire loop.

S.U. HS6-TYPE CARBURETTER

The HS6-type carburetter used on Model 2000 is fitted with a nylon tube-jet feed, but is generally similar to the basic H-type, its two main differences in construction being in (*a*) the jet unit, and (*b*) the float chamber.

Jet Unit

This assembly has been considerably simplified as the previous cork glands and sealing washers have been deleted and the jet is a simple metal tube sliding in a single bearing bush, fed by fuel along a small-diameter nylon



35. CROSS-SECTION OF S.U. HD-TYPE CARBURETTER

1. Jet
2. Diaphragm
3. Jet cup
4. Spring cup
5. Casing
6. Return spring
7. Jet-actuating lever
8. Float-chamber securing screw
9. Jet bearing
10. Jet screw
11. Fast idle screw
12. Mixture-control screw
13. Jet, hand-control lever
14. Slow-running adjustment screw
15. Slow-run orifice
16. Tapered metering needle
17. Special retaining screw
18. Piston
19. Damper
20. Oil reservoir
21. Piston return spring
22. Oil cap
23. Piston guide
24. Suction chamber
25. Union for suction pipe (Advance/Retard)
26. Throttle spindle
27. Throttle butterfly
28. Gland for spindle
29. Dished washer for gland
30. Spring
31. Shroud for spring
32. Cam
33. Push rod
34. Float chamber
35. Float
36. Float lever
37. Needle valve
38. Needle-valve seat
39. Throttle stop

tube leading direct from the base of the float chamber. This nylon tube is fastened into the base of the float chamber by nut and nipple fixing where it can be detached if jet removal is necessary.

Float Chamber

The float chamber is now fixed by three small screws on the outer diameter, and the float is of simpler construction, having no central tube. The needle and seating are the same as on the previous type of float chamber, also the fuel level is raised or lowered by bending the float-hinged lever either upwards or downwards (see under Float-chamber Level later).

S.U. HD-TYPE CARBURETTER

Twin HD carburetters are fitted to 105 and 2000TC models and a single HD unit is used on Models 95, 100, 110 and 3-litre.

The HD carburetter differs from the H-type unit primarily in the method of directing fuel to the jets, the method of adjusting the jet, the slow-running adjustment and cold-start control.

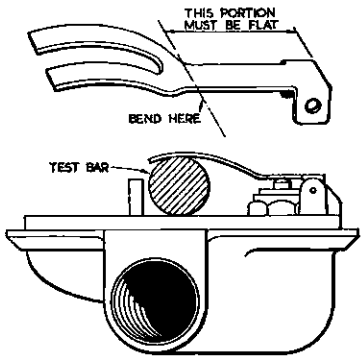
On H-type carburetters, the fuel flows to the side of the jet and then into it through small holes, but on HD units it is directed to the underside of a diaphragm and then upwards through the jet. This diaphragm is temporarily lowered to obtain a cold start or permanently lowered to enrichen the mixture.

Dismantling

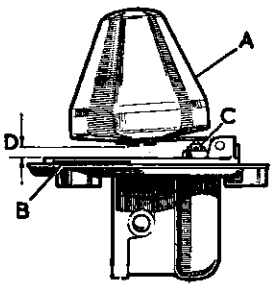
First study Fig. 35, proceed to dismantle, keeping in mind the following points.

When removing the needle-valve lever do this by driving the pivot pin from the float chamber cover. The needle (37) can now be withdrawn and the valve body unscrewed.

When withdrawing the diaphragm (2) and jet assembly mark the jet diaphragm and the body with a corresponding pencil mark to ensure correct repositioning when reassembling.



36. SETTING FLOAT LEVER ON S.U. H- AND HD-TYPE CARBURETTERS (H-TYPE UNIT ILLUSTRATED)
The test bar should be $\frac{7}{16}$-in. diameter.



37. SETTING FLOAT LEVER ON S.U. HS-TYPE CARBURETTERS

A. Nylon float
B. Gasket
C. Needle valve
D. Clearance – $\frac{1}{8}$-in.

Observe absolute cleanliness and note also that whenever throttle spindle glands (28) are removed, they and their retaining caps (29) must be renewed. Carefully examine the gland for the slow-running screw, and if it shows the slightest sign of deterioration renew it.

The piston lift pin is retained by a circlip; fit a new one upon reassembly. Examine carefully all gaskets and renew if there is any sign of cracking or hardening.

When fitting the throttle-control lever to the rearmost carburetter on 105 models, it must be positioned so that it moves through 51½° above and 23½° below the horizontal to open and close the butterfly valve fully.

Centring the Jet

It is essential that the jet and needle are centred correctly – this must be carried out before fitting the jet housing, lever and linkage assembly, and the jet bearing should not be tightened until this has been done.

Proceed as follows: With the needle extending through the loosely-fitted jet bearing, locate the jet and turn the diaphragm until the holes in it align with those in the carburetter body. Mark the diaphragm and the body with a pencil to ensure that it is refitted in the same position later.

Move the piston to allow the needle to enter and withdraw from the jet. Then with the jet pressed firmly into position and the needle fully entered, tighten the jet-bearing nut and check the piston for freedom of movement. When satisfactory, remove the diaphragm assembly complete and fit the jet housing, lever and linkage assembly into position.

Finally, locate the diaphragm-jet assembly, aligning the marks on diaphragm and body; then fit the jet-return spring, float-chamber assembly and cold-start control-needle support bracket.

Adjusting Single HD Carburetter

Whereas with the basic H-type, the jet is controlled by a nut, on the HD unit it is set by screw (12), Fig. 35, and whereas the engine speed is determined by adjustment of the throttle, it is now controlled by the slow-run valve (14). To enrich the mixture, the screw (12) should be screwed in, and to increase the idling speed the slow-run valve (14) should be undone. Check for mixture strength by lifting piston as previously described.

When correct idling is obtained, pull the mixture-control knob until the linkage is about to move the jet-operating arm and adjust the fast-idle screw (11) to give an engine speed of about 800–850 r.p.m. when hot. Then return the control knob and check that there is some clearance between the fast-idle screw (11) and the throttle stop.

Adjusting and Synchronizing Twin HD Carburetters

These are adjusted and synchronized as previously described, but to synchronize it is necessary to remove the plugs from the carburetter manifold in order to insert a listening device.

Proceed to the point where the cold-start control has been reconnected and adjusted and then disconnect the link between the two car-

S.U. CARBURETTER DATA

Year	*Model*	*Carburetter*	*Needle*	*Spring colour*
1949–54	75	Twin H4	FV	Yellow
1954–55	75, 90	Single H6	SS	Yellow
1956–59	75, 90	Single H6	SZ	Yellow
1954–59	60	Single H4	G1	Green
1957–59	105	Twin HD6	TM	Yellow
1960–62	100	Single HD6	SS	Yellow
1962–65	95	Single HD6	SS	Yellow
1962–65	110	Single HD8	UG	Red and green
1959–63	3-litre	Single HD8	UF	Red and green
1963–66	3-litre	Single HD8	UR	Red and green
1963–67	2000	Single HS6	RN	Green
1966–67	2000TC	Twin HD8	UI	Black and blue

buretters and, with both levers fully forward, check the alignment of rod and lever holes in the disconnected end. Adjust as necessary and reconnect.

Position the cold-start control inside the car to $\frac{1}{8}$ in. from the fully-home position and the levers at the carburetter end fully forward. When in this position lock the swivel pin to the inner cable.

Now pull out the cold start on the dash $\frac{5}{8}$ in. and adjust both idle screws to trap a cigarette paper and then rotate each screw one turn clockwise.

Finally, start the engine and adjust both idle screws by equal amounts to give an idle speed of 700 r.p.m.

Float-chamber Level

With the float-chamber lid removed, the float level can be checked as shown in Figs. 36 and 37. To correct, bend the float lever.

Carburetter Economy Device

On 1955–59 Models 60, 75 and 90, an economy device is fitted to the float-chamber lid. This is a venturi and jet attachment, connected by pipes between the throttle edge and inlet manifold.

When replacing the float-chamber lid, ensure that the special fibre washers are replaced as found, or the device will be rendered inoperative.

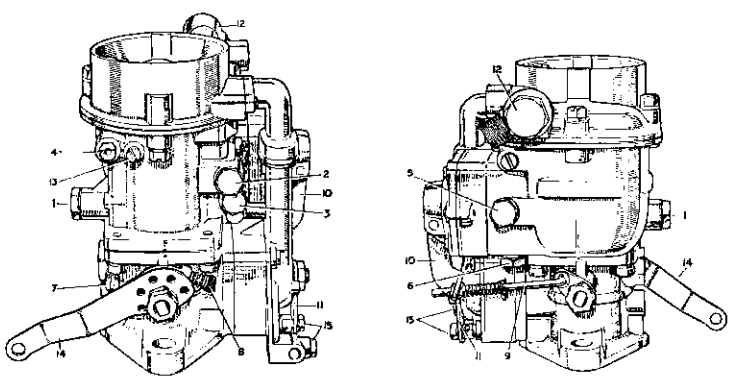
SOLEX CARBURETTER

The 1948–49 Models 60, 75 and 1960–62 Model 80 are fitted with Solex carburetters as listed in the accompanying data table.

These carburetters are of the fixed-choke multiple-jet type with separate cold-starting, slow-running and main (normal-running) circuits. They all have an accelerator pump and some form of economy device.

Slow-running mixture is provided by pilot jet and pilot-jet air-bleed and is controlled by a volume-control screw.

1. Main jet
2. Accelerator pump jet
3. Starter jet, fuel
4. Pilot jet
5. Economy jet, blank plug
6. Non-return valve
7. Volume-control screw
8. Slow-running adjustment screw
9. Operating rod
10. Pump-operating lever
11. Lever for starter
12. Banjo union
13. Special screw fixing choke tube
14. Throttle lever
15. Cold-start cable-clamping bolts



38. SOLEX CARBURETTER TYPE 40 PAIO-5 - MODEL 80

SOLEX CARBURETTER DATA

Year	*Model*	*Carburetter type*	*Jet sizes*		
			Main	*Air correction*	*Idling*
1948–49	60	32 PBI-2	102·5	106	45
1948–49	75	30 PAAI-2	97·5	240	60
1960–62	80	40 PAIO-5	125	185	50

For normal running, fuel is provided by the main jet and the main air supply for emulsification of the petrol by the choke tube. The correct air–petrol ratio is further automatically maintained by an additional air supply provided by the air-correction jet.

The Econostat device fitted to type 40 PAIO-5 carburetter, used on Model 80, consists of a supplementary supply of petrol and air drawn in only under full-throttle conditions. Operation depends entirely upon the air velocity at the waist of the choke tube creating a depression at the outlet situated in the Econostat body which carries the emulsion tube.

Dismantling

All the jets are fitted externally and are, in general, easily accessible. Note that the main jet is screwed into the submerged end of its carrier or holder.

The emulsion tube is held in position by the air-correction jet and access to it is obtained by removal of the air cleaner and jet. Access to the needle valve and float is by removing the screws securing the float-chamber cover.

Slow-running Adjustment

Two controls are provided on Solex carburetters to adjust the engine slow running. These are the slow-running adjustment screw (8), Fig. 38, which controls the engine speed, and the volume-control screw (7) which regulates the amount of mixture drawn into the engine under these conditions.

This adjustment should only be carried out with the engine at normal working temperature. To do this first make sure that the air cleaner is clean, then screw in the slow-running adjustment screw until the engine runs at a fast-idling speed. Unscrew the volume-control screw until the engine starts to hunt, then slowly screw in the volume-control screw until the engine runs evenly. When the engine runs evenly, screw out the slow-running adjustment screw to get a normal idling speed. This adjustment may cause the engine to start hunting. If so, screw in the volume-control screw until the engine runs evenly. When carrying out this adjustment, the volume-control screw should only be moved a small amount at a time and the engine allowed to settle down at each fresh setting before making a further adjustment.

PETROL GAUGE AND RESERVE SWITCH

All models are fitted with electric fuel gauges and all but Model 2000 with electric reserve switches – Model 2000 is manually operated by cable from the control on dash.

A defect in either the gauge head or the tank unit is best dealt with by replacement, but as circuit defects may be the cause of the failure, this point should first be checked. Remember that if the gauge always reads EMPTY with ignition ON there is a short circuit; if the gauge always reads FULL there is an open circuit. To test, disconnect the lead to the gauge head and switch on ignition; the gauge should read full. Now earth the lead and the gauge should read EMPTY. If both tests respond as described then both gauge and circuit are in order. Now reconnect the gauge and test the tank unit in a similar manner. If both tests are in order and the trouble is still present the fault is likely to be in the tank unit.

The reserve switch on Models 95, 110 and 3-litre Mk. II and III also acts as a changeover switch for the dual petrol pumps.

On the above models check the operation of the spare pump once a week by switching to reserve for a short period of time.

Chapter 5

COOLING SYSTEM

THE water pump on all models is belt-driven from a pulley on the crankshaft. In all instances, the main spindle carries a fan hub at one end and the impeller at the other. The water seal comprises a carbon ring and the spindle bearing is permanently attached to the spindle. At overhaul it is usually necessary to replace both spindle and bearing assembly and the carbon ring.

Fig. 39 shows the general layout of the 95, 100 and 3-litre water pump. A study of this diagram will suffice to cover instructions necessary to deal with all models.

Water-pump Removal

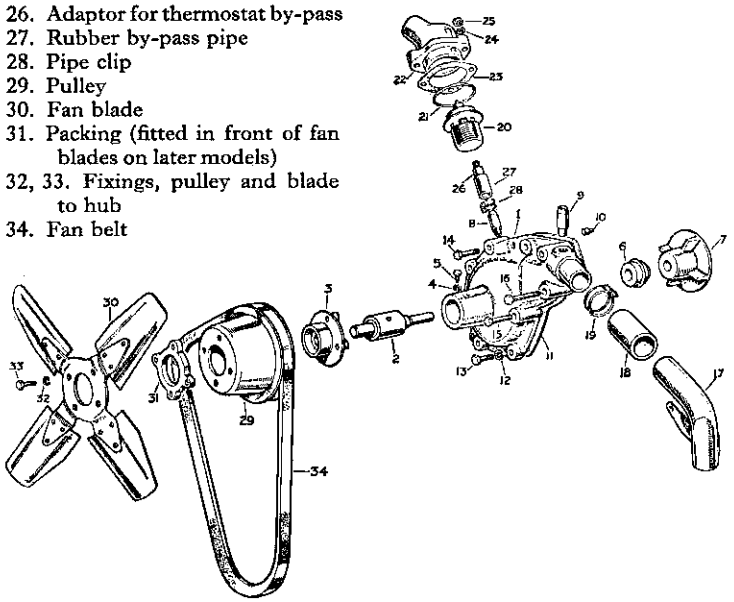
Pump removal will be obvious upon examination. First remove the fan blades and pulley. On some models, the bolts securing the fan blades to pulley and pulley to hub are common. Take care of the distance piece (when fitted) between blades and pulley and on Model 2000 the shims behind the pulley. Lift off pump complete.

Reconditioning Water Pump

Using Fig. 39 as a guide for all models proceed to strip the pump as follows. Withdraw the pulley hub (3) from spindle (2), using an extractor. Remove the set-bolt locating spindle and bearing assembly (2) and press out rearwards complete with seal (6) and impeller (7).

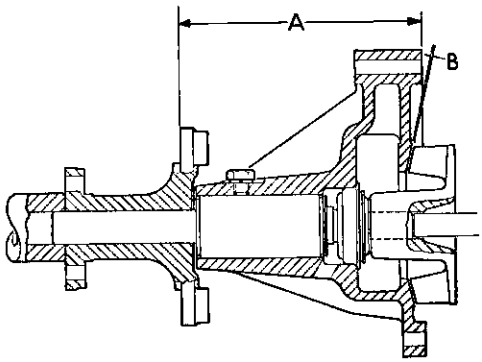
Examine this assembly carefully as it need not be renewed if the bearing is sound and the spindle reasonably free of corrosion. If the original spindle and bearing is to be used again, clean corroded portions of spindle and paint with chlorinated rubber primer or a good quality aluminium paint.

1. Casing for water pump
2. Spindle and bearing complete
3. Hub for pulley
4, 5. Special set-bolt and spring washer
6. Carbon ring and seal unit
7. Impeller
8. Adaptor for thermostat by-pass
9. Adaptor for heater pipe
10. Dowel for water-pump casing
11. Joint washer
12–16. Fixings, water pump to block
17. Inlet pipe
18. Hose
19. Clip
20. Thermostat
21. Joint washer
22. Outlet pipe
23. Joint washer
24, 25. Fixings, pipe to cylinder head
26. Adaptor for thermostat by-pass
27. Rubber by-pass pipe
28. Pipe clip
29. Pulley
30. Fan blade
31. Packing (fitted in front of fan blades on later models)
32, 33. Fixings, pulley and blade to hub
34. Fan belt



39. LAYOUT OF WATER PUMP AND THERMOSTAT – MODELS 95, 100 AND 3-LITRE

To reassemble, first insert a few drops of thick oil into the location hole in the bearing. Press the spindle and bearing assembly and, on later models, the deflector washer into the body (1), longer end of spindle leading, aligning the location holes in bearing and body and fit set-bolt. Press on the pulley hub (3) to a fixed dimension (see Fig. 40). Fit the carbon ring and seal (6) into bore of body, with the carbon ring towards mounting face. Finally, press the impeller (7) on to the spindle, leaving 0·020 in. clearance between vanes and body face.



40. WATER-PUMP ASSEMBLY DIMENSIONS

The pump shown is of Model 2000.

Dimension A	
Model 2000	4·522 in.
Models 60, 75 (1950 onwards), 90, 105	4·140 in.
Models 95, 100, 110, 3-litre	3·80 in.
Model 80	3·453 in.
Dimension B – All models	0·020 in.

Drain Taps

On all models two points are provided for draining the system. One tap is situated on the right-hand side of the cylinder block and a second tap (drain plug on 2000 models) at the base of the radiator.

Thermostat Removal

A thermostat is fitted in the water inlet pipe to the cylinder head. In the event of this not functioning correctly, it must be replaced with a new unit. To remove the thermostat proceed as follows after draining the system.

Disconnect the top water hose from the thermostat housing. Remove the air cleaner (except Models 75 (1954), 80, 3-litre and 2000), but if this is of the oil-bath type remove the aluminium outlet pipe only.

Model 75 (1954). – Remove one of the bolts securing the ignition coil and swing the coil out of the way.

Model 80. – Disconnect the heater hose and slacken the upper clip on by-pass hose.

Model 2000. – Disconnect the hose from each end of the heater pipe. Remove the two Philips screws which secure the pipe to the induction manifold and lift off the pipe.

On all models, the thermostat cover can be removed after taking out the securing bolts. The thermostat can be taken out and replaced with a new unit.

Replace the components in the reverse order.

Chapter 6

CLUTCH

A BORG and Beck coil-spring clutch is used on all models except 2000, which employs a diaphragm-spring unit. Although the general design of coil-spring clutches is similar, there is considerable variation in control linkage. Mechanical linkage is used on all models except 3-litre, where hydraulic operation is employed. Coil-spring poundage varies from one model to another and identification is by colour.

Important Note regarding 2000 Clutch

The Model 2000 clutch must not be serviced or dismantled and must be replaced or renewed as a complete unit.

Removing Clutch

In all instances, clutches can be removed with the engine in position, but on Model 2000 it is better to first remove the engine and gearbox complete.

After the gearbox has been removed, mark the flywheel and cover plate, in order to preserve the original balance on reassembly, then release the retaining bolts a little at a time and in rotation until the spring pressure is relieved.

Note that on some models additional plain washers are fitted under the clutch-cover securing nuts for balancing purposes. Replace these as found unless new parts are fitted. Note also dowels locating pressure-plate assembly; lift off assembly and remove clutch plate.

Dismantling Clutch – All Models except 2000

Mark the cover plate (7), Fig. 41, pressure-plate lugs and release levers (9) in order to preserve original balance on reassembly. Place the unit under a press with the pressure plate on a wooden block, press the cover downwards and remove the release-level nuts (12). The cover may now be lifted off.

With the inner end of the lever (9) and the top of the eye-bolt (11) as close as possible, lift the strut (13) over the ridge on the lever and remove the eye-bolt, lever and strut from the pressure plate (8).

Assembling Clutch Unit

Examine the pressure plate for damage and regrind if necessary; regrind limit 0·010 in. Examine flywheel for wear or damage. If worn, renew the primary-pinion bush (4), Fig. 41, in flywheel – the new bush to be a press fit in the flywheel (1) and the pinion an easy fit in the bush. Check the clutch springs and renew if necessary (see Data).

Assembly may now commence by reversing the dismantling procedure, using new adjusting nuts and lightly greasing all moving parts of cover-plate mechanism.

Finally, check the smooth operation of the clutch by means of the press and set the operating levers.

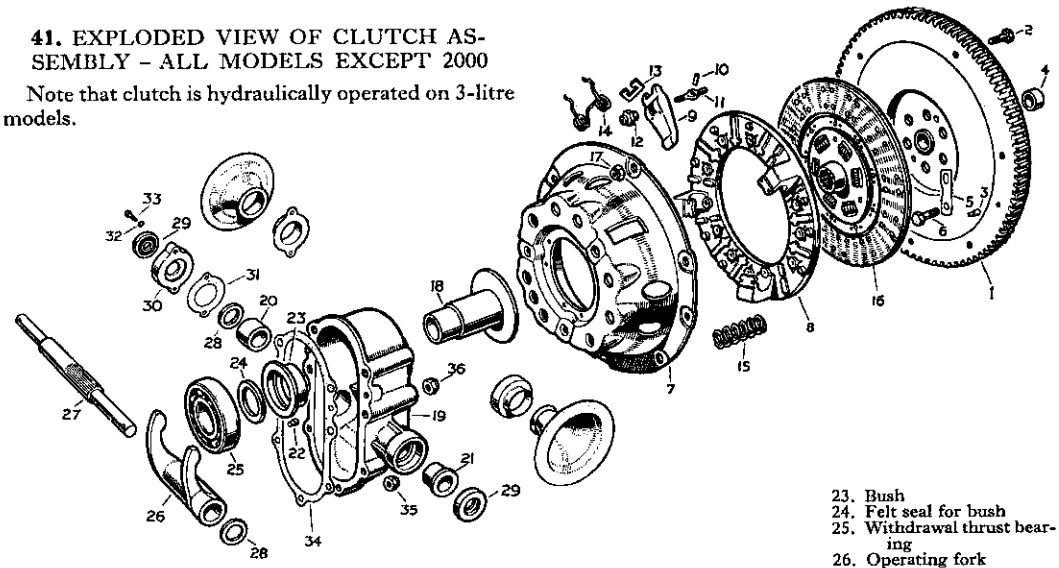
COIL-THRUST SPRING DATA

Model	*Spring colour*	*Poundage (lb.*	*Free length (in.)*	*No. of springs*
60 and early 75 . .	Cream	120–130	2·68	9
Late 75 (1954–59), 80, 90, 95, 100 . .	Yellow and green	135–145	2·68	9
105 and 110 . .	Black	150–160	2·798	9
3-litre . . .	Cream	120–130	2·68	12

Note. – The diaphragm spring of the 2000 clutch is attached by three straps.

41. EXPLODED VIEW OF CLUTCH ASSEMBLY – ALL MODELS EXCEPT 2000

Note that clutch is hydraulically operated on 3-litre models.



1. Flywheel
2. Fitting bolt
3. Dowel locating clutch unit
4. Bush
5. Flywheel locker
6. Special bolt
7. Clutch cover plate
8. Pressure plate
9. Release lever
10. Fulcrum pin
11. Eyebolt
12. Adjustment nut
13. Strut
14. Anti-rattle spring
15. Thrust spring
16. Driven plate
17. Nut
18. Withdrawal sleeve
19. Withdrawal race housing
20. Bush, large
21. Bush, small
22. Dowel locating housing
23. Bush
24. Felt seal for bush
25. Withdrawal thrust bearing
26. Operating fork
27. Cross-shaft
28. Thrust washer
29. Oil seal
30. Oil-seal housing
31. Joint washer
32, 33. Fixings for housing
34. Joint washer
35, 36. Fixings for housing

When replacing worn parts in the withdrawal unit, note following points:

The plain cross-shaft bush to be a drive fit in the housing, and the two flanged bushes a light drive fit, and the cross-shaft must be able to rotate freely in its bushes when fully assembled. The oil seals to be fitted open end inwards.

The withdrawal-sleeve bush to be a drive fit in the housing, but the bearing to be a *light* drive fit on the sleeve.

Finally, replace the cross-shaft so that the operating holes are horizontal when the fork is resting against the thrust bearing and there is $\frac{7}{16}$ in. between the sleeve shoulder and housing.

Adjusting Clutch Levers – All Models except 2000

Proceed as follows. Bolt the clutch unit down to a flywheel, using three equidistantly-spaced distance pieces in place of the driver plate, which must not be used as it has an allowable run-out of 0·010 in. Gearbox selector plungers are suitable for this as they are $\frac{3}{8}$-in. diameter.

Using a surface plate and scribing block, set the scribe to 1·655 in. above the flywheel face, either by means of a gauge as shown in Fig. 42 or by direct measurement.

Adjust each lever until the top face is level with the scribe. When correct, lock them to the eyebolts by bending the nut rim into the bolt slot.

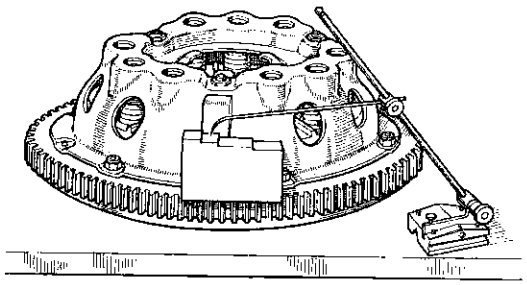
Replacing Clutch Unit – All Models

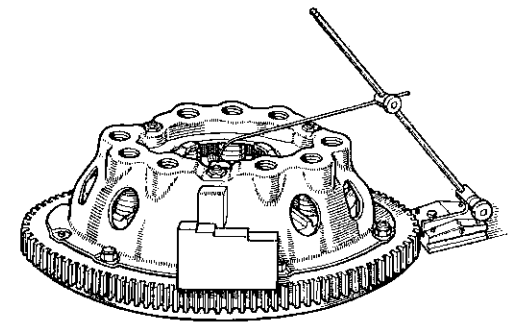
First check clutch plate run-out; this must not exceed 0·010 in. Place the plate in position on the flywheel with the longer end of the centre boss away from the engine. Assemble the unit to the flywheel, not forgetting to centralize the plate with the aid of an old primary pinion or a suitable dummy, and align the balance marks made when dismantling.

Tighten down evenly and progressively and then remove the centralizing shaft.

Clutch-withdrawal Unit – Model 2000

The withdrawal housing is retained to the gearbox by six self-locking nuts, but first remove the operating lever from the splined shaft (secured by pinch-bolt). Remove end cover, two set-bolts, followed by circlip and spacer; the shaft will now withdraw. Lift out the operating fork, taking care of the spring and thrust washer, and press out bushes. Examine all parts for wear and renew as necessary.





42. SETTING CLUTCH TOGGLES - ALL MODELS EXCEPT 2000

When refitting the thrust race ensure that it is pressed right home against the shoulder on the thrust sleeve. Fit all new gasket sand replace oil seal.

On original assembly, the mating surfaces of the withdrawal housing and bell housing are treated with Hyloman SQ32/M compound; clean off all traces before reassembly and retreat with this compound upon assembly.

Finally, tighten the six self-locking nuts retaining assembly to gearbox to torque of 25 lb-ft. and fit the external operating lever to splined shaft at 5° forward of vertical (Fig. 43).

CLUTCH ADJUSTMENT

All Models except 3-litre and 2000

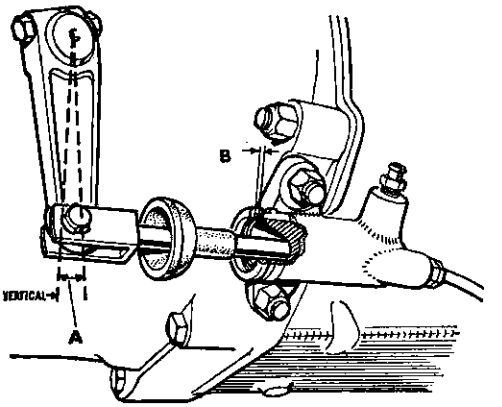
The clutch operation is by mechanical linkage. Should the linkage have been disturbed, ensure that the cross-shaft operating holes are horizontal when the fork is resting against the thrust bearing and there is $\frac{7}{16}$ in. clearance between the sleeve shoulder and housing (see Fig. 44).

Finally, adjust the length of the rod to the operating lever to give $\frac{3}{4}$ in. free play at the pedal pad (Fig. 45).

3-litre Models (Hydraulic Control)

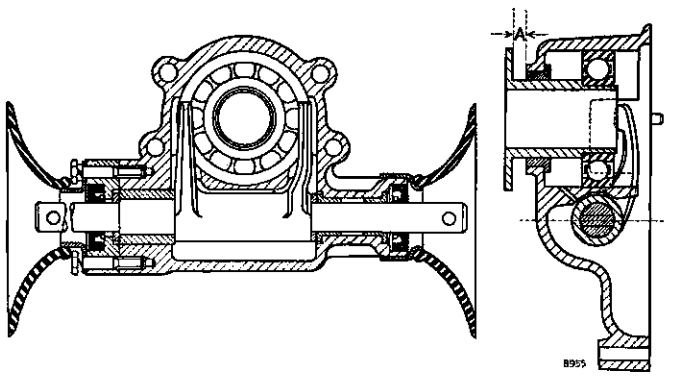
On 3-litre models, the clutch-withdrawal operation is hydraulic. It calls for a clearance of $\frac{3}{4}$ in. at the pedal pad, obtained as follows.

Assuming that partial dismantling has taken



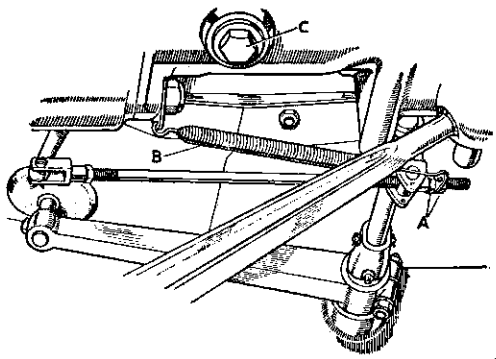
43 (*above*). CLUTCH-OPERATING LINKAGE SETTING - MODEL 2000

A. Lever 5° forward of vertical
B. Clearance between end of piston and circlip $\frac{1}{8}$ in.



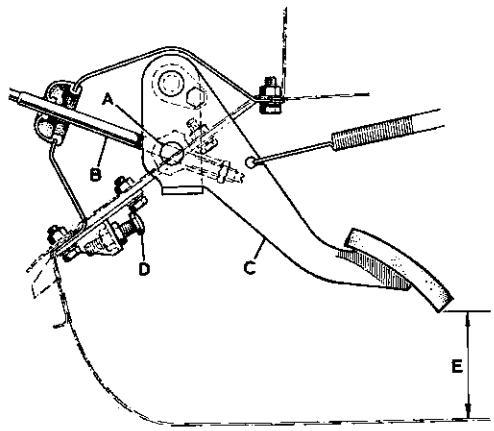
44 (*left*). REPLACING CLUTCH-WITHDRAWAL SHAFT - ALL MODELS EXCEPT 3-LITRE AND 2000

A. $\frac{7}{16}$ in.



45. CLUTCH-PEDAL ADJUSTMENT – ALL MODELS EXCEPT 3-LITRE AND 2000

A. Adjusting nuts
B. Pedal-return spring
C. Gearbox drain plug



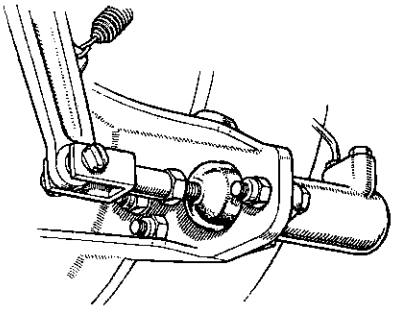
47. CLUTCH-PEDAL ADJUSTMENT – MODEL 2000

A. Fulcrum trunnion
B. Operating push rod
C. Pedal
D. Pedal
E. Pedal height 6½ in.

place, first ensure that the operating lever is fitted to the splines of the cross-shaft pointing downwards and approximately 6° forward of the right-angle position measured from the transmission centre line, with the operating fork resting on the clutch-withdrawal bearing.

Push the slave-cylinder operating rod (Fig. 46) and piston into its bore to the limit of its travel and then adjust the rod so that, when it is fitted to the operating lever, there is $\frac{1}{16}$ in. piston travel free movement – this will give $\frac{3}{4}$ in. at the pedal pad.

It is now necessary to adjust the pedal position. Do this by first adjusting the master cylinder push rod to give a dimension of 2·5 in.



46. ADJUSTMENT OF CLUTCH HYDRAULIC SLAVE-CYLINDER PUSH ROD – 3-LITRE

See text for method of adjustment.

from the centre of the clevis pin to the face of the support bracket, then tighten the locknut.

Now set the pedal stop to give 0·003 in. clearance between the pedal and the rubber stop, using a feeler gauge; then tighten the adjusting screw one further half turn and lock up.

Model 2000 (Hydraulic Control)

To adjust the clutch linkage and pedal travel on the 2000, first check that the operating lever is set 5° forward of vertical (Fig. 43). Slacken slave-cylinder push rod locknut and reduce length of push rod to *less* than $\frac{1}{8}$ in. between piston and circlip.

Set pedal height to $6\frac{1}{2}$ in. between underside of rubber pad and floor by manipulating the push rod (*B*), Fig. 47. Screw in pedal stop (*D*) to its full extent and operate pedal (*C*) to move slave piston to its rearmost position and with the clutch lever held fully rearward, adjust slave-cylinder push rod to obtain $\frac{1}{2}^{+0{\cdot}02}_{-0{\cdot}00}$ in. between piston and inside face of circlip. Lock push rod and move pedal until piston is felt to touch circlip. Hold in this position and screw out stop-bolt to contact pedal plus two full turns and lock up.

Finally, check that with pedal depressed, the slave-cylinder piston clears the circlip by a minimum of 0·010 in. and that the push rod full movement is $\frac{7}{16}$ in.

Bleeding Clutch Control – 3-litre and 2000

This is carried out in the same manner as when bleeding a brake system. The bleed nipple is located on the slave cylinder. Replenish the fluid as required at the reservoir on the master cylinder.

Chapter 7

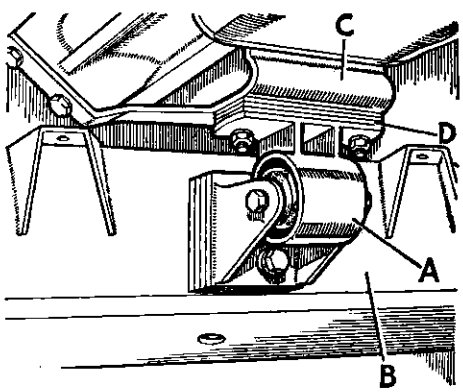
GEARBOX

SPACE will not permit detailed instruction covering all gearboxes in the range under review, but as the gearboxes used on all models other than 2000 are of the same basic design, the box currently used on 3-litre models will be dealt with in detail. Many modifications have taken place through the years, but the current gearbox embodies most of these, so in practice earlier boxes will be reasonably well covered.

The Model 2000 gearbox is dealt with separately.

It will assist in understanding the instructions which follow if it is remembered that all gearboxes are of the four-speed pattern, and that all models up to 1956 carry a built-in freewheel unit. An overdrive unit is optionally fitted to 3-litre cars and 60, 75, 90 and 105S models from 1956; it is standard equipment on 80, 100 and 110 cars. A Borg–Warner automatic transmission is available at option on 3-litre and 2000 models.

Also remember that synchromesh on second, third and top is confined to models 1950 onward with the exception of model 2000 which has synchromesh on all gears.



48. GEARBOX STABILIZER ASSEMBLY – 3-LITRE

A. Stabilizer bracket to gearbox
B. Sub-frame bracket
C. Reaction bracket
D. Shims

GEARBOX REMOVAL

All Models from 1950 except 105R and 2000

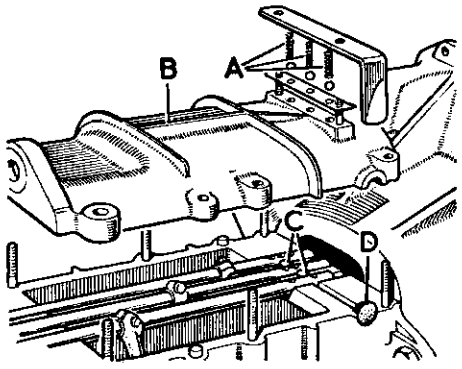
Drain the gearbox, remove front seats and disconnect battery. The gear-change mechanism can now be removed; this will be obvious upon examination.

Remove the gearbox access panel in floor and disconnect the front end of propeller shaft from flange and (on 3-litre) remove front-exhaust pipe at flange and at bracket to bell housing. Where fitted, slacken the nipple on the end of the freewheel cable and withdraw the cable, taking care not to lose the ferrule, and pull out the speedometer drive – three set-bolts. Disconnect reverse light and, where fitted, overdrive-solenoid leads.

Disengage the clutch-return spring (or overcentre spring where fitted) and remove clevis pin from clutch-operating lever and the two bolts securing the clutch cross-shaft to the gearbox (not 3-litre).

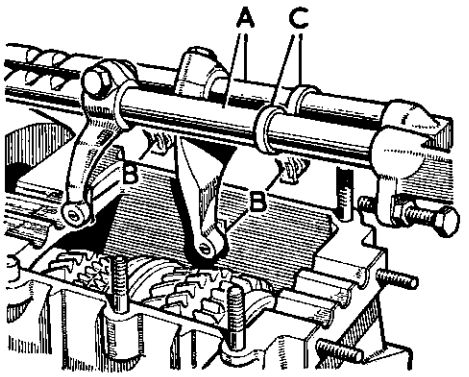
3-Litre Models. – Remove driving flange from gearbox-output shaft (self-locking nut) and remove slave cylinder from bell housing. *Do not* disconnect hydraulic pipe. Secure clutch pedal from movement as this would expel slave-cylinder components from cylinder.

Note that 3-litre models are fitted with a stabilizer assembly and a series of shims (Fig. 48). Remove this assembly and note number of shims. Release also the two rear-support brackets located between flywheel housing and sub-frame on left-hand side and cylinder block and sub-frame on right-hand side, but before doing so place a jack under the unit and raise just sufficient to release stabilizer bracket and swing it clear.



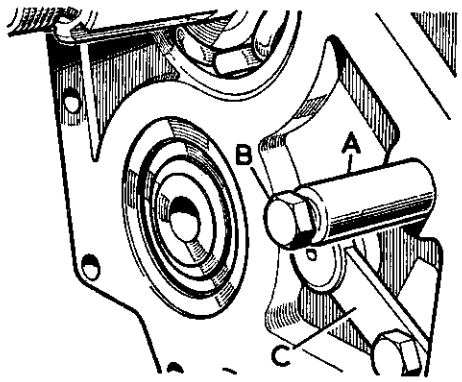
49. REMOVING GEARBOX TOP – MODEL 2000

A. Detent selector springs
B. Gearbox top
C. Selector interlocks
D. Rubber blank plug



50. REMOVING GEAR SELECTORS – MODEL 2000

A. Gear selectors
B. Phosphor-bronze shoes
C. Oil-seal rings



51. REMOVING REVERSE-SELECTOR GUIDE ROD – MODEL 2000

A. Reverse selector guide rod
B. $\frac{5}{16}$ in A.F. slave bolt
C. Location plate for reverse-gear idler shaft

All Models. – Finally remove all nuts retaining bell housing to engine, remove gearbox rear-mounting bolt (not 3-litre), lift engine by means of jack and gearbox will come away.

When replacing the gearbox assembly, reverse the above instructions, using the bell-housing inspection cover when lining up the primary pinion with the clutch plate. Finally, adjust the freewheel cable (if fitted) at the control knob until the backlash measures $\frac{1}{8}$–$\frac{1}{2}$ in. at the rim of the control knob with the control in the fixed position.

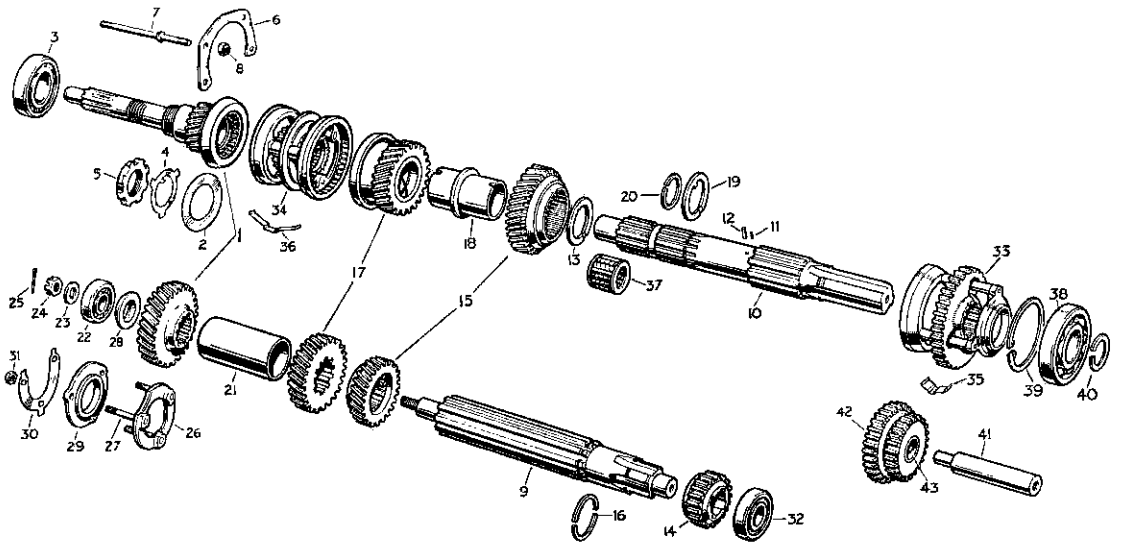
On 3-litre models preserve correct engine height and alignment by adding or subtracting shims as necessary between reaction bracket and stabilizer bracket.

Removing Gearbox – Model 2000

This operation is best carried out by removing engine and gearbox as a unit. It will be necessary to remove the radiator and then all controls, electrical, hydraulic, water pipes and mechanical linkages. It is also necessary to disconnect and remove the propeller shaft; propeller shaft removal is necessary to assist assembly when the unit is being refitted.

When dealing with the change-speed lever, first ensure that it is in the neutral position. Then remove one of the two bolts securing the gearbox rear-mounting bracket (after relieving the tension on the spring), slacken the second bolt and swing the retaining straps to one side. Release the remote-control shaft from the gear lever – two bolts securing bush to gear-change mounting plate. Now rotate the remote-control shaft through 90° to clear selector jaws and withdrawal rearwards, leaving the selector finger undisturbed on the shaft. Lift out the engine.

The gearbox can now be parted from the engine after removing starter motor and eight bolts (two fitted bolts) retaining bell housing to engine.



52. ARRANGEMENT OF GEARS – ALL MODELS FROM 1954 EXCEPT 2000

1. Primary pinion and constant gear
2. Primary pinion bearing shield
3. Bearing for primary pinion
4. Lockwasher
5. Locknut
6. Retaining plate
7. Stud
8. Nut
9. Layshaft
10. Mainshaft
11. Locating peg for rear thrust washer
12. Locating peg for mainshaft bush
13. Rear thrust washer
14. First-speed layshaft gear
15. Second-speed constant gears
16. Split ring for second-speed gears
17. Third-speed gears
18. Mainshaft bush
19. Front thrust washer
20. Spring ring fixing mainshaft gears
21. Layshaft distance sleeve
22. Layshaft front bearing
23–25. Fixing layshaft to bearing
26–27. Stud plate
28. Distance washer
29. Layshaft bearing retainer
30. Lock-plate
31. Nut
32. Layshaft rear bearing
33. Second synchronizing clutch and first-speed gear
34. Third and top synchronizing clutch
35, 36. Detent springs for synchronizing clutch
37. Mainshaft front bearing
38. Mainshaft rear bearing
39. Circlip fixing bearing to casing
40. Ring-fixing shaft in bearing
41. Reverse-gear shaft
42. Reverse gear
43. Bush for reverse gear

GEARBOX DISMANTLING (ALL MODELS)

To strip the gearbox, first drain the oil and then remove the clutch-withdrawal unit. To do this on early models, remove the bolts securing the dust-proofing clip inside the bell housing, the split pin and washer securing the clutch-operating lever and pull out the pin from inside the bell housing. Remove the self-locking nuts securing the withdrawal unit, and lift this off complete with grommets and clips, and finally remove the freewheel unit complete.

On all other models, first remove the operating lever (pinch-bolt) and then the clutch-withdrawal unit complete.

The selector shafts and forks can now be removed (this can be done with the gearbox in position if necessary).

On models to 1954 unscrew the three selector plugs and remove the reverse and forward selector springs. On 1955 models onwards, remove the screws securing the retaining plates and withdraw the springs. The reverse-light switch and selector-shaft seal-retaining plates can now be removed and the gearbox cover lifted off.

Consult Figs. 49–51 for details of the top cover and selector shafts and forks on Model 2000. Note that on this model it is necessary to first slacken the nuts retaining gearbox to bell housing before the gearbox lid can be removed.

Lift out the selector shafts; engaging first gear to remove the reverse shaft and the first/second shaft and engaging third gear to remove third/fourth shaft (not 2000). On 2000 model, lift out reverse shaft first and then the other two shafts together, taking care of the bronze shoes fitted to each fork.

Remove the bell housing (all models). To do this, first lock the layshaft by engaging two gears and slacken off the layshaft nut. Remove the four bolts securing the bell housing to the

box. The bell housing can now be tapped off and with it will be carried the primary shaft and the layshaft constant gear; at the same time drive the layshaft back through the bell-housing bearing (not 2000).

Dismantling Gearwheel Assemblies – All Models from 1950 except 2000

Study Fig. 52 and proceed as follows. The layshaft assembly and the conical distance piece (28) can now be withdrawn from the bell-housing bearing (22) and the bearing, retained by three nuts (31) and lock-washer (29), can be pressed out together with the retaining plate (29). Press out the primary pinion (1) complete with bearing (3) after releasing retaining plate (6).

If it is required to remove the primary pinion from its bearing (3), this can be done after releasing the locknut (5) (left-hand thread) and washer (2) and then sliding off the mainshaft front bearing (37) and synchronizing clutch (34).

The layshaft (9) can now be lifted from the box and the distance tube (21), the third and second constant gears (15) and (17) and the two ring segments (16) slid off. If necessary, press off the first layshaft gear (14) and rear bearing (32).

To strip the mainshaft (10), first remove the external circlip (40) securing the mainshaft to the rear bearing (38) and drive the shaft forward out of the bearing, using a thimble to protect the threaded end, and then the first-speed gear (33) will slide off.

Remove the spring ring (20) located inside the third-gear recess and slide off the thrust washers (19), third-speed gear (17), bush (18) and second-gear (15). If necessary, drill out, or otherwise extract, the peg (11) locating the rear thrust washer (13).

The mainshaft rear bearing (38) is retained in the casing by an internal circlip (39). To remove this bearing, heat the casing uniformally to 90°–100° F. (the temperature of a normal degreaser unit) and press out the bearing, remembering that to replace this bearing, reheating will be necessary.

Knock out the layshaft rear-bearing outer race (32), using a punch through the two holes provided, and then press out the reverse shaft (41) and remove reverse-gear assembly (42).

Dismantling Procedure for 1948–49 Gearboxes

The following main differences in dismantling procedure for earlier models should be noted.

When separating the gearbox from the bell housing, if care is taken in applying a lead hammer to the rear end of the mainshaft, the gearcase will come away, leaving the gear cluster in position in the bell housing.

At this juncture carefully examine the assembly before further disturbance, and take particular note which way gears sit, the presence or absence of thrust washers, etc., and their location, because these points vary from year to year. When satisfied regarding these points, remove the mainshaft and layshaft rearwards and then the primary shaft in the same direction, not forgetting the primary shaft is retained by a split ring and the bearing for primary shaft is secured by two $\frac{1}{4}$-in. bolts. Should it be necessary to remove the reverse shaft, it is threaded to accommodate an extractor ($\frac{3}{8}$ in. B.S.F.).

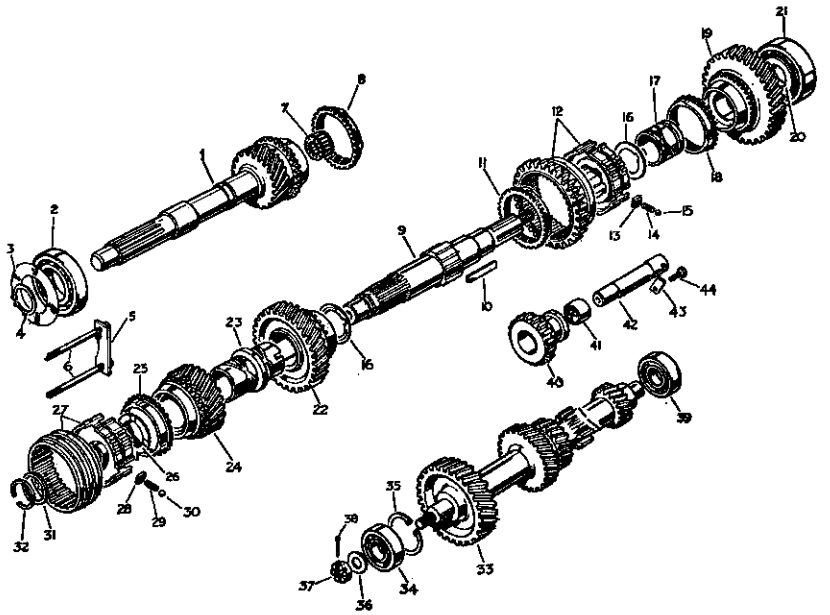
Dismantling Gearwheel Assemblies – Model 2000

First study Fig. 53 and then proceed as follows. Temporarily retain the mainshaft gear train from disintegrating by securing with wire, or better still a hose clip. The gear assemblies are in position in the bell housing as shown in Fig. 54. The mainshaft assembly can be lifted clear if the layshaft is pushed a little to one side and by manipulation of the 3rd/4th synchro unit. Place on one side and remove synchro cone (8), Fig. 53, and roller bearing (7) from primary pinion (1).

Remove the nut and washer (36) and (37) from front of layshaft and then drive the primary pinion (1) and layshaft rearwards together (use lead hammer), noting two retaining plates (5) and four bolts (6) that will come away with the pinion, leaving bearing (2), oil baffle (3) and circlip (4) still in position.

The layshaft assembly is in one piece and cannot be dismantled further. Dismantle the mainshaft after first removing the temporary retaining clip.

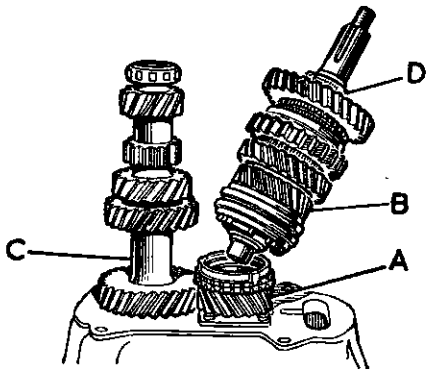
If necessary all bearings can now be removed. The layshaft front bearing, retained by circlip



53. ARRANGEMENT OF GEARS - MODEL 2000

1–6. Primary pinion, bearing, baffle, plate, circlip, bearing-retaining plate and fixing bolts
7. Primary-pinion needle-roller race
8. Primary-pinion sychro cone
9. Mainshaft
10. Key for thrust washers
11. Second-gear synchro cone
12. Low-gear synchro
13–15. Sliding block, spring and ball
16. Thrust washer (1st/2nd gear)
17–20. First-gear bush, synchro cone, gear and thrust washer
21. Rear bearing
22. Second-speed gear
23. Distance sleeve
24–26. Third-speed gear, synchro cone and thrust washer
27. High-gear synchro
28–30. Sliding block, spring and ball
31, 32. Spacing washer and retaining ring for high-speed inner member
33. Layshaft gear cluster
34–38. Front bearing, circlip, washer, nut and split-pin
39. Rear layshaft bearing
40–44. Reverse gear, bush, shaft, retaining plate and set-screw

(35) is removed by drifting; remove outer race of layshaft rear bearing in a similar manner, but use an extractor to remove inner race from shaft. Press the ballrace (2) from primary shaft (retained by circlip) and finally the mainshaft rear bearing (21) by drifting from the casing.



54. LIFTING MAINSHAFT FROM PRIMARY PINION - MODEL 2000

A. Primary pinion
B. Mainshaft assembly
C. Layshaft
D. Hose clip retaining gear assemblies

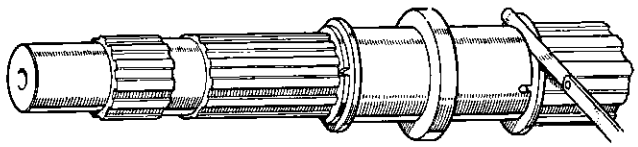
GEARBOX REASSEMBLY (ALL MODELS)

Clean and examine all parts removed for wear or damage and arrange to replace as required.

As explained in the dismantling instructions it will be necessary to preheat the gearcase to 90°–100° F. and then press in the mainshaft rear bearing (until it abuts the casing flange, except 2000) and the layshaft rear-bearing outer race (until flush with casing on 2000), and insert the first/second selector-locating pins (not 2000).

If it is decided to replace the reverse-gear bush, it should be a press fit in the gear, both ends bell-mouthed to prevent moving in the gear, and the finished bush a sliding fit on the shaft. Whilst the case is still warm (not 2000)

55. MEASURING MAINSHAFT-BUSH END FLOAT – ALL MODELS FROM 1950 EXCEPT 2000



press in the reverse shaft, and locate the gear with its smaller wheel to the rear. Finally, locate the mainshaft rear bearing by means of the internal circlip.

Reassembling Mainshaft – All Models from 1950 except 2000

Proceed to assemble the mainshaft as follows with reference to Fig. 52. Replace the rear thrust washer (13), but do not fit the bush-locating peg (12) at this juncture. Slide on the mainshaft bush (18) with the large locating slot to the rear, together with the second-speed gear (15), synchro cone to rear.

Assemble the third-speed gear (17) on the bush with the gearwheel against the shoulder and secure with the second thrust washer (19) and the *old* spring ring (20). At this point, measure the end-float of the second-speed gear; this should be 0·004–0·007 in., with the third gear pressed hard against the shoulder.

Now check the end-float of the third gear in a similar manner and to the same dimensions; if excessive or insufficient, correct by rubbing down or replacing the bush.

Next check the mainshaft-bush end-float. To do this, strip and reassemble with the bush and washers only. The float should be 0·001–0·008 in. (see Fig. 55), but endeavour to keep the measurement as low as possible by selective assembly of thrust washers; these can be obtained in thicknesses of 0·125, 0·128, 0·130 and 0·135 in.

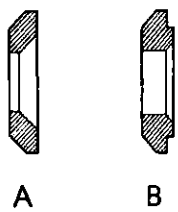
When satisfactory end-float at all points has been obtained, dismantle and reassemble by first fitting the rear thrust washer (13), Fig. 52, and peg (11) and the bush-locating peg (12) followed by the bush (18) and gears and then the front thrust washer (19) with its groove in line with the small slot in the bush and secure the assembly using a *new* spring ring (20). Finally, slide the first-speed gear (33) on to the rear end of the shaft, drive the mainshaft into the rear bearing (38) and secure with circlip (40).

Reassembling Layshaft – All Models from 1950 except 2000

First of all, note that two different types of layshaft distance washers are in use, these are illustrated in Fig. 56. Where type (*A*) is found, no end-float between gears and distance pieces is allowed. Where type (*B*) is found, 0·003–0·005 in. end-float is essential, and oversize sleeves are available to effect that end. Note also that layshaft assemblies (*A*) and (*B*) are interchangeable as assemblies, but not so far as component parts are concerned.

To check the end-float where applicable, assemble temporarily in the following manner. Slide the first-speed layshaft gear (14), Fig. 52,

56. LAYSHAFT WASHERS – ALL MODELS FROM 1950 EXCEPT 2000



over the splines on to the rear of the layshaft (9), chamfer forward, and then fit the rear-bearing inner race (32) (tap fit). On 1954–55 models only, apply grease to the ring grooves on the shaft and position the split rings (16); then slide the second gear (15) on to the layshaft with flange facing forward and recess over the split ring. On 1956 models, fit the second gear with flange facing forward and the plain side against the layshaft shoulder. Follow with the third-speed gear (17) (flange forward), the distance piece (21), constant gear (1), distance piece (28) and finally bearing (22).

Tighten the assembly and check end-float (0·003–0·005 in.), using feeler gauge between sleeve (21) and gear (1). When this point is satisfactory, remove from the shaft the nut, washer, bearing, distance piece and constant gear and insert the shaft complete with the remaining parts into the gearbox ensuring that the

gears are not allowed to move forward on the shaft, otherwise the split rings (where fitted) will be displaced.

Reassembling Gearcase to Bell Housing – All Models from 1950 except 2000

Commence reassembly by placing the bearing shield (2), Fig. 52, on the primary pinion (1) and press the bearing (3) to the primary shaft until the shield is held against the shoulders, and secure the bearing in this position with the lock washers and nuts (4) and (5) – left-hand thread.

Warm the bell housing as when dismantling, press in the pinion and bearing and secure. Whilst the housing is still warm, press in the layshaft bearing (22) until flush with the rear face of the housing and secure with the retainer, lockplate and nuts (29), (30) and (31).

Place the *smaller* diameter of the conical washer (28) on the bearing (22) and the gear (1) on the washer and in mesh with the primary pinion.

Follow this with the third/fourth synchromesh unit (34) to the mainshaft (internal splines to rear) and finally mainshaft front bearing (37).

Offer up the bell housing to the gearbox, carefully locate the two shafts and two dowels and secure with four bolts at top and the clutch-spring anchors at the bottom. Finally, engage two gears and lock up the layshaft – plain washer, nut and split pin.

Replace the clutch-withdrawal unit, not forgetting the dust-proofing grommets, and replace the operating lever on the driver's side. Seal the grommets to the bell housing, the stepped one to the starter-motor side.

Replacing Selector Shafts – All Models except 2000

Assuming that work is being done on a current arrangement, the following information will broadly cover all models, except 2000. Commence by sliding a sealing ring on to each shaft, followed by the appropriate fork and secure in position.

Engage third gear and fit the third/fourth selector with its sealing ring in its recess outside the box.

Partially engage first gear and locate the first/second selector.

Fully engage first gear and enter the reverse selector at right angles to the mainshaft, lower and turn until correctly positioned. Insert the interlocking plungers between the selectors, fit and secure the top cover; replace the seal retainers and reverse-light switch.

On 1954 models only, drop the selector balls and springs into their respective bores, screw in the plugs and then replace the blanking screw and washers in the interlocking-plunger hole and fit retaining plate.

Refit gear-change mechanism, not forgetting the insulating pad; the arrow should be pointing to rear and the word TOP uppermost.

Adjust the second-gear selector stop to allow 0·002 in. clearance when second gear is fully engaged.

Finally, insert the freewheel operating spring (where fitted) into the reverse shaft and refit freewheel assembly.

Checking Tolerances of Mainshaft Assemblies – Model 2000

Before reassembling the gear-trains on this model it is necessary to first make a number of dummy reassemblies in order to check tolerances as detailed below.

Second-speed Gear. – Assemble the second-speed gear (22), Fig. 53, to the slotted end of the flanged bush (23). Fit thrust washer (16) to mainshaft snug against the collar from front end. Thread the bush on to the mainshaft and hold snug against collar and check clearance, using a feeler gauge; this clearance should be 0·004–0·007 in.

Third-speed Gear. – Add the third-speed gear (24) to the above assembly followed by thrust washer (26). Hold parts in close contact and check clearance for third-speed gear; this again should be 0·004–0·007 in. If necessary, correct either of the above clearances by reducing the appropriate end of the bush using a face plate and emery cloth – or replace the bush.

Remove all parts and proceed to check the end-float of the bush (23), assembled this time without the gearwheels; proceed as follows. Assemble to the mainshaft the thrust washer (16) snug against the mainshaft shoulder, followed

by bush (23) – location slot first, then the second thrust washer (26), the synchro inner member (27), spacing washer (31) and spring ring (32). The bush end-float should be 0·000–0·002 in. Correct as necessary by selective assembly of spacer (31) available in four thicknesses: 0·095, 0·098, 0·101 and 0·104 in. When the correct bush end-float is obtained, remove parts from the mainshaft.

First-speed Gearwheel. – Assemble to rear end of mainshaft thrust washer (16), bush (17), gearwheel (19) and thrust washer (20). Hold the assembly snug against shoulder on mainshaft and check end-float of gear; this should be 0·002–0·007 in. Correct as necessary by reducing or replacing bush as indicated. Remove components.

Refitting Gearwheel Assemblies – Model 2000

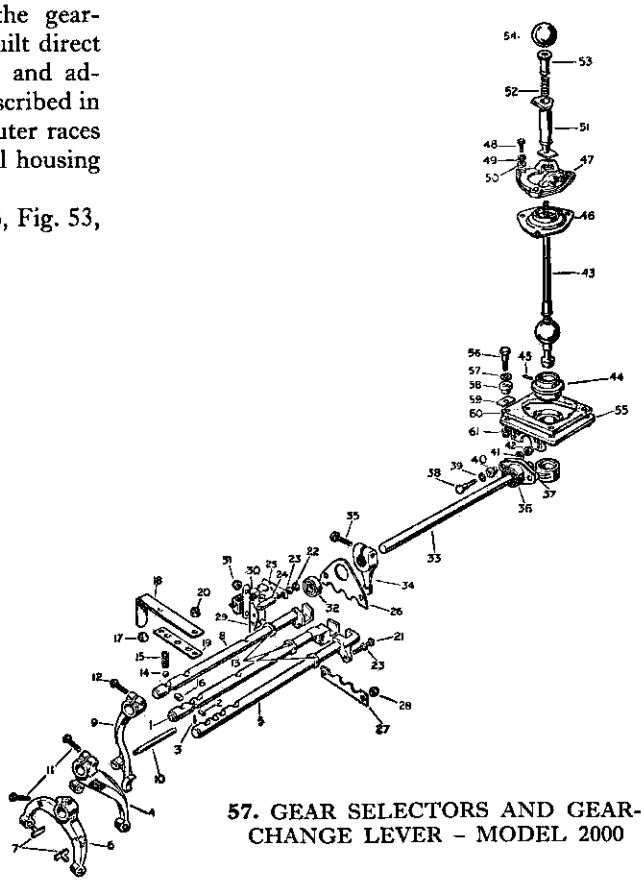
Unlike the previous gearboxes, the gearwheel assemblies on this model are built direct to the bell housing. Having checked and adusted as necessary all clearances as described in the previous section, and fitted the outer races of the appropriate bearings to the bell housing and gearcase, proceed as follows.

First assemble the primary shaft (1), Fig. 53, together with the oil baffle (3), the retaining plates and bolts (5) and (6) and the layshaft cluster (33), drawing in the primary-pinion bearing (2) with the aid of the retaining plates and bolts. Fit the layshaft nut and washer (36) and (37), but leave slack. Fit the roller bearing (7) to the primary pinion.

Refitting Gearcase to Bell Housing – Model 2000

Reassemble the mainshaft assemblies by reversing the stripping instructions and temporarily secure the gear assemblies with a hose clip. Take care to fit the thrust washers (16) and (26), Fig. 53, with the oil grooves towards the bush (23). With the bell-housing mouth downwards, and the layshaft and mainshaft vertical, remove the temporary retaining clip from the rear end of the mainshaft. Place the reverse idler (40) in position (lead on gear teeth to front) in

1, 4. 1st/2nd-speed selector shaft and fork
2. Interlock pin
3. Fixing peg
5, 6. 3rd/4th-speed selector shaft and fork
7. Pad
8–10. Reverse selector shaft, arm and guide spindle
11. Set-bolt (⅜ in. UNF × ⅞ in.)
12. Set-bolt (⅜ in. UNC × 1 in.)
13. O-ring, sealing shafts
14–16. Ball, spring and interlock plunger
17. Rubber plug for interlock hole
18–20. Retaining plate, joint and self-locking nut
21. Set-bolt
22–24. Reverse-stop adjustment bolt, locknut and distance piece
25. Reverse-light switch striker
26. Upper sealing plate
27. Lower sealing plate
28. Self-locking nut
29–31. Bracket, reverse-light switch and self-locking nut
32–35. Bush, gear-change shaft, selector lever and bolt
36. Retainer cap
37. Bush-retaining plate
38–42. Fixings for retainer cap
43. Gear lever
44. Spherical seat
45. Locating pin
46. Retaining cap
47. Cap, reverse stop and retaining finger
48–50. Fixings
51. Sleeve for reverse sleeve
52, 53. Spring and retaining sleeve
54. Knob
55. Support plate
56–61. Fixings



57. GEAR SELECTORS AND GEAR-CHANGE LEVER – MODEL 2000

the gearcase. Fit a new gasket to bell housing, treated with Hyloman SQ 32 M compound. The gearcase can now be lowered into position and the retaining bolts inserted. After tightening, check that there is perceptible end-float in layshaft, if not suspect bearing for incorrect fitting.

The layshaft retaining nut may now be tighened to torque of 50 lb-ft., temporarily engaging two gears, and then slacken off bell-housing retaining nuts until gearcase top has been fitted. Replace reverse-gear spindle (42) and secure with location plate (43) and nut (44).

Replacing Selector Shafts – Model 2000

Fit the forks to the shafts together with the sealing rings (13), Fig. 57, small diameter towards fork. Secure forks (pinch-bolt) in approximately correct position. Do not fully tighten pinch-bolt.

The instructions which follow are somewhat complicated and accuracy in following them is essential.

Insert the first/second-speed shaft (1) and adjust the fork (4) so that the outer member of the synchro unit is half-way between the cones on the gear and the jaw is upright. Check also that in this position detent ball (14) would locate in shaft. Maintain this position, tighten the pinch-bolt and withdraw the shaft.

Insert third/fourth-speed shaft (5) and engage third gear, check that the detent groove lines up and then check clearance between outer member of synchro unit and the third gear; this should be 0·005 in. Adjust fork to obtain conditions described, ensure that shaft jaw is upright and tighten pinch-bolt.

Now engage fourth gear and check that the undercut on the inner member of the synchro unit is just visible; if not, recheck original setting and adjust as necessary. When correct, withdraw the shaft.

Insert reverse shaft (8) assembly and insert guide rod (10) in fork (9). Set first/second outer member in neutral, engage reverse gear, adjust selector fork to ensure reverse is fully engaged, check that detent lines up and the jaw on shaft is upright and tighten fork pinch-bolt.

Set reverse shaft in neutral and engage first gear and check that reverse idler does not foul first/second synchro; if it does recheck original setting. When satisfactory remove reverse-shaft assembly.

Fit the pads (7) to the forward gear-selector forks and insert both shaft assemblies together, carefully locating oil seals (13) at rear of casing. Fit the reverse shaft and oil seal and insert guide rod (10). Fit the two interlock plungers (16) followed by gearcase cover and secure to 15 lb-ft. torque. The four bolts securing gearcase to bell housing may now be tightened to 50 lb-ft. torque.

Insert shaft-location balls and springs (14) and (15) and rubber plug (17), fit retaining plate (26) and finally reverse-light switch (30). Adjust the *selector stops* controlling *top* and *reverse* to allow 0·010-in. clearance with gear in question fully engaged by manipulating stop bolts (21) and (22).

Finally, refit the clutch-withdrawal mechanism by reversing the stripping operations and reassemble gearbox to engine.

OVERDRIVE UNIT

From the point of view of servicing, it can be assumed that the overdrive unit will require little attention beyond lubrication (see Chapter 1). However, should attention be required at any time, expert advice should be solicited through a Rover distributor.

Chapter 8

BRAKES

THERE have been a number of different types of Girling braking systems used on Rover cars and in the instructions which follow they are dealt with under their respective headings.

Bleeding the Brakes – All Models

If the level of the fluid in the supply tank is allowed to fall too low, or if any fluid connection has been broken for any reason, it becomes necessary to bleed the brakes.

This operation is too well known to need repetition here, but note the following points. Bleeding must be carried out at all four wheels commencing at the wheel farthest from the master cylinder. The engine must be 'dead' and where a servo reservoir is fitted (Models 90, 105 and early 3-litre), the plug must be removed.

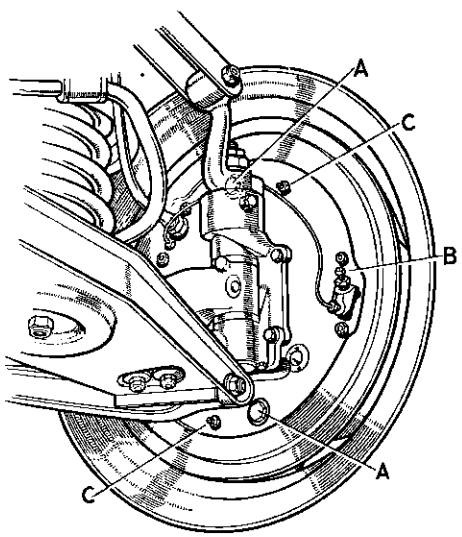
On Model 2000 which has disc brakes on all wheels, proceed as above but at two bleed points only; the rear left-hand caliper and front left-hand caliper.

GIRLING HYDRO-MECHANICAL BRAKES (1948–49 MODELS 60 AND 75)

The braking system fitted to 1948–49 Models 60 and 75 is of the Girling hydro-mechanical type, the front-wheel units being actuated hydraulically and the rear units mechanically. The handbrake is mechanical and to the rear wheels only.

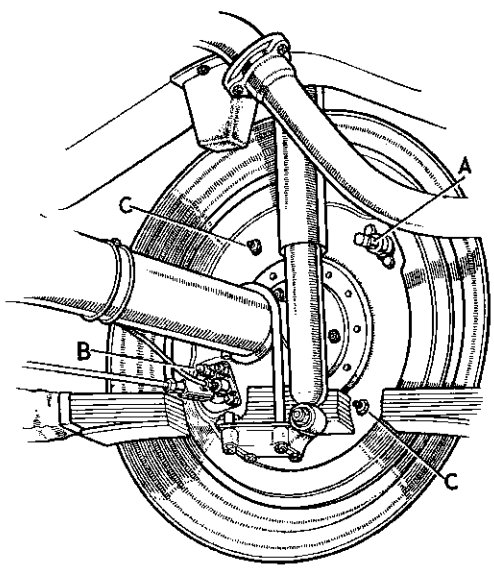
Routine Maintenance

The fluid reservoir is mounted on the scuttle, and it should be checked weekly for correct fluid level, which is three-quarters full.



58. FRONT-BRAKE ADJUSTMENT – 1953–59 MODEL 60, 1950–59 MODEL 75 AND 1954–55 MODEL 90

A. Adjuster
B. Bleed screw
C. Steady post



59. REAR-BRAKE ADJUSTMENT – DRUM-BRAKED MODELS 1950 ONWARDS

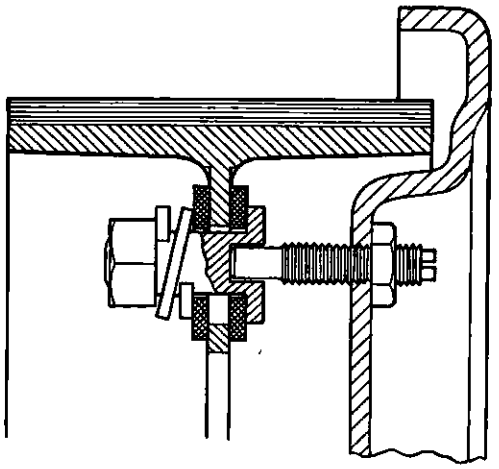
Adjustment

Front Wheels. – Adjustment is carried out at each front wheel separately. On the external face of the anchor plate will be found a hexagon adjustment bolt which operates a snail cam bearing on the leading shoe; there is no adjustment for the trailing shoe.

Having jacked up the wheels, spin each in turn and rotate the adjuster bolt away from the centre of the wheel until the shoe contacts the drum and then back off towards the centre of the wheel until the drum is free.

Rear Wheels. – Adjustment is effected by rotating the small set-screw (¼-in. Whitworth spanner or tommy bar where provided) in a clockwise direction as far as possible. Whilst doing this, a 'click' will be felt and heard at every quarter-revolution of the screw.

When the shoe contacts with the drum no further tightening is possible; when this point is reached turn the screw back one 'click'. In this position, the screw is automatically locked. If any slight binding is noticed after adjustment (tap the drum with a spanner, if no ring results the shoe is binding), a sharp application of the brake pedal will centralize the shoes in the drum and provide clearance.



60. STEADY-POST ADJUSTMENT – FRONT BRAKES OF MODELS 90 (1956 ONWARDS) AND 105

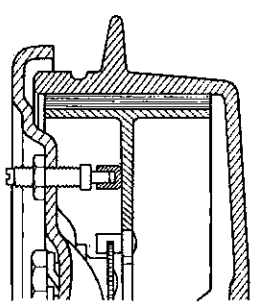
Adjustment

Separate adjustment is required for each front shoe, but only one adjustment for each pair of rear shoes. This is effected in a manner similar to that used on the earlier models by a serrated snail cam on each backplate (two on each front wheel and one on each rear). Back off two serrations and remember to apply the

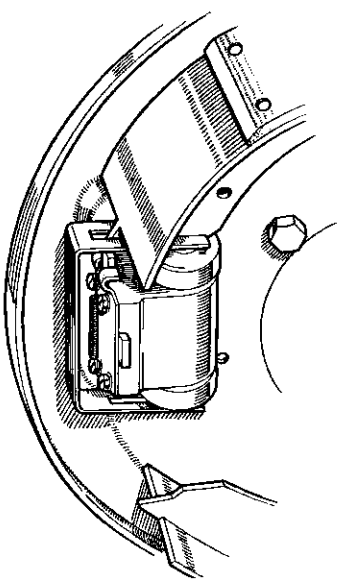
GIRLING HYDRAULIC BRAKES

Model 60	..	..	1953–59
Model 75	..	..	1950–59
Model 90	..	..	1954–55

The brakes fitted to the above models are hydraulic to all wheels – a two-leading shoe system is used on the front wheels, whilst the rear wheels carry one leading and one trailing shoe.



61 (*left*). STEADY-POST ADJUSTMENT – MODELS 60 AND 75 (1950 ONWARDS), 90 AND 105 (EXCEPT FRONT BRAKES FROM 1956), AND REAR BRAKES OF 80, 100 AND 3-LITRE



62 (*right*). RETAINING CLIP FOR WHEEL CYLINDERS

brakes hard in order to centralize the shoes before adjusting at the rear.

Steady Posts

If the shoes have been disturbed in any way, the steady posts, one to each shoe, will require readjusting.

To do this, slacken off each steady post until clear of the shoe. Adjust the shoes as previously described, and then, with the brakes fully applied, adjust each post until it just contacts the web of the shoe and then secure the locknuts.

Figs. 60 and 61 will make this clear.

Girling Hydraulic Brake Overhaul

Rear Unit. – To remove the rear units, first remove the wheels and then slacken off the shoe adjusters and disconnect the cross-rod from the backplate draw link. The drum can now be removed.

Remove the shoes and springs. If the wheel cylinders are not to be removed ensure that the pistons are retained in position, otherwise fluid may be lost and dirt enter; this is best effected by means of a clip, see Fig. 62.

After cleaning, lubricate the draw link, rollers, tappets and the adjuster plungers with graphite grease, paying particular attention to the threads in the adjuster housing.

When replacing the adjuster plungers, make sure they are correctly paired, this can be checked by placing them end to end and noting if the slots are parallel (Fig. 63).

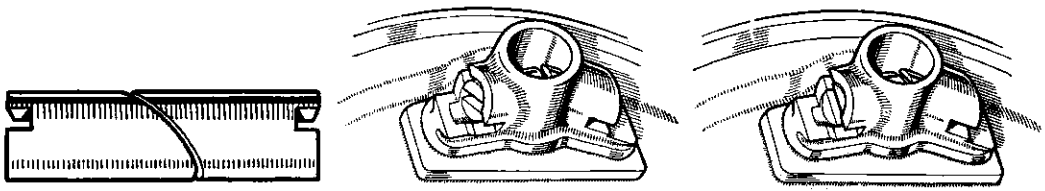
When replacing the wheel cylinder, leave the fixing nuts one turn slack to ensure that the assembly can float on the backplate.

If new linings have been fitted, back off at both ends and fit the trailing shoe (having the shorter lining), to the bottom.

Front Unit. – Deal with the front-brake units in the same manner as given for the rear units and when complete, bleed the brakes.

Master Cylinder. – This can be removed after draining the system by disconnecting one front flexible pipe and pumping the fluid, by means of the brake pedal, into a clean container.

Remove the two banjo bolts securing pipes to cylinder and detach the stop-lamp switch spring (or pressure switch on later models), the return spring and the master-cylinder rod from



63. REPLACING ADJUSTER PLUNGERS

(*a*) Correct pair of plungers (*b*) Plungers in incorrect bores (*c*) Plungers in correct bores

Depress the brake pedal and wedge or tie it in position and disconnect the fluid pipe at the wheel cylinder end. Unscrew the bleed nipple and remove the ball and cover. Remove the pistons, seals, air excluder and spring and detach the tappet-return spring.

Remove the adjuster housing, withdraw the two plungers and unscrew the adjuster cone.

Clean and examine all parts and renew as necessary, paying particular attention to all rubber items.

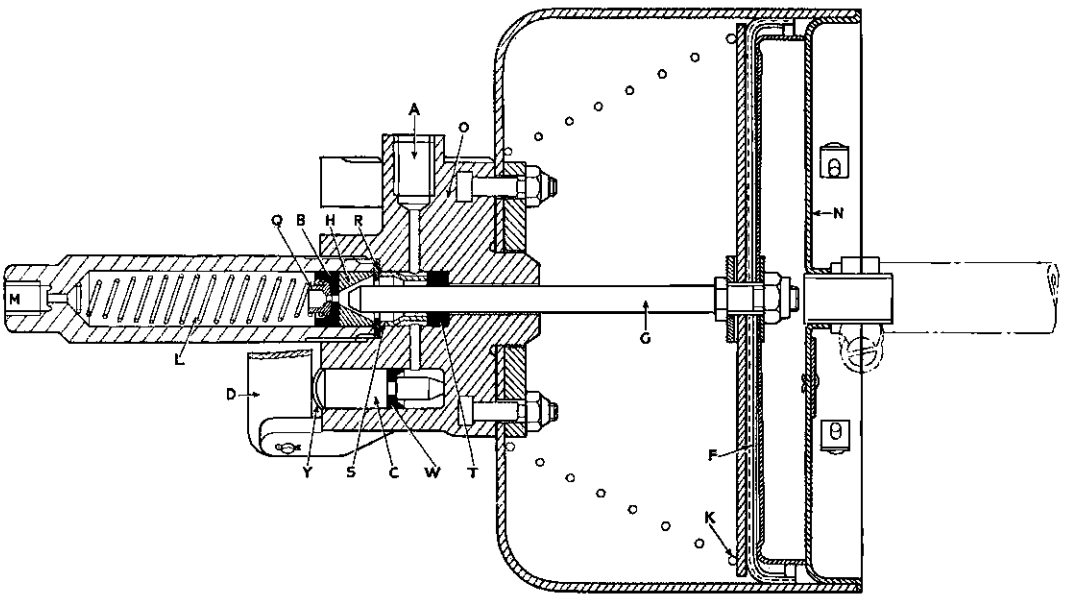
Wash the component parts of the wheel cylinder in brake fluid and take great care to avoid contact with oil or grease.

the brake pedal. Finally, withdraw the three set-bolts and remove the master cylinder from the chassis.

Carefully dismantle the master cylinder and inspect all parts; to strip, remove the end cap and gasket and then pull out the return spring and seal support.

Pull off the rubber boot, detach the internal circlip and lift out the push rod and retaining washer. Push out the piston and seal through the front (flanged) end and the recuperating seal and shim rearwards.

Clean all parts in brake fluid and reassemble in the reverse order as above. Refit to chassis



64. CLAYTON DEWANDRE SERVO UNIT FITTED TO 90 MODELS FROM 1956

A. Inlet post	D. Valve lever	G. Piston rod	K. Piston spring
B. Seal	E. Valve	H. Piston (secondary)	L. Piston (secondary) spring
C. Plunger	F. Piston (main)	J. Valve spring	M. Outlet

and, using new brake fluid, bleed the system after having checked that the master cylinder rod has $\frac{1}{16}$ in. end play. This latter point is most important, because if not correct complete return of the piston is prevented, and thus recuperation will not take place.

VACUUM-SERVO ASSISTED BRAKES

Vacuum-servo assistance was added to Models 90 from 1956 and all 80, 95, 100, 105, 110, 3-litre and 2000. Two main systems are used: the Clayton Dewandre confined to Model 90, and the Girling system used on all other cars.

When a servo system is fitted, the general layout is modified – although two wheel cylinders are fitted to each front wheel and one to each rear wheel as previous models, the front shoes are trailing and not leading.

Brake Adjustment – Models 90 (1956–59), 105 and early 3-litre

On these models no manual adjustment is provided for the front brakes as they are fitted with a stabilizing arrangement used in connection with the steady post and the shoes are automatically adjusted. Should dismantling have taken place it is essential that the steady posts are readjusted until they bear against the stabilizer bolt, the shoes being held in contact with the drum by pedal pressure during the operation.

All other adjustments are as detailed for earlier models.

CLAYTON DEWANDRE VACUUM SERVO – MODEL 90 (1956–59)

As this unit is confined to late 90 models and was not produced in any great quantity, it will not be described in detail. If Fig. 64 is studied, no great difficulty should arise when overhauling.

The Clayton Dewandre servo unit can be readily dismantled for overhaul. However, observe absolute cleanliness and plug each pipe disconnected to prevent loss of fluid or entry of foreign matter. Upon reassembly observe the three following points:

(1) *Lubrication.* – Ensure that the seals do

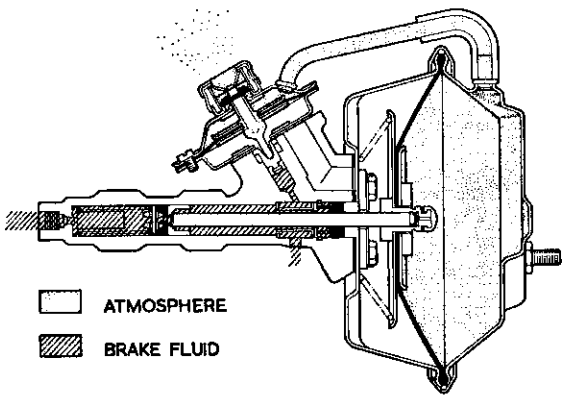
facing away from retaining screws (8). Finally, fit retaining plate (7) and secure with the two screws and copper washers.

Check the action of the valve gear by hand, noting that the valves must move freely and that in the static position the valve nearest to the body flange should be open and the other closed.

Fit a new seal (17) to the plug (16) and insert plug to a point that leaves $\frac{1}{16}$ in. projecting from body.

Refit the filter base (3), using a new joint washer (4) and secure by washers and set-screws (18). Insert a new filter element (2) and replace cover (1).

Replace the vacuum pipe (41), using a new joint (27) and secure to valve body (5), fitting the clamping plate (3) from the inside of the cylinder.



67. CROSS-SECTIONAL VIEW OF GIRLING SERVO UNIT TYPE LD (PRESSURE APPLIED) – MODEL 2000

Fit a new piston seal-packing ring (35) to the piston seal (36) and the nylon washer (42) to the piston rod and enter the piston to the cylinder, preceded by spring (37), with piston held firmly against spring pressure. Fit the end cover (33) using a new gasket (34) and secure.

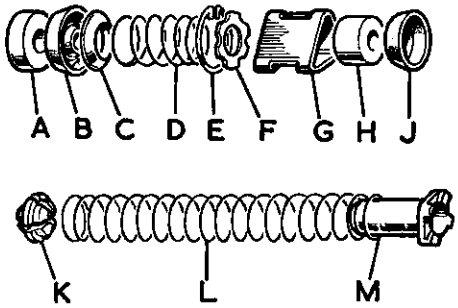
Servicing Girling Servo Unit Type LD – Model 2000

The type LD servo unit (Fig. 67) fitted to 2000 models can readily be removed for attention, observing the points previously described for Mk. I and II units.

Overhaul kits are available through Girling stockists to cover this unit and they are of two types: a major repair unit and a air-control valve unit. Much time will be saved if these are procured in advance.

To dismantle the type LD servo unit, first remove and discard the rubber elbow from the unit body, and the air-valve cover and diaphragm assembly.

Remove the valve housing, and, using *low* air pressure at the hydraulic inlet and with a thumb placed over the hydraulic outlet, blow out the valve piston (see Fig. 68). Remove seal from the piston and discard. Remove the return spring and then part the vacuum shell from the slave cylinder; held by four bolts, lock washers and



68. PISTON ASSEMBLY OF GIRLING SERVO UNIT TYPE LD – MODEL 2000

A. Guide piece
B. Secondary cup
C. Cup spreader
D. Spring
E. Circlip
F. Washer
G. Distance piece
H. Hydraulic piston
J. Main cup
K. Spring guide
L. Spring
M. Spring retainer

gasket. Remove all parts from the slave cylinder (items *A–M*, Fig. 68), by extracting items (*A*), (*B*), (*C*), (*D*) using a hooked wire and then depress item (*H*) with the aid of a brass push rod $\frac{5}{16}$ in. diameter and release the circlip (*E*); the remaining parts will now come away. Finally, remove the rod from the diaphragm.

Examine all metal parts for wear or damage and replace as necessary; in any case, replace all rubber parts. Any part to be re-used should be washed in methylated spirit. On assembly dip all rubber cups and seals in brake fluid.

Reassembling Girling Servo Unit Type LD – Model 2000

Start by reassembling the piston assembly and as an aid to this prepare a metal sleeve

1·75 in. long by 0·725 in. outside diameter with a bore of 0·625 in.

Proceed as follows (Fig. 68 refers). Assemble items (*K*), (*L*) and (*M*) in the order shown. Fit main cup (*J*) by passing it through the prepared sleeve. Insert the piston (*H*) into the bore, flat face leading and then hold the piston depressed, using a brass rod and fit items (*G*), (*F*) and (*E*) in that order. Insert items (*D*), (*C*) (dished side inward), (*B*) (hollow side inward and locating on (*C*)) and finally item (*A*) – smooth side inward.

Reassemble the vacuum shell to the slave cylinder and secure. Then assemble the large diaphragm backing plate to threaded end of push rod (lip downwards), followed by diaphragm (hollow face forward) and then small plate (lip upwards). Secure with nut and lock threads with centre punch; fit rubber buffer.

Fit return spring, small end under locking-plate tabs and large end to diaphragm assembly and enter push rod into slave cylinder bore by compressing the spring. Retain in this position and fit end cover, securing with clamping ring, leave securing nut hand-tight.

Fit the seal to the valve with lip facing away from piston and insert in slave bore. Refit valve housing and secure. Fit control-valve diaphragm to valve housing with narrow stem inserted into piston. Finally, fit a new air-valve cover assembly and rubber elbow, position end cover to align elbow and connecting pipe and tighten the clamping-ring nut.

Return the unit to the car and test in position.

GIRLING DISC BRAKES

Girling disc brakes are fitted to the front wheels only on Models 80, 95, 100, 110, 3-litre and to all wheels on Model 2000. On models other than 2000, conventional drum brakes are fitted to the rear wheels and these are basically as described in previous paragraphs of this chapter.

The disc brake consists of a steel disc and a hydraulically-operated caliper, the latter containing two pads each operated by a piston.

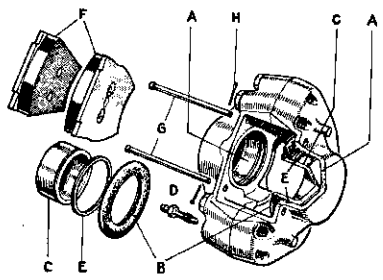
No adjustment is provided or required, and when relining becomes necessary new pads are fitted as described below.

Fitting New Pads

The pads are visible when in position, and relining becomes necessary when the thickness has been reduced by wear to $\frac{1}{8}$ in. ($\frac{1}{4}$ in. on 2000).

For models other than 2000, first remove split pin (*H*), Fig. 69, and withdraw the retaining pin (*G*). Withdraw pads using pliers. On late models anti-rattle springs are fitted which should be removed.

To fit new pads, first push in each piston to



69. EXPLODED VIEW OF BRAKE CALIPER (DISC BRAKE) – MODELS 80, 100 AND 3-LITRE

A. Piston housing
B. Rubber boot
D. Bleed nipple
E. Sealing ring
F. Pad
G. Securing pin
H. Special split pin

the bottom of their respective bore, using steady even pressure, and slip in the new pad.

Position the anti-rattle springs (when fitted) over the back-plate of the head with the tangs of the springs downward. Replace retaining pins using new split pins.

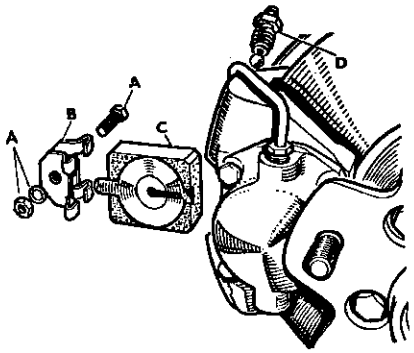
For Model 2000, both front and rear, remove brake-pad keep plate (*B*), Fig. 70, and withdraw pad (*C*) with the aid of a suitably hooked tool.

To fit new pads, a special tool Part No. 600464 will be required.

By inserting the forked end of this tool between the caliper bridge and astride the piston-backing plate, the pistons can be pressed back into their respective cylinders and the pads inserted. Ensure that the slot in the pad-locating plate engages with the spigot on the backing plate. Replace keep plate and secure.

Removing Brake Calipers

To remove the front calipers from models other than 2000 first slacken the bleed nipple,



70. RENEWING FRONT BRAKE PAD - MODEL 2000

A. Fixing bolt, nut and washer
B. Keep plate
C. Brake pad
D. Bleed nipple

slowly depress the brake pedal and then wedge in position.

Disconnect front fluid hose and caliper pipe. Remove the pads as previously described, and the caliper can be lifted out after releasing securing bolts.

On Model 2000 merely disconnect fluid pipe at swivel pillar, depress and wedge brake pedal and release caliper unit (two bolts, lock-plates and plain washers).

To remove rear calipers on Model 2000, it is first necessary to remove the differential drive shaft. To do this, first remove brake disc and then remove connecting pipe from caliper and plug to prevent leakage. Release clip on differential housing bolt (one nut) and, on right-hand side only, disconnect flexible brake hose. Separate handbrake adjuster unit from linkage (clevis pin) and separate bearing housing from pinion housing by undoing four bolts. The drive shaft can now be withdraw complete with caliper, taking care of spacer between bearing housing and pinion housing. The caliper can now be removed (note shims), after taking out two bolts and spring washers.

Refitting Brake Calipers

When refitting the calipers, use new lock-plates and tighten bolts to torque of 57–65 lb-ft. On rear calipers of Model 2000 remember to refit shims as found and then check the gap between each side of the disc and the caliper inner face. This must not vary by more than 0·010 in.; correct if necessary by shim manipulation.

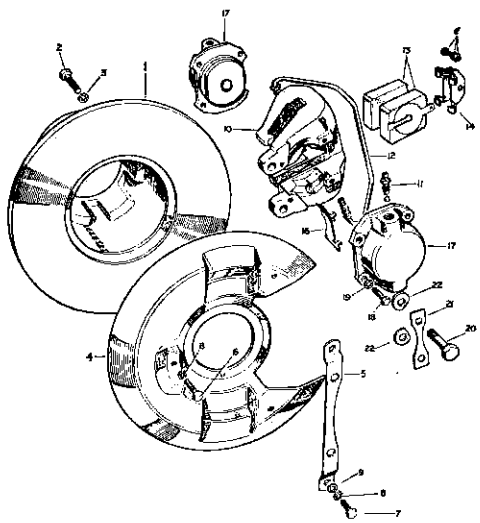
When refitting drive shaft on Model 2000 observe the following points. Offer up the drive-shaft assembly to pinion housing using original spacer, and check clearance between face of drive-shaft housing and pinion housing. This should be 0·003–0·005 in.; correct as required by selective assembly of spacer. Withdraw shaft, refit caliper and use Hylomar SQ 32 M compound on joint faces when replacing shaft.

Finally tighten shaft-securing bolts to torque of 60 lb-ft., replace discs and bleed brakes.

Piston Assemblies

If it is intended to overhaul piston assemblies, before commencing to dismantle clean off all external dirt, remembering that absolute cleanliness is essential.

For all models except 2000 remember that



71. FRONT DISC-BRAKE LAYOUT - MODEL 2000

1. Disc
2, 3. Fixing, disc to hub
4. Shield and dust cover
5–9. Fixing for shield
10. Caliper assembly
11. Bleed screw
12. Bridge pipe
13. Friction pads
14. Keep plate for pad
15. Fixing for keep plate
16. Pad-support plate
17. Piston and cylinder assembly
18, 19. Fixing for cylinder
20–22. Fixing for caliper

the caliper body (*A*), Fig. 69, is in two halves and under no circumstances must they be separated. The pistons (*C*) can be readily withdrawn from the body (*A*) and the sealing ring (*E*) can be prised out.

To reassemble, first wash all parts in brake fluid. Clean out the sealing-ring groove and fit a *new* ring.

Lubricate piston and bore with brake fluid. Fit the smaller diameter of boot (*B*) to the groove around the piston bore and then insert piston into bore using no force.

When fully home, lift the lip of the boot to the top of the piston, and insert into annular groove of piston.

Tighten bleed screws, refit assembly to disc and bleed brakes.

On Model 2000, the pistons are in two self-contained assemblies (17), Fig. 71, bolted to the caliper body (10) by four bolts (18); release these and the piston assemblies will come away. Remove dust boot as on previous models, extract piston with the aid of light pressure from an air line and extract dust seal and piston seal. Do not dismantle further.

To reassemble, proceed broadly as detailed for previous models, but when assembling the piston, locate it over the retractor pin and carefully apply an even pressure to the piston-backing plate.

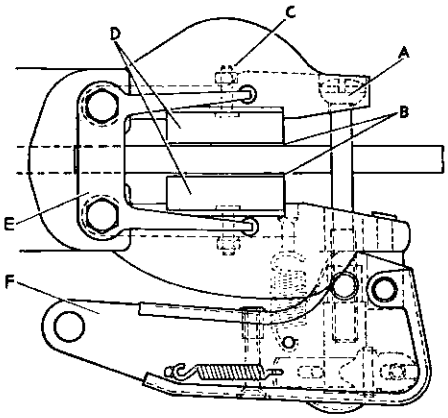
Note that on all models repair kits are available which contain replacement consumable parts. Also note that it is advisable to keep a tight check on the presence of piston corrosion; replace pistons if present.

Removing and Replacing Brake Discs

Front Wheels. – Discs are readily removed after removing the brake calipers and dismantling the front hub. On Model 2000 do not entirely remove the caliper, merely remove the two bolts retaining caliper to swivel pillar; this will leave the caliper dangling. To avoid damage, suspend the caliper with a piece of string or wire.

When refitting, observe the following points. Assemble and adjust the front-wheel bearing to leave no end-float, but still allow the disc to turn.

Tighten the disc securing bolts by diagonal selection. When finished, check radial run-out, using a dial gauge; run-out must not exceed 0·003 in.



72. HANDBRAKE LAYOUT – MODEL 2000

A. Adjuster bolt
B. 0·010-in. clearance at these points
C. Pad-locating bolt
D. Handbrake pads
E. Retractor plate
F. Auto-adjuster unit

Run-out can be due to one of several faults such as wear in hub bearings or a bad-mating surface between disc and hub. The latter may be due to damage, trapped foreign matter or distortion. Worn hub bearings must be replaced. Often correction can be obtained by repositioning disc. When run-out is satisfactory re-adjust bearings to correct end-float.

Rear Wheels (*Model 2000*). – To remove the rear discs it is first necessary to withdraw drive shafts retained by four bolts, release these, expand de Dion tube and withdraw shaft. Also remove the outer-disc pad from both rear handbrake and footbrake calipers.

Refit as described for front discs and check clearances as described under Refitting Brake calipers.

Handbrake (*Model 2000*). – This model is fitted with disc handbrake operation. In order to remove and replace brake pads it is first necessary to disconnect and lower the final drive. It should also be noted that when new discs are fitted, a clearance of 0·010 in. should be allowed between disc and pad by the manipulation of adjuster bolt (*A*), Fig. 72. Subsequent adjustment is taken care of by the auto-adjuster (*F*).

Chapter 9

STEERING GEAR

WITH one exception, every model under review is fitted with a recirculating ball-type steering unit. Model 2000 uses an hour-glass worm and roller type. Overhaul of either unit is quite straightforward and can be carried out without the aid of special equipment.

Power steering is fitted to 3-litre models, either as an optional extra or as standard equipment from 1966 onwards; this is dealt with on page 70.

Lubrication attention to the steering box is given on page 12.

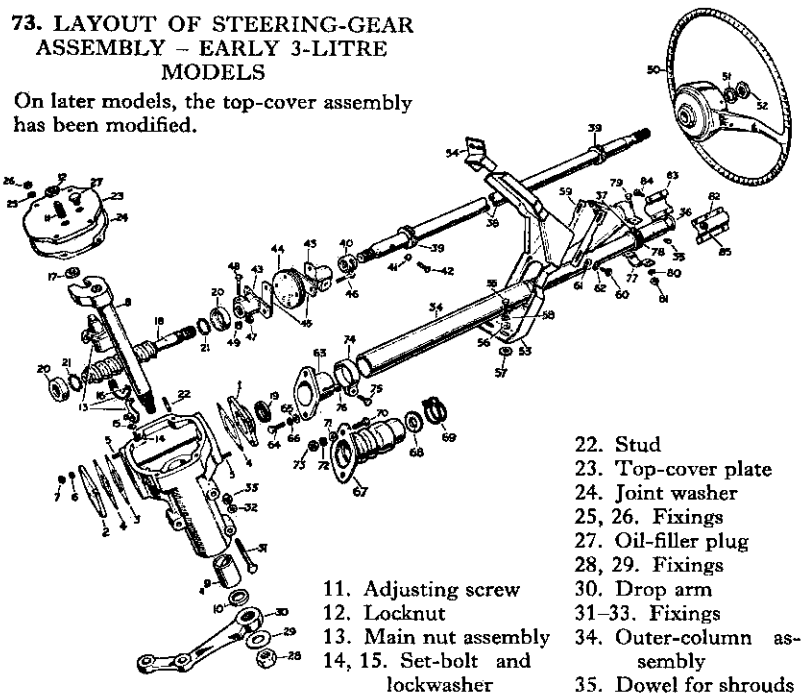
Removing Steering Unit

The removal of the unit from the chassis is fairly simple and obvious on examination.

3-litre Models. – Disconnect the choke cable and remove the carburetter air-intake elbow. Remove the ball joints from the steering-box drop arm. Mark the steering-shaft flange (43), Fig. 73, and the flexible coupling (44) to facilitate reassembly. Part the coupling from the flange (two bolts 46, 47) ensuring that shaft (38) does not move upward; to avoid this happening,

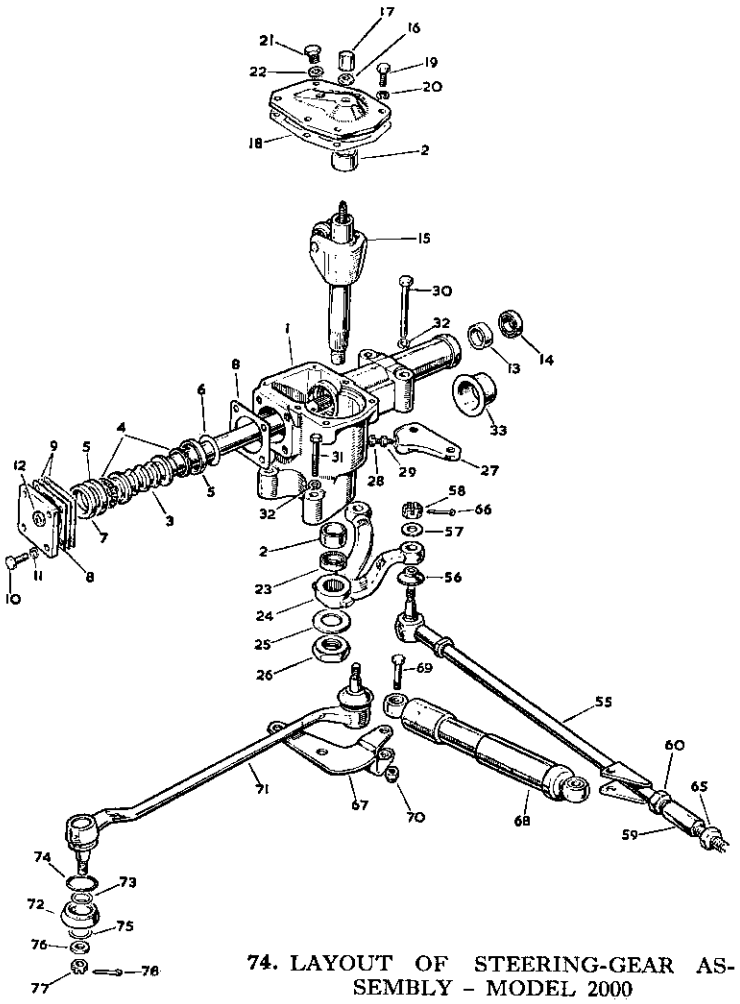
73. LAYOUT OF STEERING-GEAR ASSEMBLY – EARLY 3-LITRE MODELS

On later models, the top-cover assembly has been modified.



1. End-cover plate, upper
2. End-cover plate, lower
3. Joint washers, steel
4. Joint washers, paper
5–7. Fixings
8–10. Rocker shaft, bush and oil-seal
11. Adjusting screw
12. Locknut
13. Main nut assembly
14, 15. Set-bolt and lockwasher
16. Steel balls (⅜ in.)
17. Roller for main nut
18. Inner column
19. Oil seal
20. Adjustable ball-race
21. Steel balls
22. Stud
23. Top-cover plate
24. Joint washer
25, 26. Fixings
27. Oil-filler plug
28, 29. Fixings
30. Drop arm
31–33. Fixings
34. Outer-column assembly
35. Dowel for shrouds
36. Bearing for outer column
37. Dowel for steering-column support bracket
38. Steering-column shaft
39. Spring washer
40–42. Clamping ring for shaft and fixings
43. Coupling flange
44. Flexible coupling disc
45. Locating plate
46, 47. Fixings, flanges, disc and locating plates
48, 49. Fixings
50–52. Steering wheel and fixings
53. Mounting bracket
54. Steering-column tie bracket
55–58. Bracket fixings
59–62. Support bracket and fixings
63–66. Anchor bracket and fixings
67–73. Grommet for steering column, felt washer, hose clip and fixings for grommet
74–76. Clamp and fixings
77–81. Clip, tape and clip fixings
82. Clamp plate
83. Strengthening plate
84, 85. Fixings

1. Steering box
2. Bush for rocker shaft
3. Inner column and cam
4. Cage and balls for cam
5. Cup for cage and balls
6. Shim for bearing
7. Spacer washer for cam
8. Joint washer for front-cover plate
9. Nylon shim, front-cover plate
10. Set-bolt ($\frac{5}{16}$ in. UNC × $\frac{3}{4}$ in. long
11. Spring washer
12. Special rubberized washer
13. Top bush for inner column
14. Oil seal for inner column
15. Rocker shaft
16. Locknut for adjusting screw
17. Domed nut for adjusting screw
18. Joint washer
19. Set-bolt ($\frac{5}{16}$ in. UNC × $\frac{3}{4}$ in. long)
20. Spring washer
21, 22. Oil-filler plug and washer
23. Oil seal for rocker shaft
24. Drop arm
25. Tab washer
26. Special nut
27. Lock-stop bracket, driver's side
28. Special bolt
29. Locknut ($\frac{5}{16}$ in. UNF)
30. Set-bolt ($\frac{3}{8}$ in. UNF × 3 in. long)
31. Set-bolt ($\frac{3}{8}$ in. UNF × 2 in. long)
32. Spring washer
33. Grommet
55. Steering track-rod assembly
56. Rubber boot for ball joint
57. Plain washer
58. Special slotted nut
59. Adjuster for track rod
60. Locknut ($\frac{9}{16}$ in. UNF) for adjuster, R.H. thread



74. LAYOUT OF STEERING-GEAR ASSEMBLY – MODEL 2000

65. Locknut ($\frac{9}{16}$ in. UNF) for ball joint, L.H. thread
66. Split pin
67. Damper mounting bracket
68. Steering damper
69. Bolt ($\frac{3}{8}$ in. UNF × $1\frac{7}{8}$ in. long)
70. Self-locking nut ($\frac{3}{8}$ in. UNF)
71. Steering side-rod assembly
72–78. Rubber boot, boot ring, garter spring, boot retainer, plain washer, slotted nut and split pin

a suitable clip can be secured to the shaft adjacent to the bulkhead. Remove the three bolts securing steering box to sub-frame and lift clear.

Model 2000. – Remove the screen-washer bottle and disconnect and leave suspended the brake-reservoir unit. With wheels on full lock, free ball joints on track-rod (55), Fig. 74, and side-rod (71) with extractor.

Slacken bolt securing the steering-column universal joint, remove four bolts (30) securing box and withdraw box complete with lock-stop (27).

All Models except 3-litre and 2000. – Removal

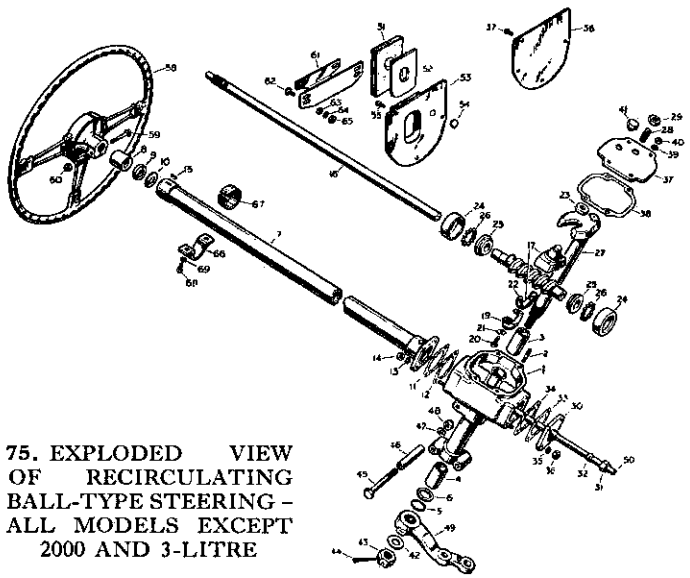
procedure is rather more complicated as it will be found necessary to disconnect all electrical connections from column or wheel and in some cases, the petrol and vacuum pipes, carburetter linkage and carburetter and accelerator cross-shaft.

Where fitted, remove screen-washer pump from toe-board and finally drop arm. Remove bolts securing steering box to chassis, slide the unit forward and lift out over the front wing.

Dismantling Steering Assembly – Model 2000

Mount the assembly in a vice and remove drop arm (24), Fig. 74, secured by nut and washer (25 and 26). Remove cap nut (17) and locknut (16) from rocker-shaft adjuster. Remove bolts (19) securing top cover and then screw in the rocker-shaft adjuster to withdraw the top cover and lift off; note paper gasket (18). The rocker-shaft assembly (15) can now be lifted out. Remove end cover held by four bolts, spring washers and a special rubber washer (12) – note paper joint (8) and nylon shims (9).

Extract the distance piece (7), outer-bearing cap (5) and caged balls (4) from the forward end and withdraw camshaft complete with inner cap and ball race (4 and 5) and finally shims (6), if fitted; retain these for reassembly. If the rear



75. EXPLODED VIEW OF RECIRCULATING BALL-TYPE STEERING – ALL MODELS EXCEPT 2000 AND 3-LITRE

1. Steering box
2. Stud for covers
3, 4. Rocker-shaft bushes
5. Oil seal for rocker shaft
6. Washer for seal
7. Outer column
8. Fibre bush
9. Oil seal
10. Plain washer
11. Joint washer
12. Shim
13, 14. Fixing outer column to box
15. Key for outer column
16. Inner column
17. Main nut
19. Retainer for transfer tube
20, 21. Fixing retainer to nut
22. Ball for nut
23. Roller for nut
24–26. Inner-column bearings
27. Rocker shaft
28, 29. Adjuster for shaft
30. End cover
31, 32. Fixing tube to cover
33. Joint washer
34. Shim
35, 36. Fixing end cover to box
37. Top cover
38. Joint washer for cover
39, 40. Fixings for cover
41. Oil-filler plug
42–44. Fixing drop arm to shaft
45–48. Fixing steering-box to chassis
49. Drop arm
50. Control tube for column
51–53. Sealing column at scuttle
54. Redundant hole plug
55 & 57. Drive screws
56. Cover for redundant aperture
58. Steering wheel
59, 60. Fixings for steering wheel
61. Support for column
62–65. Fixing bracket to dash
66–69. Fixing column to support

cup is to be removed, warming the box will facilitate this.

Reassembling Steering Assembly – Model 2000

Commence reassembly by fitting shims (6) to a nominal value of 0·015 in. followed by bearing cup (5); replace the remaining parts in order shown in Fig. 74 taking great care that the outer race does not tilt and lock; distance collar (7) can be used as a guide to obviate this. Fit a sufficient number of shims (9) at this stage to allow definite end-float when the end-plate together with paper washers (8) have been replaced and the mounting bolts (10) returned to the front outer holes.

Using a dial gauge measure the camshaft end-float, note the figure and then remove shims to the value of the measured end-float plus 0·005 in.; this will achieve a bearing pre-load of 0·005 in.

Refit rocker shaft (15) into steering box, locate top cover over shaft adjuster and wind into position by turning adjuster anti-clockwise. Fit the adjuster locknut (16), but do not tighten. Fit the drop arm with the steering in the straight-ahead position, that is with the track-rod arm in line with the camshaft and pointing to the rear.

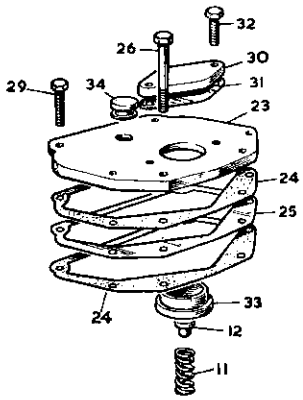
Backlash Adjustment – Model 2000

This is effected by manipulating the adjusting screw (15), Fig. 74, until no backlash is apparent at the drop arm – do not overtighten or stiff steering will result. Progressively turn the steering anti-clockwise and note, in terms of degrees using a protractor, at what point backlash becomes apparent. Return to centre and repeat the operation clockwise. If the number of degrees movement is equal on either side of centre to within 10°, the position is satisfactory and the adjuster locknut may be tightened. If the difference between left and right exceeds 10°, correction can be obtained by adding or removing shims (6) in increments of 0·005 in. and at the same time adding or removing shims (9) to maintain the original 0·005 in. preload. When the adjustment has been made, tighten drop arm using a new lockwasher.

Dismantling Steering Assembly – All Models except 2000 and 3-litre

Consult Fig. 75 and proceed by withdrawing horn wire from column, remove top cover (37) and drain oil. Lift out the roller (23) and rocker shaft (27). Detach the union nut (31) and withdraw the control tube (50) downwards through end cover (30).

Mount the outer column in a vice and remove bottom cover (30), taking care of shims (34) and

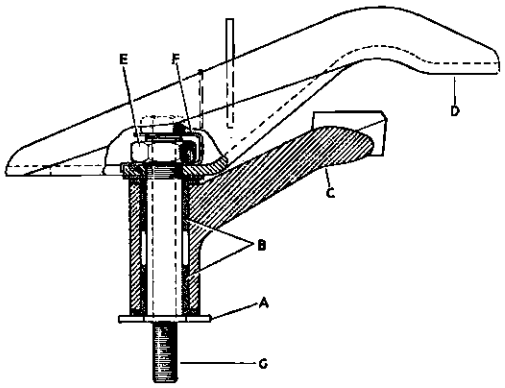


76. STEERING-BOX TOP COVER DETAILS – LATER 3-LITRE

11. Spring for rocker shaft
12. Button for rocker shaft
23. Cover plate
24. Paper washers (0·005 in.)
25. Steel washer (0·002 in.)
26. Dowel for cover
29. Cover bolt
30. Plate for spring
31. Washer
33. Button holder
34. Oil-filler plug

washer (33). The outer column is fixed to the box by nuts and spring washers (13 and 14), remove these and tap away the box from the column. Note that, when this is done, the balls (26) will fall into the box; these can be retrieved later. Rotate the inner column and tilt the box until the main nut (17) and balls can be removed from the end of the shaft through the top aperture. The inner column can now be drawn away, the bearing members (24 and 25) removed.

If a complete overhaul is contemplated press out the two bushes (3 and 4) and the oil seal (5) and knock out the fibre bush (8) and oil seal (9) from the top of the outer column.



77. CROSS-SECTION OF STEERING RELAY – EARLY 2000

A. Flanged tube
B. Bushes
C. Relay body
D. Mounting plate
E. Locknut
F. Lockplate
G. Mounting bolt

Reassembling Steering Assembly – All Models except 2000 and 3-litre

To reassemble, proceed in the reverse order by first replacing the rocker-shaft bushes and the oil seal in the steering box and the washer, oil seal and fibre bush into the top of column.

Pass the inner column through the steering box and slide on the upper ball-race members followed by a joint washer, shim and then a second joint washer. Retain the twelve balls in the main nut with grease and then screw the nut on to the inner column, rotating the column until the nut enters the box with the taper uppermost.

Secure the outer column in a vice and enter the inner column and bolt up the box to the column.

With the inner column as far forward as possible, stick the nine top ball bearings to the inner column with grease, and then move the column back until the balls are in the race member.

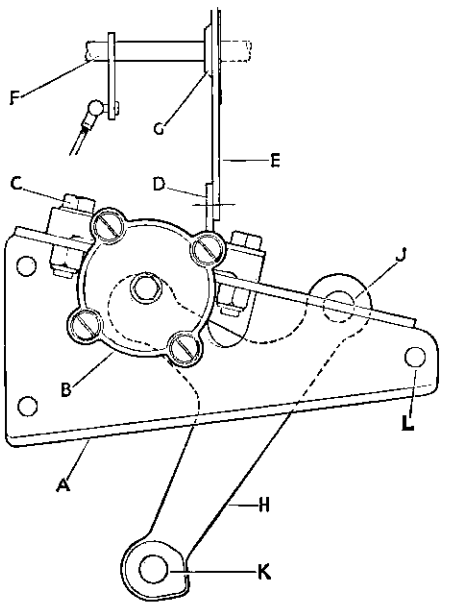
Assemble the lower ballrace in a similar manner and secure with the bottom cover. At this point it should be possible to turn the inner column by hand, but there must be *no end-float*. If necessary, add alternative shims and joint washers under the bottom cover to achieve this condition.

Finally, replace the rocker shaft, roller, joint and cover, locating the roller in the cover slot. No end-float is permitted on the rocker shaft, but it is *most important* that the adjustment for this is made with the main nut in the centre of its movement. Having determined this point, bearing in mind that a complete lock-to-lock movement of the inner column involves $3\frac{1}{4}$ turns, screw the rocker-shaft adjuster (28), Fig. 75, in by hand until it contracts the shaft and then tighten a further tenth of a turn and apply locknut (29).

The unit may now be replaced in the vehicle, but delay replenishing with oil until it has been installed.

Steering Box Assembly – 3-litre Models

The steering assembly used on all 3-litre models (not power steering) follows closely the



78. COMBINED STEERING RELAY AND DAMPER – LATER 2000

A. Steering-idler mounting bracket
B. Steering idler
C. Bolt fixings (steering idler)
D. Mounting angle bracket
E. Accelerator coupling shaft bracket
F. Coupling shaft
G. Nylon bearing
H. Idler relay
J. Track-rod connection
K. Steering-link connection
L. Fixing holes

arrangement described previously. One point of difference is that on the 3-litre, the steering-box unit and steering-column unit are separate assemblies – a flexible rubber coupling connects the two units together.

A second important difference covers the question of rocker-shaft end-float adjustment. This is carried out on all early 3-litre cars as described in the previous section, and such boxes may be recognized by the adjuster mounted on the top-cover plate (see items 11 and 12, Fig. 73).

On later models, however, no adjustment is provided for rocker-shaft end-float, but the assembly is spring-loaded above the rocker shaft. On these boxes add or remove shims to obtain minimum end-float – no pre-load – and when satisfactory replace items (11), (12) and (33), Fig. 76, and bolt down top-cover plate (23).

Steering Relay

The steering-relay unit takes several forms. Removal presents little difficulty and will be obvious upon examination.

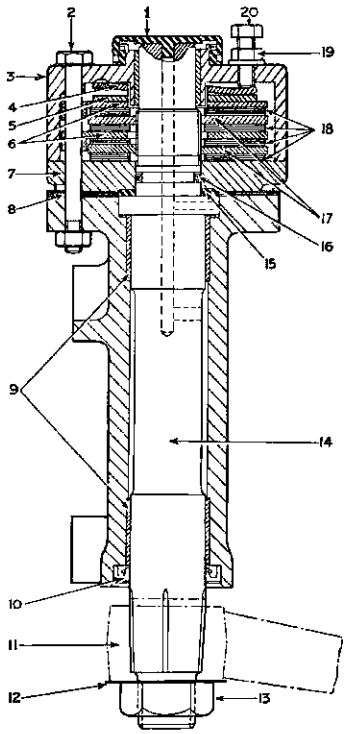
Early 2000 Models. – A mechanical unit is used and overhaul consists of replacing the two bushes (*B*), Fig. 77. When reassembling tighten the locknut (*E*) to torque of 60 lb-ft. Ensure that there is no end-float by the manipulation of the flanged tube (*A*).

Later Model 2000. – An hydraulic damper is used (Fig. 78) and this unit cannot be overhauled. Should a fault develop (an oil leak), replace the unit. Do not attempt to remove the relay lever; this has been selectively assembled to the shaft and correct positioning in relation to the internal vanes is critical.

3-litre Models (Not Power Steering). – A mechanical relay is used (Fig. 79). This incorporates friction loading by means of wooden discs on early models and Ferodo discs on models Suffix 'B' onwards. At overhaul, the oil seals (10) and bushes (9) may need renewal.

Upon reassembly, fit shaft (14) to the housing with thrust washers (15) in position. Fit the mounting plate (7) *without* shims and, holding the plate firmly in position, measure the gap between flange and plate. Prepare shims (8) to this dimension plus a minimum of 0·001 in. to a maximum of 0·006 in. Temporarily remove plate (7) and fit oil-seal (10) and then replace plate plus prepared shims. Replace the friction discs (18) and steel plates (4, 5 and 6) in the order shown in Fig. 79 noting that plate (4) is aligned to the cover by dowels, and that plate (5) has two 'dents' on its upper surface.

When assembly is complete recheck shaft end-float (0·001–0·006 in.) and correct by shim manipulation as necessary. Refit steering arm (11) to original position of splines.



79. CROSS-SECTION OF STEERING RELAY – 3-LITRE MARKS I, IA AND II WITH SUFFIX LETTER A

1. Rubber cover
2. Fixing bolt
3. Damper housing
4. Adjuster plate
5. Pressure plate
6. Fixed plate
7. Mounting plate
8. Shims
9. Bushes
10. Oil seal
11. Drop arm
12. Lockwasher
13. Fixing nut
14. Relay shaft
15. Thrust washer
16. Rubber sealing ring
17. Splined-steel rotor plates
18. Wooden friction discs
19. Locknut
20. Adjusting bolt

It is now necessary to adjust the frictional loading of the discs by means of screw (20). To do this, mount the unit in a vice and, using a suitable spring balance hooked to the outer eye of the drop arm, measure the loading; this should be 24–26 lb. Correct as necessary by adjusting screw (20).

On 3-litre models Suffix 'B' onwards, a similar relay unit is used, but no friction discs are incorporated. Overhaul requires replacement of bushes and oil seal (open end inward), and adjustment of end-float to 0·001–0·006 in. (shims). This model relay is used in conjunction with an hydraulic steering damper; this cannot be overhauled, only replaced.

All Models except 3-litre and 2000. – The steering relay is a simplified version of Fig. 79 and contains no means of adjusting shaft end-float. On many models, however, a modification to incorporate means of adjustment has been fitted.

The oil-filter plug has been drilled and tapped ¼-in. B.S.F. and a special bolt fitted to the plug, head downward. A slot has been cut in the face of the head to allow oil to pass into the relay shaft, and a second slot cut into the opposite end of the bolt to permit adjustment by screwdriver. To adjust, tighten the bolt until the end-float just disappears and tighten the locknut.

POWER STEERING

Power steering has been fitted as an extra to a large number of early 3-litre models and is standard on all 3-litre cars from 1966 onwards. Outwardly, there is little difference between a power-steering unit and a conventional unit. Internally, however, it is comparatively complicated; because of this it is not normally expected that overhaul would be undertaken other than by the manufacturers. A factory-exchange system is available if the unit fails.

The unit is self-contained, and a reservoir supplies fluid to a belt-driven pump, which in turn supplies fluid under pressure to the steering box. A filter is incorporated in the reservoir.

Removing the Unit

This follows normal procedure but, in addition, it will be necessary to first drain the oil. to do this, remove the filler cap and disconnect the return pipe from the steering box. *Do not* re-use the oil drained off. Disconnect the flexible hoses from the box and seal all open ports and hose unions against entry of dirt. If metallic sediment is noticed in the drained oil, the system must be carefully checked, the cause located and rectified, and the system cleaned.

Do not start the engine at any time unless the reservoir is full and coupled to the unit, or severe pump damage may result.

Rocker-shaft End-float

This is critical on power-steering units and should be measured with the aid of a dial gauge applied to the extreme tip of the drop arm to read 0·002–0·004 in. Adjust as may be required at the adjusting screw provided.

Refilling and Bleeding

Fill the reservoir with automatic transmission fluid. Then start the engine and run at a fast idle for one minute, having previously fitted a rubber tube to the bleed screw located on the steering-box top cover, inserting the open end of the tube into a container of not less than four pints capacity.

With the engine still running, open the bleed screw and turn the steering from lock to lock until a steady stream of oil free from bubbles results; adding more oil as may be necessary.

When satisfactory, tighten the bleed screw, remove the tube and replenish the reservoir to the 'full' mark on the dipstick. Replace the dust cover over the bleed screw and check all hose joints, pump and steering box for leaks, by holding the steering on full lock in both directions – this allows full pressure to develop. *Do not* maintain full pressure for more than 30 seconds in any one minute. Keep the engine running until the operation is complete.

Chapter 10

FRONT SUSPENSION

FRONT-SUSPENSION layouts fall into three groups – (1) 3-litre, (2) 2000 and (3) all other models. Fig. 81 illustrates the torsion-bar suspension used on 3-litre and Fig. 83 shows the 2000 suspension. Fig. 84 illustrates the last group and for all practical purposes covers every model in that group from 1948.

Wheel Alignment

Before checking wheel alignment it is essential to ensure that: tyre pressures are correct on all wheels; the front tyres are evenly worn; the wheels are 'true' and the car is on level ground. When these points are satisfactory, with the car unladen and the wheels set straight-ahead, push the car forward a short distance; rock the front end up and down a few times to establish a static position and then measure the toe-in (check with data table on page 76). Correct as necessary by manipulating the track-rod length and then recheck.

Push the car forward a distance equal to one half revolution of the road wheels and recheck. A mean of the two readings if within the prescribed limits can be accepted.

Checking Steering Angles

Unless these angles (castor, camber and swivel-pin inclination) are correct a number of undesirable steering defects can result. They are built into the car in the first instance, and can only alter as a result of damage or, to a lesser extent, wear. The Fault-location Chart at the end of this chapter indicates most of the known troubles under this heading and should be consulted as necessary.

To check castor or camber angles, proceed as follows. Check and correct if necessary the toe-in. Now set the car in the datum position. This is an artificial position obtained by loading or jacking the chassis as shown in Fig. 80 for all models using a chassis frame.

On the 3-litre, check and adjust as may be required, the torsion-bar height. On Model 2000, the datum position is assumed to be with the car unladen, on level ground and with five gallons of petrol in the tank.

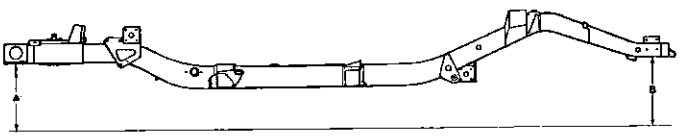
The steering angles can now be checked using normal garage equipment but, as no adjustment is provided, variations from normal will indicate damage to component parts or settled front springs. All these points may be checked visually in the first instance and in detail if found necessary.

Finally, if any correction has to be made to either castor or camber, recheck toe-in, as the dimensions are all co-related.

Torsion-Bar Suspension – 3-litre Models

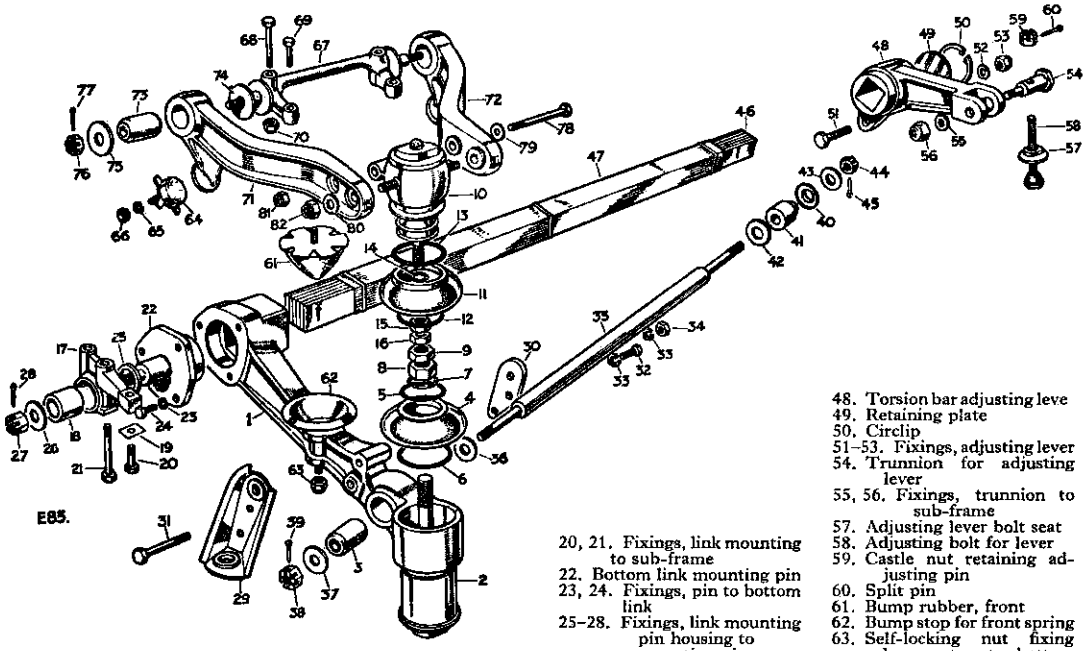
Laminated torsion-bar suspension is used on all 3-litre models. Little attention is required so far as the torsion bar is concerned, but it becomes necessary to adjust for height should any dismantling have taken place. Proceed as follows.

With car on level ground, tyre pressures normal and tyres evenly matched for wear, depress and release the front of the vehicle a few times to



80. CHASSIS IN DATUM POSITIONS (NOT 3-LITRE OR 2000)

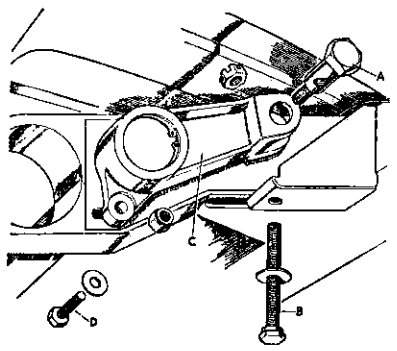
Dimension A = 15¼ in. Dimension B = 15½ in.



81. LAYOUT OF 3-LITRE FRONT SUSPENSION

1. Bottom link
2. Bottom ball swivel
3. Flexible bush for radius arm
4. Rubber boot for ball swivel
5. Retaining spring (small)
6. Retaining spring (large)
7. Joint washer
8. Securing nut
9. Special self-locking nut
10. Top ball swivel
11. Rubber boot
12. Retaining spring (small)
13. Retaining spring (large)
14. Joint washer
15. Nut
16. Self-locking nut
17. Link mounting-pin housing
18. Flexible bush
19. Tab washer
20, 21. Fixings, link mounting to sub-frame
22. Bottom link mounting pin
23, 24. Fixings, pin to bottom link
25–28. Fixings, link mounting pin housing to mounting pin
29. Shock absorber and anti-roll bar bracket
30. Shock absorber mounting plate
31–34. Fixings, bracket to bottom link
35. Radius rod
36–39. Fixings, radius rod to bottom link
40–45. Fixings, radius rod to sub-frame
46. Torsion bar assembly
47. Grease sleeve for torsion bar
48. Torsion bar adjusting leve
49. Retaining plate
50. Circlip
51–53. Fixings, adjusting lever
54. Trunnion for adjusting lever
55, 56. Fixings, trunnion to sub-frame
57. Adjusting lever bolt seat
58. Adjusting bolt for lever
59. Castle nut retaining adjusting pin
60. Split pin
61. Bump rubber, front
62. Bump stop for front spring
63. Self-locking nut fixing bump stop to bottom link
64. Rebound stop rubber
65, 66. Fixings, rubber to sub-frame
67. Top link mounting arm
68–70. Fixings, mounting arm to sub-frame
71. Top link complete, front
72. Top link complete, rear
73. Bush for top link
74–77. Fixings, top link to mounting arm
78–82. Fixings, top link to swivel housing

allow it to take up a static position. Now measure the distance between the underside of the front-jacking tubes and the ground; this should be 9 in. $\pm \frac{1}{4}$ in. If the measurement is outside the limit, slacken the lever-trunnion locking nut (*A*), Fig. 82, slacken the clamping bolt (*D*), and by movement of the bolt (*B*) the torsion-bar height can be corrected. Retighten (*A*) and (*D*).



82. ARRANGEMENT OF TORSION-BAR ADJUSTING LEVER - 3-LITRE MODELS

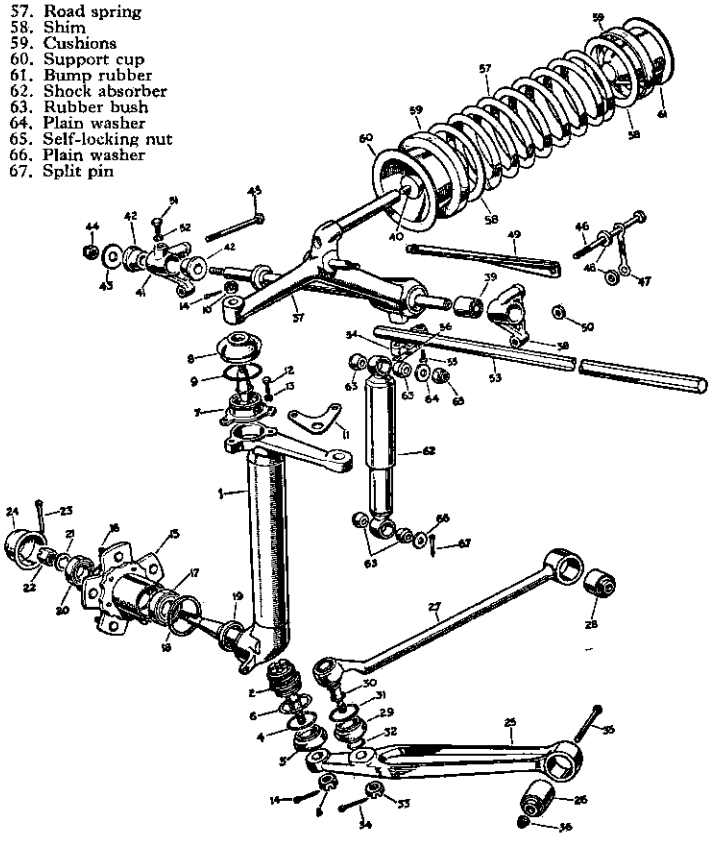
A. Trunnion for adjusting lever
B. Adjusting bolt
C. Adjusting lever
D. Clamping bolt for adjusting bolt

Removing a Torsion Bar – 3-litre Models

This must be done with extreme care, or injury to the operator may result.

Jack up the front of the car in the normal way and support on a suitable stand. Remove road wheels, disconnect steering arms, brake hose, brake drums (or calipers) and torsion rod. Remove shock absorbers at lower mounting and radius rod from bottom link. Now relieve the

1. Swivel pillar, R.H.
2. Bottom ball joint
3. Flexible boot
4. Retaining ring for boot
5. Special slotted nut
6. Retaining ring for ball joint
7. Top ball joint
8. Flexible boot for top ball joint
9. Retaining ring for boot
10. Special slotted nut
11. Mounting plate for front-brake hose
12. Set-bolt (¼ in. UNF × ¾ in. long)
13. Spring washer
14. Split pins
15. Front-hub assembly
16. Road-wheel stud
17. Bearing for hub, inner
18. Oil seal for inner bearing
19. Distance piece for hub bearing
20. Bearing for hub, outer
21. Special washer
22. Slotted nut (⅝ in. UNF)
23. Split pin
24. Hub cap
25. Bottom link, R.H.
26. Bush
27. Bottom-link strut, R.H.
28. Bush
29. Rubber boot
30. Boot ring
31. Garter spring for boot
32. Retainer for boot
33. Special slotted nut
34. Split pin
35. Bolt
36. Self-locking nut
37. Top-link assembly, R.H.
38. Mounting bracket, inner
39. Bush
40. Rubber covered ball end
41. Mounting bracket, outer
42. Bush
43. Special washer
44. Self-locking nut
45. Set bolt, outer
46. Set bolt, inner
47. Locking plate
48. Packing washer
49. Stiffener, R.H., at top link
50. Spacing washer
51. Set-bolt
52. Spring washer
53. Anti-roll bar
54. Cap for anti-roll bar
55. Set-bolt
56. Locking plate
57. Road spring
58. Shim
59. Cushions
60. Support cup
61. Bump rubber
62. Shock absorber
63. Rubber bush
64. Plain washer
65. Self-locking nut
66. Plain washer
67. Split pin



83. LAYOUT OF 2000 FRONT SUSPENSION AND FRONT HUBS

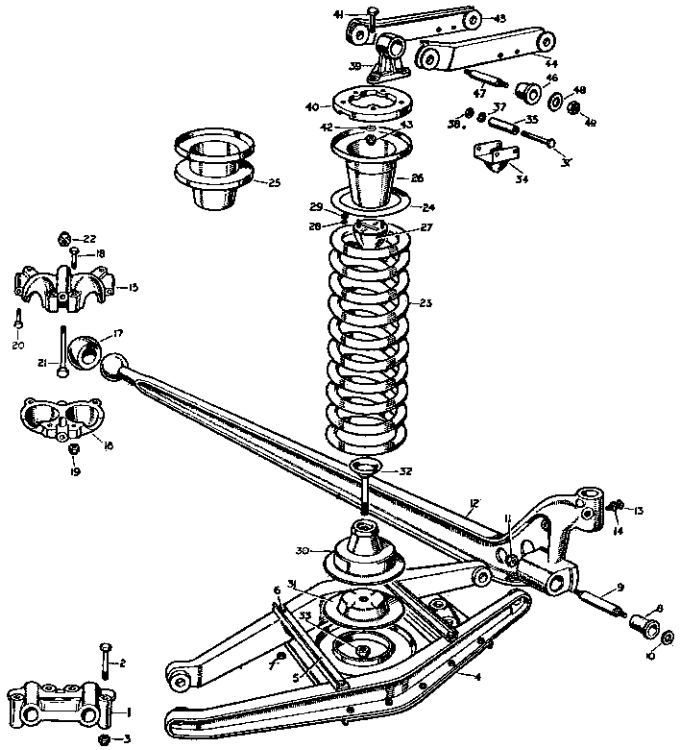
load on the torsion bar by placing a trolley jack under the extreme outer edge of the bottom link; jack to be at right-angles to centre line of car. Raise the suspension until the car is about to lift off its supporting stands. Now remove the self-locking nut from the lower ball swivel pin and slacken the securing nut about ⅛ in. Place two blocks of wood between the top links and the rebound rubbers and lower the jack slightly to subject the lower ball swivel pin to torsion-bar load. Smartly tap the stub axle round the swivel to release the taper and then jack up again to relieve the load on the securing nut. Remove this nut and lower the suspension to its full extent, thus relieving all torsion-bar loading. The torsion bar can now be removed outwards and downwards after releasing the remaining securing bolts.

To refit a torsion bar, reverse the above instructions and remember that the characteristics of the car will be altered if the order of the constituent leaves are changed.

Road Spring Removal – All Models except 3-litre

Proceed as follows on all models except 2000. Jack the car well off the ground and support at all four corners and remove front wheels. After disconnecting the torsion rod and shock absorber from the bottom-link plate, place a heavy jack under the bottom-link member and secure the chassis to the jack with a chain. Insert a packing block between the jack and the spring, ensuring that it has adequate bearing surface and a spigot to enter the base of the spring.

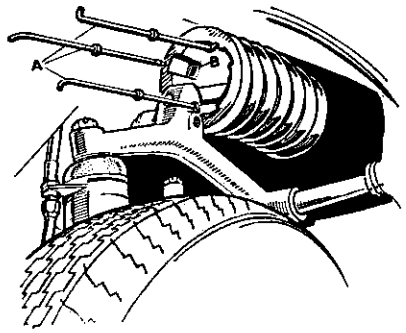
With the aid of the jack, raise the bottom link



1. Bracket for bottom links
2, 3. Fixing bracket to chassis
4. Bottom links
5. Strap
6, 7. Fixings for strap and support
8. Rubber bush
9. Pin
10. Washer
11. Nut
12. Radius arm
13, 14. Lock stop
15. Ball housing for radius arm
16. Cap for housing
17. Rubber ball for radius arm
18, 19. Fixing cap to housing
20–22. Fixing cap and housing
23. Road spring
24. Shim for spring
25. Cone for bump rubber – 60 models
26. Cone for bump rubber – 75 and 90 models
27. Bump rubber
28, 29. Fixing bump rubber to cone
30. Support bush
31. Spring support plate
32. Bump stop
33. Nut fixing bump stop
34. Rebound rubber for spring
35–38. Fixings for rebound rubber
39. Inner bearing housing for top links
40. Packing piece for spring
41–43. Fixing for housing and packing
44, 45. Top links
46. Rubber bush
47. Pin
48. Washer
49. Nut

84. RADIUS ARM AND FRONT ROAD SPRING – GENERALLY APPLICABLE TO ALL MODELS EXCEPT 3-LITRE AND 2000

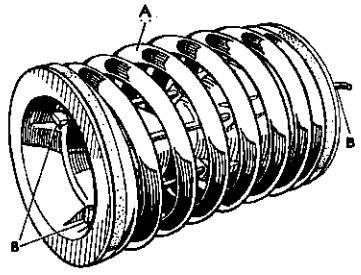
until the chain is tight and then remove the bolts securing the spring-support plate to the link members. Lower the jack carefully and remove support plate, bump stop, spring, bump rubber and support. Retain any shims found under the spring.



85. FITTING FRONT-SPRING RETAINERS – MODEL 2000

A. Spring retainers
B. Slots in spring end cap

Model 2000. – On this model, provision is made whereby the spring can be locked in a compressed position by the insertion of three rods inserted through slots provided in the spring end cap as illustrated in Figs. 85 and 86. When this has been done, jack up and support the front of the car. Remove shock-absorber top



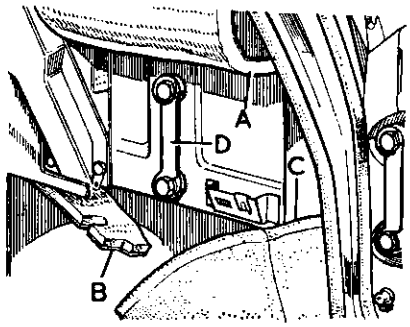
86. FRONT-SUSPENSION SPRING AFTER REMOVAL – MODEL 2000

A. Spring held in compressed state
B. It is essential that the rods are only turned through 90° after insertion through the backplate

fixing and disconnect top steering ball-joint from top link. Remove the anti-roll bar cap.

Working from inside the car, remove the locker lid and then cut and bend the bulkhead insulation panel at points (*A*), (*B*) and (*C*) in Fig. 87. Release lock-plate (*D*) and remove bolts securing mounting bracket. The spring can now be withdrawn complete with top link assembly.

With the aid of a press, remove the spring-retaining rods and release tension on the spring – the shims, rubber cushions, bump rubber and support cap will now come away. Upon re-assembly of the spring and component parts, a press will again be required; ensure that the slots for the retainer rods are in line, insert rods and release press. Retain in that form, return to chassis by reversing stripping operation and when all is secure remove retaining rods.

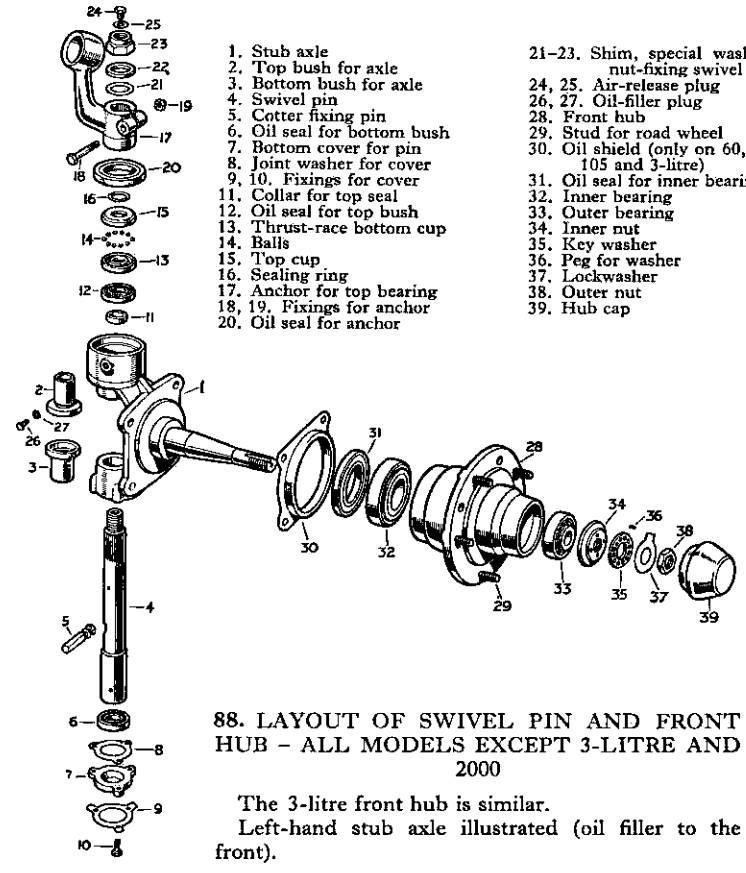


87. TOP-LINK SECURING BOLTS – MODEL 2000

A, B, C. Cuts in insulation
D. Bracket-securing bolts and lock-plates

Stub Axles and Swivel Pins (Columns)

Models 3-litre and 2000 use a swivel 'column' utilizing a ball joint at top and bottom; all other models use a straight-through king-pin arrangement.



1. Stub axle
2. Top bush for axle
3. Bottom bush for axle
4. Swivel pin
5. Cotter fixing pin
6. Oil seal for bottom bush
7. Bottom cover for pin
8. Joint washer for cover
9, 10. Fixings for cover
11. Collar for top seal
12. Oil seal for top bush
13. Thrust-race bottom cup
14. Balls
15. Top cup
16. Sealing ring
17. Anchor for top bearing
18, 19. Fixings for anchor
20. Oil seal for anchor
21–23. Shim, special washer and nut-fixing swivel pin
24, 25. Air-release plug
26, 27. Oil-filler plug
28. Front hub
29. Stud for road wheel
30. Oil shield (only on 60, 75, 90, 105 and 3-litre)
31. Oil seal for inner bearing
32. Inner bearing
33. Outer bearing
34. Inner nut
35. Key washer
36. Peg for washer
37. Lockwasher
38. Outer nut
39. Hub cap

88. LAYOUT OF SWIVEL PIN AND FRONT HUB – ALL MODELS EXCEPT 3-LITRE AND 2000

The 3-litre front hub is similar.

Left-hand stub axle illustrated (oil filler to the front).

STEERING DATA

Camber Angle

All models except 3-litre Mk. II, III and 2000	2° ± 1°
3-litre Mk. II and III	1½°
Model 2000	0° ± 1°

Castor Angle

1948 Models 60 and 75	6° pos.
All other models except 3-litre Mk. II, III and 2000	1° neg. ± 1°
3-litre Mk. II and III	¼° pos.
Model 2000	½° pos. ± ½°

Swivel-pin Inclination

1948 Models 60 and 75	7°
All other models except 3-litre and 2000	3½° ± 1°
3-litre Mk. I and IA	4°
3-litre Mk. II and III	4½°
Model 2000	8°

Front-wheel Toe-in

All models except 3-litre and 2000	1/16 ± 1/16 in.
3-litre	0 ± 1/16 in.
Model 2000	3/64 ± 3/64 in.

Lubrication arrangements provide a reservoir that requires to be 'topped up' at intervals on all models except late 3-litre (suffix 'C' onwards) and Model 2000; these latter cars are prepacked and require no lubrication.

To lubricate early 3-litre models, jack up the car at the front and remove the two plugs in the ball swivel and replace with a UNF ¼-in. straight grease nipple into lower hole of the top swivel and a similar, but cranked nipple into the lower hole of bottom swivel. Using a hand-gun, pump in a recommended lubricant until it seeps from the upper hole. Replace top plug, remove nipples and replace bottom plug. Do this at 12,000-mile intervals.

On all other models (not 2000) remove air-release plug (top) and filler plug (level with stub axle), refill oil reservoir (S.A.E. 140 oil) and replace plugs.

When filling oil reservoir on early models as a service operation, continue to pour in oil until a fair quantity has overflowed. This is because water from the road may have entered from the bottom and the reservoir may contain part oil (upper half) and part water (lower half).

Front-hub Bearings – To Replace and Adjust

The instructions which follow are based upon Models 95, 110 and 3-litre. Other models are similar and differences will be readily picked up upon examination.

Commence by replacing the hub-bearing outer race (33), Fig. 88, which is a press fit and then drop the larger bearing (32) into its outer member followed by the oil seal (31), also a press fit, with lip towards bearing. Pack lightly with grease.

If the hub is to be fitted to a vehicle equipped with disc brakes, a concentric ring of Prestic 5686 must be applied between the shield and axle face. On hubs with drum brakes, apply sealing compound between shield and back-plate.

Fit hub (28) to stub axle (1) and fit the inner member of outer race, also greased. Replace inner nut (34) and tighten to remove all end-float. If discs are fitted check run-out (see page 63). Slacken inner nut two holes and check end-float (0·004–0·006 in.) using a dial gauge.

If necessary, for final correction, readjust inner nut and then lock with key washer (35) and peg (36) followed by tab washer (37) and outer nut (38). The final reading must be taken with the outer nut fully tightened. Finally, refit drums or caliper as appropriate.

Model 2000 is dealt with in a similar manner but adjustment is obtained by selective assembly of thrust washer (21), Fig. 83, obtainable in three sizes: 0·110, 0·1075 and 0·1050 in.

FRONT-SUSPENSION FAULT LOCATION AND REMEDY

Car Pulls to One Side

1. Incorrect camber. – *Check for worn bushes or damage to front suspension.*
2. Incorrect or unequal castor. – *Check for damage or front wheel alignment.*
3. Uneven tyre pressures or tyre wear. – *Renew or correct.*
4. Dragging brake. – *Correct.*
5. Dry or tight front-wheel bearings. – *Inspect for damage, replace, adjust or lubricate.*
6. Tight or dry swivel pins on top and bottom ball joints. – *Free and lubricate, renew if damaged.*
7. Incorrect toe-in. – *Adjust.*

Car Wanders

1. Incorrect castor. – *Check for wear or damage.*
2. Incorrect toe-in. – *Reset.*
3. Worn front-wheel bearings. – *Renew and adjust.*
4. Worn swivel pins and bushes or suspension ball swivels. – *Renew as necessary.*
5. Tight steering assembly. – *Rectify.*
6. Bent or broken frame or sub-frame (3-litre). – *Examine for damage and check dimensions.*
7. Loose rear-axle U-bolts (not 2000). – *Tighten.*
8. Tyre wear or uneven pressure. – *Replace or correct.*

Low-speed Shimmy

1. Excessive castor. – *Check for wear or damage to suspension.*
2. Loose steering. – *Tighten.*
3. Loose wheel bearing. – *Check for damage, and replace or adjust.*
4. Worn ball joints. – *Renew.*
5. Wheels out of balance. – *Correct.*

High-speed Shimmy

1. Eccentric wheels and/or tyres. – *Check for buckled wheels or damaged covers.*
2. Out-of-balance wheels and tyres. – *Balance.*
3. Under or unequal inflation of tyres. – *Correct.*
4. Loose engine mountings. – *Check rubber mountings for damage, renew or tighten.*
5. Faulty steering damper (when fitted) or shock absorbers. – *Renew.*
6. Worn or loose front-wheel bearings. – *Adjust or replace.*
7. Loose sub-frame (3-litre). – *Tighten.*

Wheel Thump

1. Unequal tyre pressures. – *Correct.*
2. Unbalanced wheels. – *Balance.*
3. Inoperative damper. – *Replace.*

Excessive Tyre Wear

1. Incorrect camber. – *Check for wear or damage.*
2. Incorrect toe-in. – *Reset.*
3. Under inflation. – *Correct.*
4. Fast cornering, harsh braking or sustained high-speed driving. – *Remedy in hands of driver.*

Front End Noisy

1. Looseness in front suspension. – *Retighten all nuts and bolts, checking all rubber mountings for wear and renew as necessary. Check front-wheel alignment.*
2. Hydraulic dampers noisy. – *Check damper mounting bushes for wear. If damper itself is noisy, replace unit.*
3. Worn bushes. – *Renew as necessary.*

Chapter 11

REAR AXLE AND REAR SUSPENSION

THE type of differential assembly and axle-shaft arrangements used throughout the period under review may conveniently be divided into two groups: (1) 2000 models, and (2) all other models.

Model 2000 uses a hypoid-geared final drive incorporating universally-jointed two-piece axle shafts. The final-drive casing together with the external outer axle shafts are an important part of the rear suspension.

The assembly used on all other models is of the conventional semi-floating design with a spiral-bevel final drive.

Axle-shaft Assembly – All Models except 2000

This can readily be removed after disconnecting brakes and removing six bolts (21), Fig. 89, securing the bearing housing (15) to axle case.

To dismantle the shaft assembly, first strip the brake-anchor plate and remove the collar (20) which locates and retains the rest of the components. This collar was pressed on under heavy load upon original assembly and is best removed by mounting the shaft in a lathe and turning it off; the shaft is centred at both ends to accommodate this. The components will now come away and the hub bearing and sleeve (17) and (18) can be pressed from the housing (15) and the oil-seal (19) from the sleeve.

To reassemble axle shaft reverse the stripping operation, using a new seal and if necessary, a new bearing, pressing the latter into the housing until it abuts the shoulder. Press on a *new* retaining collar (20) – a press of from 2–6 tons is required for this – and replace shaft and bolt bearing housing to axle case. Note that the two shafts are not interchangeable as the differential is off-set by $\frac{5}{8}$ in.; watch this point upon reassembly.

No attention need be paid to end-float as, on earlier models, end thrust is taken on the ball race.

Dismantling Differential Assembly – All Models except 2000

The differential assembly can be removed after partly withdrawing both axle shafts, disconnecting the propeller shaft and removing fixings (3) to (6), Fig. 89.

To strip the differential, withdraw the bolts (35) and remove the bearing caps, marking them to ensure correct replacement and then remove adjusting nuts (37). If the bearings (36) are not to be replaced, keep the outer races separate so that they may be reassembled to their original inner races.

Remove the set-bolts (27) retaining the crown-wheel (note that on some models two of these are 'fitted'). Tap out the differential wheel spindle (30) after removing split pin (31) and remove wheels (28), pinions (29) and washers (33). Remove the bearings (36) using an extractor; if one is not available, a chisel inserted between casing and bearing will suffice.

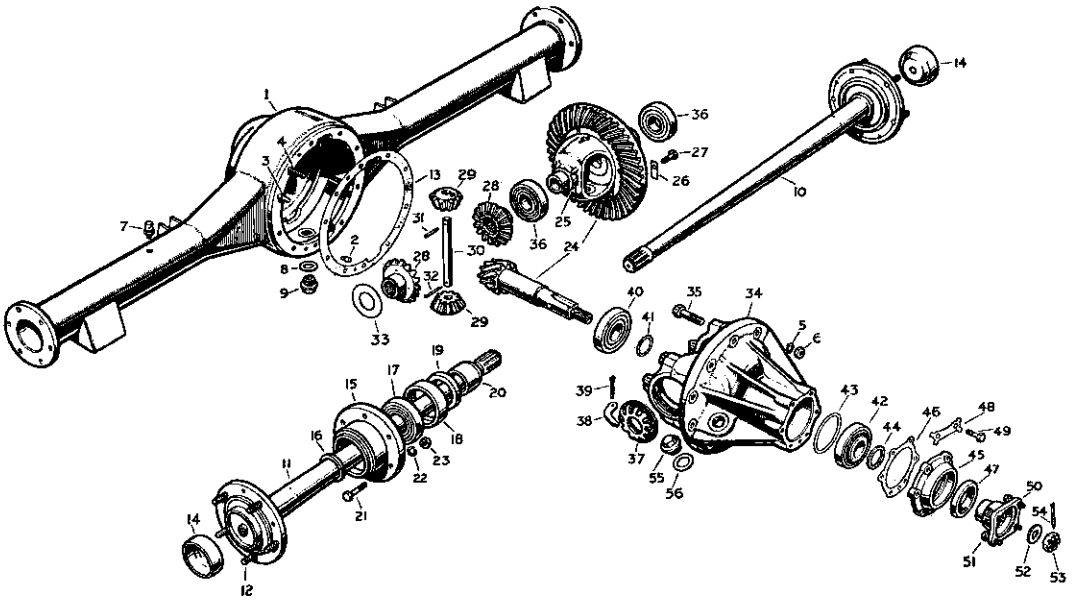
From the rear, remove the pinion-driving flange (50), followed by the oil-seal retainer (45) and joint washer (46). Remove *rearwards* the pinion (24) and large inner race (40), and *forwards* the distance washer (44) and small inner race (42). Lift off from pinion shims (41) and press off bearing (40). Press out pinion-bearing outer member, carefully retaining shims for future use.

Wash and examine all parts, renew as necessary, bearing in mind that the crownwheel and pinion are 'mated' parts and must be replaced as such. If necessary, renew the oil-seal (47) in the retainer (45), lip to rear, and use a jointing compound between seal and casing.

Reassembling Differential Assembly – All Models except 2000

Proceed to reassemble as follows.

Press the outer members of the pinion bearings



89. EXPLODED VIEW OF REAR-AXLE ASSEMBLY - ALL MODELS EXCEPT 2000

1. Axle casing
2. Dowel locating differentia
3–6. Fixing differential to axle
7. Breather
8, 9. Oil-drain plug
10, 11. Axle shafts
12. Stud for road wheel
13. Joint washer
14. Extension piece for wheel changing
15. Hub-bearing housing
16. Distance washer
17. Bearing for hub
18. Sleeve for oil seal
19. Oil seal for hub
20. Retaining collar
21–23. Fixing for bearing housing
24. Crownwheel and bevel pinion
25. Differential casing
26, 27. Fixings for crownwheel
28. Differential wheel
29. Differential pinion
30. Spindle for pinions
31, 32. Fixings for spindle
33. Thrust washer for differential
34. Bevel pinion housing
35. Bolt fixing bearing cap
36. Roller bearings for differential
37. Bearing adjustment nut
38. Lock-tab
39. Split tab
40. Rear bearing for bevel pinion
41. Shim for pinion position
42. Front bearing for bevel pinion
43. Shim for bearing pre-load
44. Distance washer
45. Retainer for oil seal
46. Joint washer for retainer
47. Oil seal for pinion
48, 49. Fixings for retainer
50. Driving flange
51. Driving bolt
52–54. Fixings for driving flange
55, 56. Oil-level/filler plug

(40) and (42), Fig. 89, into the casing (34) using a press block. *Do not* replace the large shims (43) at this stage. Press the larger pinion bearing on the pinion until it abuts the shoulder.

Assemble the pinion in position, adding a number of the small shims (41), and secure temporarily with the front bearing (42), distance washer (44) and driving flange (50). *Do not* fit the oil-seal at this stage. Tighten the securing nut to torque of 85 lb-ft. and check the bearing preload in the following manner.

Mount the casing in a vice and bolt a flat bar to the driving flange; the bar should be as light as possible. Next, hang a 1-lb. weight to the bar and slide it downwards along the bar until the pinion turns under its weight. When this happens, the weight should be from 9 to 14 in. from the centre of the pinion. If *less* than 9 in. increase the preloading by removing shims (41); if more than 14 in. add shims (41).

The next step is to measure the distance between the axis of the crownwheel and the end face of the pinion. This dimension is 3–3·002 in. and it can be checked as shown in Fig. 90.

Shims (43), Fig. 89, amounting to the thickness as shown by the feeler gauge must now be placed under the rear-bearing outer member, and the same amount *added* to the smaller shims (41) previously fitted. Having done that, re-check the pre-loading torque and readjust as necessary.

The oil-seal retainer and joint washer may now be fitted, not forgetting to ensure that the cut-away in the joint washer is in line with the oil holes in the casing. Note also that as the oil seal runs on the driving flange, this should not be worn or damaged.

Insert the driving bolts into the flange and fit the flange. The differential wheels, pinions, thrust washers and spindle may now be replaced and the backlash checked; this to be at an absolute minimum and definite. Do this by thrust-washer selection; these are available in 0·005-in. stages from 0·040 in. Now fit the crownwheel, tightening the set-bolts evenly, and after pressing on the inner member of the differential bearings, position the assembly in the casing, together with the outer members and the serrated adjusting nuts.

Replace the bearing caps in their original position, partially tighten the bolts so that the adjusting nuts can be turned by hand. After ensuring that the crownwheel is not solidly in mesh with the pinion, tighten the adjusting nuts by hand to a point that just eliminates the end-float.

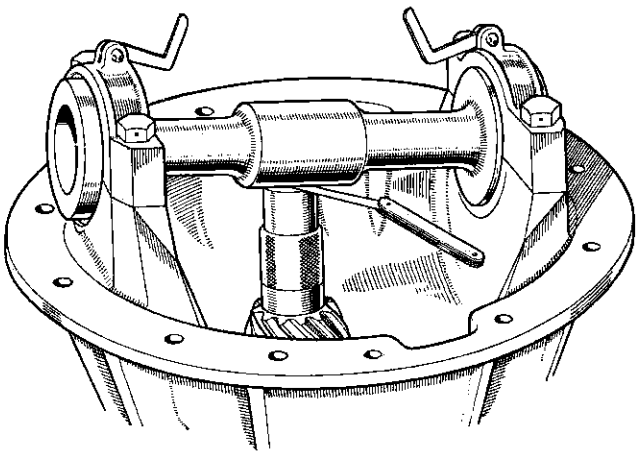
Checking Crownwheel Backlash – All Models except 2000

This is best dealt with by the use of a dial indicator. It is possible to use a 'trial and error' system which involves a constant check of tooth markings, a tedious and somewhat lengthy procedure, and is not therefore recommended.

The backlash between the crownwheel and pinion should be 0·007 in.; adjust backlash by serrated nuts (37), Fig. 89; turn both nuts by same amount.

When correct backlash is obtained, check that serrated nuts are finger tight and tighten bearing-cap bolts; turn each serrated nut clockwise one half of a serration to pre-load the bearings 0·005 in.

Insert the locking tabs into slots in the serrated nuts and lock bearing-cap bolts and tabs with wire.



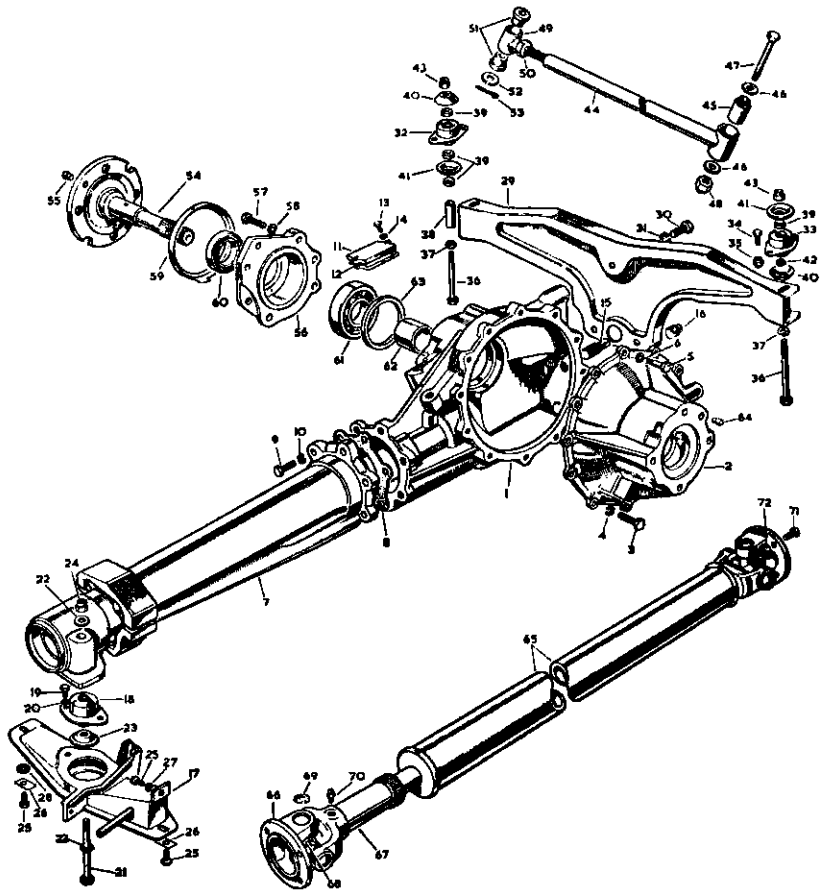
90. CHECKING PINION HEIGHT – ALL MODELS EXCEPT 2000

Removing Final-drive Assembly – Model 2000

Unlike previous models, to remove the differential unit it is necessary to remove from the vehicle the entire final-drive assembly.

To do this, part the inner and outer axle-shaft assemblies on either side at the point where they are bolted to the rear-brake discs and disconnect brake connections, both mechanical and hydraulic. Remove bolts securing assembly to the rear-support bracket; remove side bolt and

1. Housing
2. Cover
3. Set-bolt
4. Spring washer
5. Fitting bolt
6. Shakeproof washer
7. Extension case
8. Joint washer
9. Set-bolt
10. Spring washer
11. Inspection cover for pinion housing
12. Joint washer
13. Set-bolt
14. Spring washer
15. Filler plug
16. Drain plug
17. Mounting bracket
18. Flexible mounting
19. Set-bolt
20. Spring washer
21–24. Fixings, flexible mounting to extension casing
25–28. Fixings, front mounting bracket to base unit
29. Mounting bracket
30. Set-bolt
31. Spring washer
32. Flexible mounting, R.H.
33. Flexible mounting, L.H.
34. Bolt
35. Self-locking nut
36–43. Fixings, final drive to rear flexible mountings
44–46. Rear-stabilizer rod, bush and thrust washer
47, 48. Fixings, rod to final drive bracket
49. Screwed end
50. Locknut (⅝ in. UNF)
51–53. Fixings, screwed end to base unit
54. Differential drive shaft
55. Dowel locating brake disc
56. Bearing housing, R.H.
57. Set-bolt
58. Spring washer
59. Oil catcher
60. Oil seal for drive shaft
61. Bearing for drive shaft
62. Thrust collar for bearing
63. Spacer, 0·255 in., for drive-shaft bearing



91. FINAL-DRIVE CASINGS AND PROPELLER SHAFT – MODEL 2000

64. Dowel
65. Propeller-shaft assembly
66. Flange yoke
67. Sleeve yoke
68. Journal complete
69. Circlip for journal
70. Grease nipple
71. Special bolt
72. Self-locking nut

slacken the two lower bolts securing front-support brackets and disconnect rear end of propeller shaft with the assembly supported on a jack. Lower the jack and lift out assembly complete.

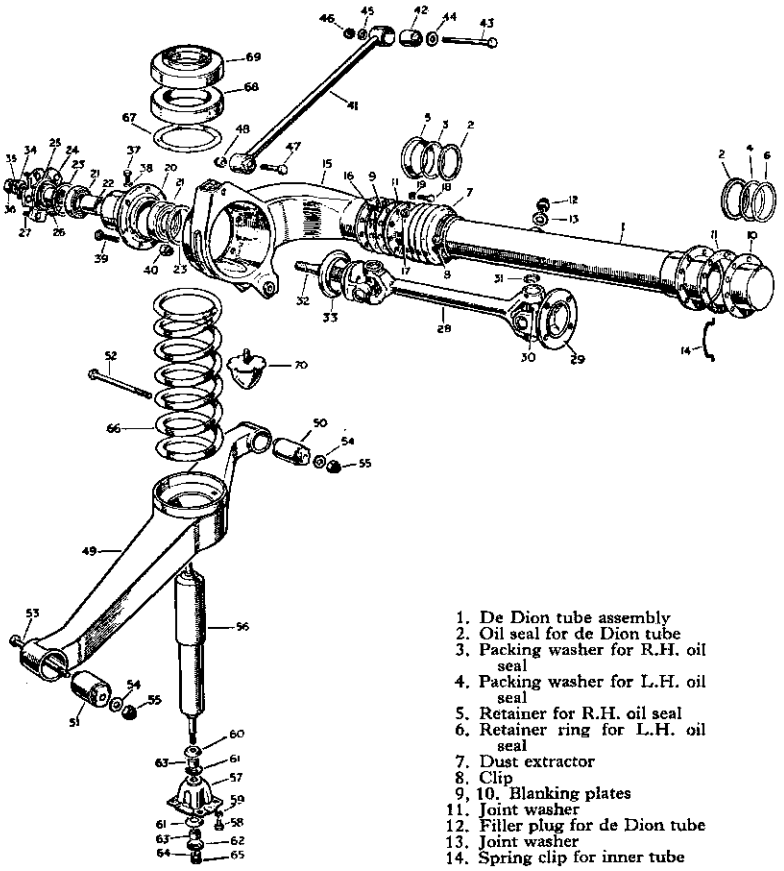
Removing Differential Unit from Casing – Model 2000

To remove the differential assembly, it is necessary to first remove the front-mounting bracket and then the brake discs and all adjacent brake parts. Withdraw both inner-axle shaft assemblies and the final-drive extension case (six bolts).

The differential assembly can be lifted out after parting the differential casing held by ten bolts, two of which are 'fitted'.

Dismantling Differential Unit – Model 2000

Study Fig. 93 and proceed to drift out the differential bearings (14) from the differential casing. Then remove the pinion assembly. To do this, first remove nut (22), locknut (21) and taper-roller bearing (19). Withdraw the pinion (2) and remove from it the shims (20) and distance sleeve (18). Using a brass drift, remove both bearing races, obtaining access to the front one by removing both filler and drain plugs from



1. De Dion tube assembly
2. Oil seal for de Dion tube
3. Packing washer for R.H. oil seal
4. Packing washer for L.H. oil seal
5. Retainer for R.H. oil seal
6. Retainer ring for L.H. oil seal
7. Dust extractor
8. Clip
9, 10. Blanking plates
11. Joint washer
12. Filler plug for de Dion tube
13. Joint washer
14. Spring clip for inner tube
15. De Dion elbow assembly, R.H.
16. Stud for de Dion elbow
17–19. Fixings, elbow to de Dion tube
20. Rear hub
21. Hub bearings
22. Collapsible spacer for hub bearings
23. Oil seal for rear hub
24. Driving flange assembly
25. Dust excluder, outer
26. Drive screw fixing dust excluder
27. Stud for road wheel
28. Drive-shaft assembly for rear hub
29. Flange yoke for drive shaft
30. Journal
31. Circlip
32. Yoke shaft for rear hub
33. Dust excluder, inner
34–36. Fixings for yoke shaft
37. Plug for rear hub
38. Joint washer
39. Bolt $\frac{7}{16}$ in. UNF × $1\frac{1}{8}$ in. long
40. Self-locking nut ($\frac{7}{16}$ in. UNF)
41. Top-link assembly
42. Bush
43–46. Fixings, top link to base unit
47, 48. Fixings, top link to de Dion elbow
49. Bottom link assembly, R.H.
50. Bush, long
51. Bush, short
52–55. Fixings, bottom link to base unit and de Dion elbow
56. Shock absorber
57. Lower mounting for shock absorbers
58, 59. Fixings, mountings to bottom links
60–65. Fixings, shock absorber to base unit and lower mountings
66. Road spring
67. Shim
68. Cushion, top and bottom
69. Top-support cup for road spring
70. Bump rubber

92. REAR SUSPENSION, REAR HUBS AND DRIVE SHAFTS – MODEL 2000

the casing. To remove the roller bearing and shims (17) from the pinion head an extractor will be required. If they are to be refitted, keep races and rollers in their original pairs.

To part the crownwheel (2) from carrier (1), remove ten bolts (3) and two 'fitted' bolts (4). Remove the peg from the end of spindle (11) and drive out the spindle. Pinions (10), wheels (8) and thrust washers (9) can now be lifted out. Clean and examine all parts for damage, replacing as necessary. Pay particular attention to the pinion thrust face in the carrier and remove any raised metal at that point.

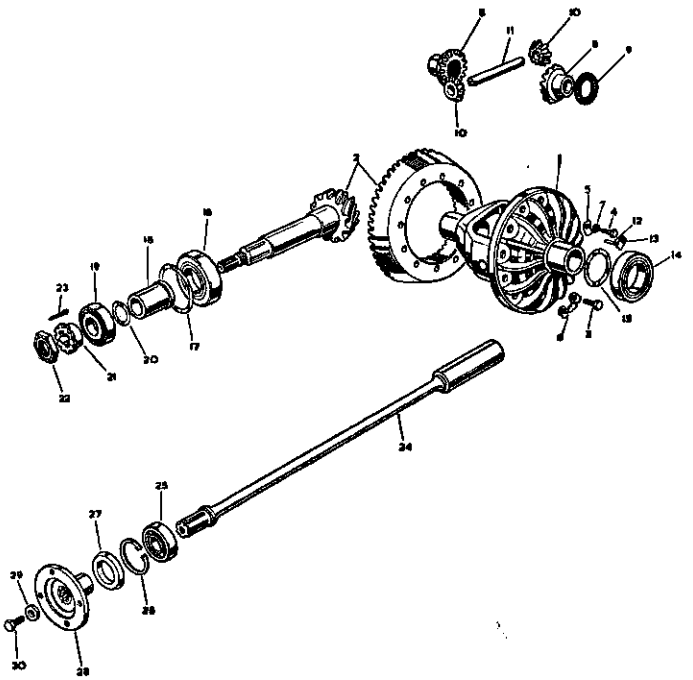
Reassembling Differential Unit – Model 2000

Proceed to reassemble the differential assembly by reversing the stripping operations, paying particular attention to the following points.

First assemble the differential wheels and pinions (8) and (10), Fig. 93, to spindle (11) and insert into carrier. Check that there is a minimum but definite backlash between the pinions and each wheel and that each can rotate freely; this is done by selective assembly of washer (9), available in four sizes. When satisfactory, fit locking peg.

Setting Pinion. – To set the pinion, first prepare a slave race to use for setting purposes to be fitted temporarily in place of bearing (16). To do this grind down a *new* bearing until it is a sliding fit in the housing (this can be retained for future use). Press this slave bearing on to the pinion and drift the front-bearing race and the rear-bearing slave race (no shims) into the hous-

1. Differential case
2. Crownwheel and hypoid pinion
3. Special bolt, 1·016 in. long
4. Fitting bolt, 1·031 in. long
5. Single locker
6. Double locker
7. Plain washer
8. Differential wheel
9. Thrust washer, Tufnol
10. Differential pinion
11. Spindle
12. Locking pin for spindle
13. Retainer for locking pin
14. Differential bearing
15. Differential-bearing shim
16. Bearing, pinion end
17. Shim, bearing adjustment
18. Spacer
19. Bearing front end
20. Shim, bearing adjustment
21. Distance piece
22. Special locking nut
23. Split pin
24. Extension shaft
25. Bearing
26. Circlip
27. Oil seal
28. Coupling flange
29. Plain washer
30. 'Wedglock' bolt

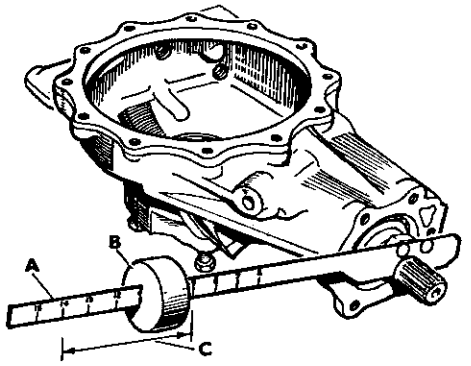


93. DIFFERENTIAL AND EXTENSION SHAFT – MODEL 2000

ing and then insert pinion assembly (again no shims) and add slotted collar (21) and nut (22). Tighten to provide a pre-load of 9–14 lb-in. using an arm gauge (Fig. 94).

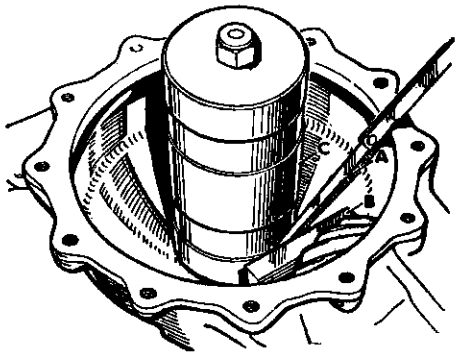
The next step is to adjust pinion height. For this purpose a special gauge (Part No. 600299) is required; it comprises a height gauge and a slip gauge (Fig. 95). Position the gauge and measure the clearance as shown. From the figure obtained deduct 0·003 in., add shims to this value beneath the slave race and reassemble. Recheck clearance as detailed above; this to be 0·002–0·004 in.; correct as may be necessary by addition or subtraction of shims from the pinion slave race.

Again remove the assembly, fit new race in



94. CHECKING PINION-BEARING PRE-LOAD – MODEL 2000

A. Arm gauge
B. 1 lb. weight
C. Tolerance, 9–14 lb-in.



95. CHECKING PINION HEIGHT – MODEL 2000

A. Feeler gauge
B. Slip gauge
C. Pinion-height gauge

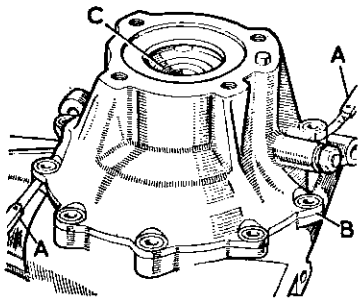
FINAL DRIVE DATA – MODEL 2000

Backlash (crownwheel to pinion)	0·005–0·008 in.
Crownwheel bearing pre-load	0·005 in.
Pinion-bearing pre-load	9–14 lb-in.
Pinion height (nose of pinion to crownwheel axis)	1·990 in.
Hub-bearing pre-load	5–10 lb.
Pinion-housing cover clearance	0·003–0·005 in.
Brake disc run-out	0·007–0·010 in.

Tightening Torques (lb-ft.)

Crownwheel bolts	15
Pinion nut	75
Drive shaft to discs	68
Bearing housing to pinion housing	30
Cover to pinion housing:	
$\frac{5}{16}$ in. nuts	15
Others	30
Extension housing to pinion housing	30

place of slave race, recheck and if satisfactory place on one side.



96. CHECKING DIFFERENTIAL-BEARING PRE-LOAD – MODEL 2000

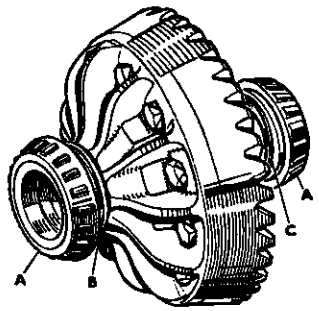
A. Feeler gauges
B. Housing faces
C. Differential bearing

To obtain silent running, variation is sometimes made to the pinion-height clearance. This variation is inscribed on the pinion face and can be up to a maximum of ± 0·005 in. Where a plus dimension is inscribed on the pinion, the equivalent thickness of shims must be *removed* and vice versa. This operation is carried out after the pinion height has been adjusted to standard as described above.

Crownwheel-bearing Pre-load. – Now proceed to prepare the differential case to receive the differential assembly by driving bearing races (14), Fig. 93, into case and cover. Fit *slave* roller races to carrier (1) with shims to the value of 0·050 in. and proceed to measure pre-load on crownwheel bearings by assembling as shown in Fig. 96 but without pinion assembly. Using two feeler gauges inserted at diametrically-opposite points check the clearance between cover and case – no bolts fitted, but cover held firmly in position – this should be 0·003–0·005 in. Correct as may be necessary by the manipulation of shims under the upper carrier race only. Remove and set aside crownwheel assembly.

Rechecking Pinion Pre-load. – Return now to the pinion assembly and assemble this to the housing using shims (20), Fig. 93, to the approximate value of 0·060 in. between collar (18) and bearing (19). Recheck that pinion pre-load is 9–14 lb-in. and adjust as may be required by manipulation of shims (20). Refit crownwheel assembly and secure cover.

Crownwheel Backlash. – Before proceeding further, check the crownwheel backlash which



97. IDENTIFICATION OF CROWNWHEEL SHIMS – MODEL 2000

A. Differential bearings partially withdrawn
B. Bearing pre-load shims
C. Crownwheel backlash shims

should be 0·005–0·008 in. Measure backlash by inserting a dial test gauge through the oil filler-level orifice.

If correction is required it is obtained by adding or subtracting shims from the *lower* bearing only, and to maintain pre-load value add or subtract shims to an equal value from the top bearing (see Fig. 97). Again remove the crownwheel assembly, replace slave races with new races, recheck for any variations in race height and adjust the appropriate shims to suit.

Finally fit the crownwheel assembly, apply Holomar S9/32M compound to case facing and secure fixing bolts.

Axle-shaft Assemblies – Model 2000

As previously explained, the axle-shaft assemblies on Model 2000 are articulated. Each assembly comprises two shafts in tandem from the differential unit outward to the road wheel. The inner shaft is splined to the differential at its inner end and carries the rear-brake disc at its outer end. The outer shaft carries the wheel-hub assembly at its outer end and is coupled to the inner shaft through a universal joint and the brake disc.

Both the inner and outer shafts may be removed as independent assemblies as detailed below.

Outer-shaft Assembly – Model 2000

This assembly can be lifted out after removing the six bolts (39), Fig. 92, retaining the hub (20) to the De Dion assembly elbow (15) and the four bolts securing the universal-joint flange to the inner shaft.

Servicing Rear Hub. – If it is desired to overhaul the rear hub, the inner and outer members (*D*) and (*J*), Fig. 98, can be parted by drifting. After lifting out the tube (*F*) press out the bearing (*E*). Remove oil-seals (*G*) and (*L*) and drift out bearing (*K*).

To reassemble using new bearings and oil seals, reverse stripping instructions and when *replacing* the splined shaft, ensure that splines are free from grease and apply sparingly 'Loctite' sealant AVV.

The retaining nut (*B*) must be tightened to obtain a bearing pre-load of 5–10 lb. measured by means of a spring balance. Do this by mounting the assembly in a vice, attach the spring balance to the hexagon plug on the top of housing (*J*) and measure the pull required to rotate the hub; as this loading is high it will be found necessary to use an extension tube on the spanner to obtain sufficient leverage.

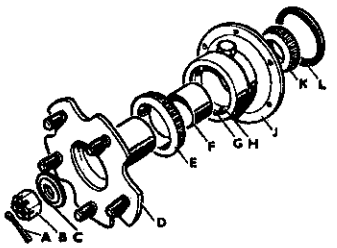
If the assembly is made using the *original bearings*, proceed in a similar manner but tighten the nut originally to a point that just traps the distance tube and measure the loading. Irrespective of this figure, tighten still further to obtain an *additional* loading of 3–8 lb.

In order that the Loctite sealant may fully harden, do not run the car for a period of 12 hours.

Inner-shaft Assembly – Model 2000

This can be removed after detaching the brake disc and ancillary parts, leaving the caliper and spacer in position – it will come away with the assembly. Study Fig. 91 and then remove the four bolts securing the bearing housing (56) to the differential case and withdraw inner shaft (54) taking care not to lose the spacer (63).

It will be noted that the components comprising the inner-shaft assembly are retained in position by a collar (62). This requires a special puller for removal, but as this is not readily available, turn it off in a lathe until only a skin remains and then split with a chisel. The oil-seal (60) and bearing housing (56) are now released, and the bearing (61) may be drifted out. Do not remove oil catcher (59) unless it is essential.



98. REAR HUB – MODEL 2000

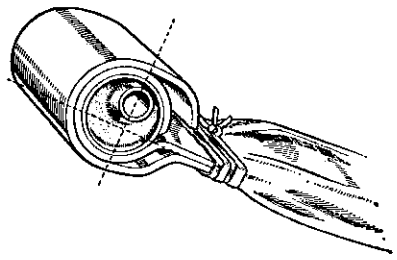
A. Split pin
B. Castle nut
C. Special washer
D. Hub for road wheel
E. Bearing, outer
F. Collapsible tube
G. Oil seal
H. Outer track for bearing
J. Housing for hub
K. Bearing, inner
L. Oil seal

On reassembly, press the bearing and oil-seal into the housing, having pre-soaked the seal for 15 minutes in oil and seal it with Bostik 1776. Position the housing over the drive shaft and press home, using a tube of suitable length.

Should the oil catcher have been removed, fit a new one and ensure that the lip is adjacent to the oil-drain hole on the underside of the housing and press right home using a wooden block.

Replacing Axle-shaft Assemblies – Model 2000

Reverse removal operations. When fitting the outer assembly, ensure that there is a clearance of at least 0·010 in. between the bolt ends secur-



99. POSITION OF REAR-SPRING RUBBER-SHACKLE BUSH (FORWARD END – 3-LITRE MODELS

ing the brake disc and shaft flange and the oil catcher.

When fitting the inner-shaft assembly, first fit the original spacer (63), Fig. 91, and offer up the assembly to the final-drive casing and ensure that there is a clearance of 0·003–0·005 in. between inner-shaft housing (56) and final-drive casing. Adjust as may be required by selection of spacers – available in three sizes. When correct, temporarily remove and refit brake caliper, using original shims. Refit and seal faces using Hylomas SQ 32 M compound. Refit brake parts and check disc run-out as described in Chapter 8.

REAR SUSPENSION

All Models except 3-litre and 2000

All models have leaf springs except 3-litre and 2000 models which use coil springs.

To remove a leaf spring, jack up the rear of the car and remove the road wheel. Support the body under jacking tube and then lower jack under axle. Remove the spring bottom plate and U-bolts. Swing the shock-absorber bracket to one side. Remove the self-locking nut and unscrew the rear pin from the tapped inner-shackle plate.

Unscrew the rear upper pin and remove the shackle plates. If necessary, drive out the rear-shackle pin bushes and distance pieces from the chassis.

Replacement is a reversal of removal, but note that new shackle-pin bushes must be a drive fit in the frame. The distance piece between them must be lined up with a pilot when entering the shackle pin. The front-anchor pin self-locking nut and shackle bolts should be tightened to a torque of 72 lb-ft.

Model 3-litre

The rear springs on 3-litre models are rubber-mounted both front and rear. The rear end uses two rubber blocks mounted on a triangular base and can readily be replaced.

A rubber bush is used at the forward end, and in the event of a replacement, the new bush should be a drive fit and aligned as illustrated in Fig. 99.

Model 2000

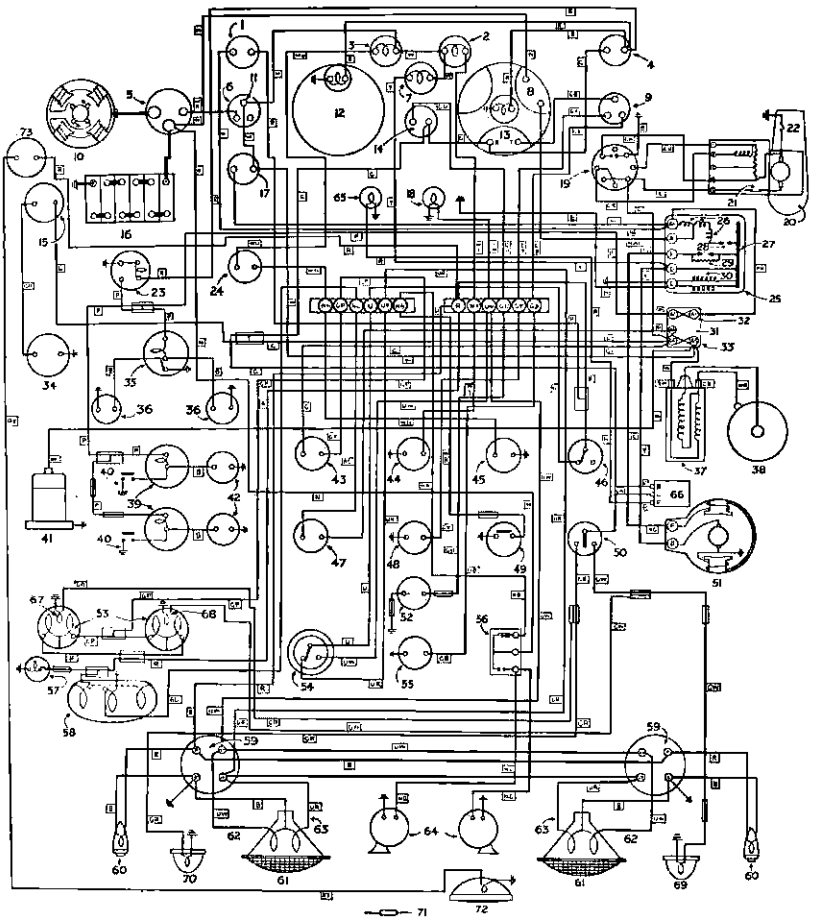
To remove the rear coil springs on Model 2000, jack up car at rear and remove road wheels. Place a jack under the bottom link just rear of the spring location and raise the jack just enough to allow the removal of the lower end of the shock-absorber mounting.

Remove bolt securing bottom link to the De Dion tube, lower the jack and the spring, complete with rubber packing, will come away.

To refit, reverse operations, but do not re-tighten the bottom-link securing bolt until the car has been lowered to its wheels and is in a static unladen position.

ELECTRICAL WIRING DIAGRAMS

1. Main-lamp switch
2. Oil-pressure warning light
3. Mixture-control warning light
4. Panel-light switch
5. Starter-solenoid switch
6. Starter switch
7. Ignition warning light
8. Ammeter
9. Petrol/oil level switch
10. Starter
11. Centre terminal
12. Speedometer
13. Petrol/oil level gauge
14. Petrol reserve switch
15. Heater fan switch
16. 12-volt battery (positive earth)
17. Ignition switch
18. Headlamp warning light
19. Windscreen-wiper switch
20. Windscreen-wiper motor
21. Thermostat switch
22. Limit switch
23. Clock
24. Mixture-control switch (at control)
25. Voltage-control box
26. Series windings
27. Regulator frame
28. Contacts
29. Resistance
30. Shunt windings
31. S.F.6 fuse box
32. Fuse A.2
33. Fuse A.4
34. Heater fan
35. Map-reading light
36. Front-door switches
37. Coil
38. Distributor
39. Interior lights
40. Interior-light switches (on centre pillars)
41. Petrol pump
42. Rear-door switches
43. Stop-lamp switch
44. Oil-pressure switch
45. Mixture-control thermostat switch (at cylinder head)
46. Headlamp switch
47. Reverse-lamp switch
48. Oil-level gauge sump unit
49. Horn push
50. Indicator switch
51. Dynamo
52. Petrol-reserve valve
53. Stop/tail lamps
54. Headlamp dipper switch
55. Petrol-tank level unit
56. Horn relay
57. Luggage-boot light and switch



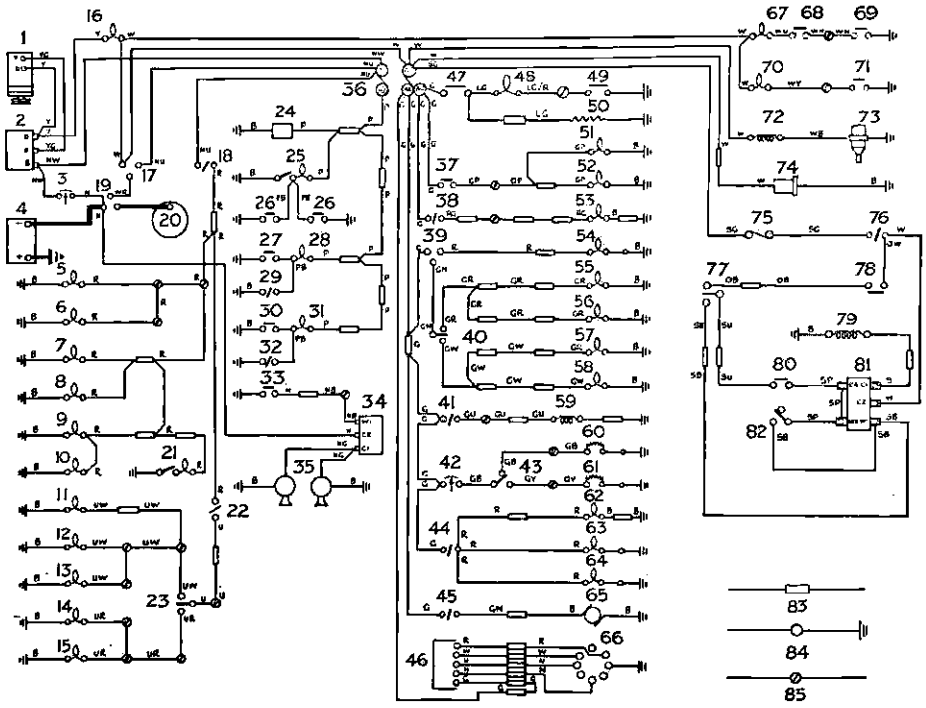
100. WIRING DIAGRAM FOR 1955–9 MODELS 60, 75, 90 AND 105

58. Reverse and rear-number plate lamp
59. Junction box
60. Sidelamp
61. Headlamp
62. Main beam
63. Dip beam
64. Horns
65. Direction-indicator warning light
66. Flasher unit
67. R.H. rear-flasher bulb
68. L.H. rear-flasher bulb
69. R.H. front-flasher bulb
70. L.H. front-flasher bulb
71. Snap connector
72. Fog lamp
73. Fog-lamp switch

KEY TO CABLE COLOURS

B. Black	N. Brown	R. Red	W. White
G. Green	O. Orange	S. Slate	Y. Yellow
LG. Light Green	P. Purple	U. Blue	

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

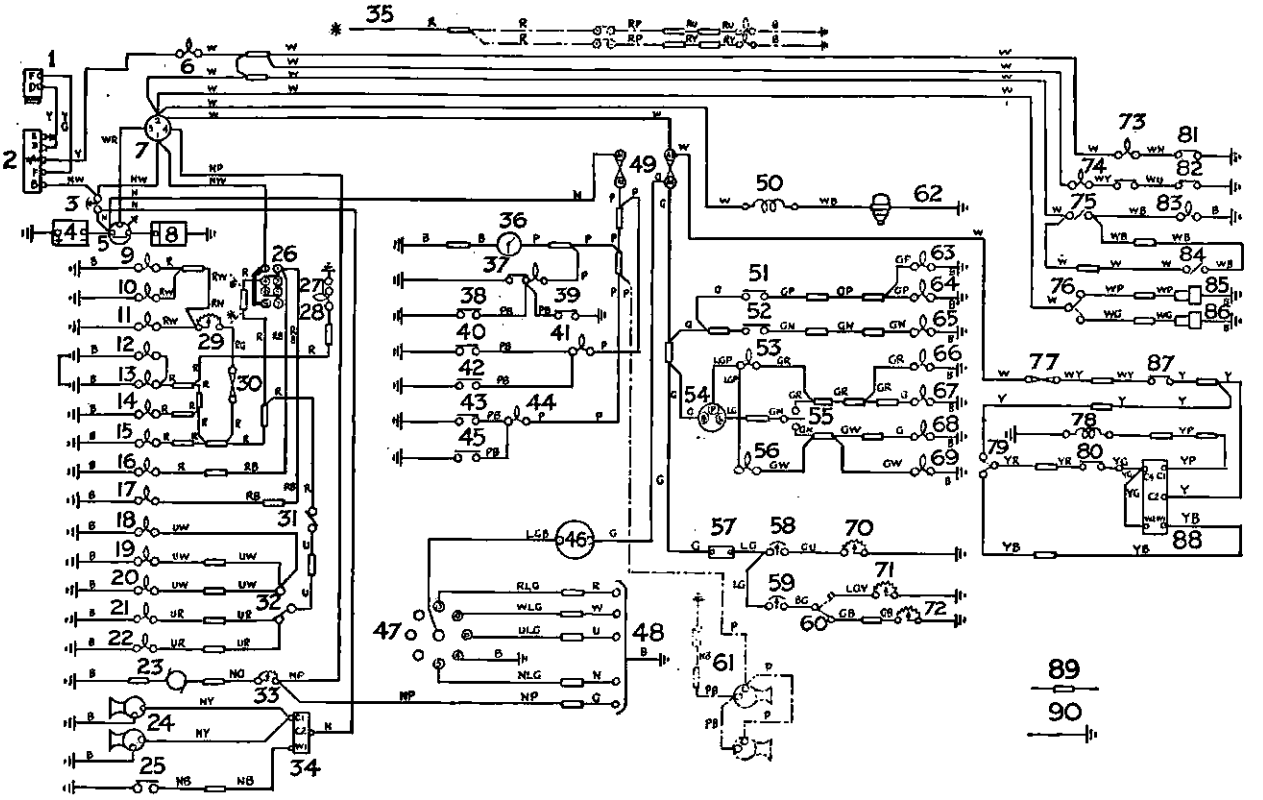


101. WIRING DIAGRAM FOR MODELS 80 AND 100

Key to cable colours is as given on page 87.

1. Dynamo
2. Current-voltage control
3. Ammeter
4. Battery, 12-volt positive earth
5. Side lamp, L.H.
6. Side lamp, R.H.
7. Tail lamp, L.H.
8. Tail lamp, R.H.
9. Number-plate lamp
10. Number-plate lamp
11. Warning light for headlamp
12. Main beam, L.H. headlamp
13. Main beam, R.H. headlamp
14. Dip beam, L.H. headlamp
15. Dip beam, R.H. headlamp
16. Warning light for ignition
17. Switch, ignition and starter
18. Switch, main lamp
19. Starter solenoid
20. Starter
21. Boot lamp and switch
22. Switch, headlamp
23. Switch, headlamp dip
24. Clock
25. Front-interior light and switch
26. Door switch for front light
27. Door switch for rear light
28. Rear light
29. Pillar switch for rear light
30. Door switch for rear light
31. Rear light
32. Pillar switch for rear light
33. Horn push
34. Relay for horns
35. Horns
36. Fuse box
37. Switch, stop-lamp
38. Switch, reverse-lamp
39. Flasher unit
40. Switch for flasher on column
41. Switch, fuel-reserve
42. Fuel guage
43. Switch, petrol/oil level, 100 models only
44. Switch panel
45. Switch, heater
46. Wiper motor
47. Mixture-control switch*
48. Mixture-control warning light*
49. Mixture-control thermostat switch, at cylinder head*
50. Carburetter starter-heater element*
51. Stop lamp, L.H.
52. Stop lamp, R.H.
53. Reverse lamp
54. Warning light, flasher
55. Flasher lamp, L.H. front
56. Flasher lamp, L.H. rear
57. Flasher lamp, R.H. rear
58. Flasher lamp, R.H. front
59. Fuel reserve valve
60. Fuel-tank level unit
61. Oil-level gauge sump unit, 100 models only
62. Clock illumination
63. Panel illumination
64. Panel illumination
65. Heater
66. Switch, windscreen-wiper
67. Mixture-control warning light†
68. Mixture-control switch†
69. Mixture-control thermostat switch, at cylinder head†
70. Warning light, oil-pressure
71. Switch, oil-pressure, 100 models only
72. Ignition coil
73. Distributor
74. Fuel pump, 100 models only; mechanical on 80 models
75. Fuse box
76. Switch on gearbox, closed in top gear only‡
77. Switch, steering-column‡
78. Switch, closed, zero to half throttle‡
79. Solenoid‡
80. Switch, open, zero to one-eighth throttle‡
81. Relay‡
82. Switch, kickdown‡
83. Snap-in connections‡
84. Earth connectors via terminals and/or fixing bolts
85. Junction-box terminals

* Later 80 models with carburetter heater element
† Early 80 and all 100 models.
‡ Laycock overdrive circuit.



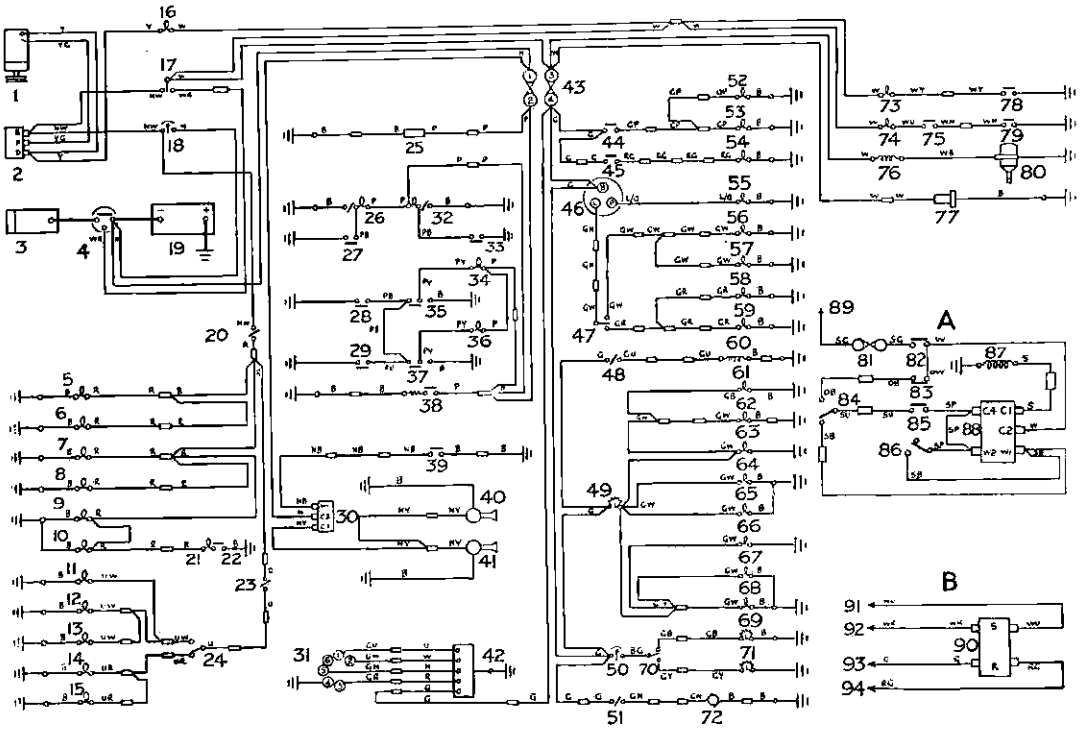
102. WIRING DIAGRAM FOR MODELS 95 AND 110

With positive-earth return.

Key to cable colours is as given on page 87.

1. Generator
2. Voltage-regulator box
3. Ammeter
4. Battery
5. Solenoid switch
6. Ignition warning light
7. Ignition and starter switch
8. Starter motor
9. Clock illumination
10. Speedometer illumination
11. Grouped instrument illumination
12. Rear No. plate illumination
13. Rear No. plate illumination
14. Rear lamp, L.H.*
15. Side lamp, L.H.*
16. Side and park lamp, R.H.*
17. Rear and park lamp, L.H.*
18. Main beam warning light
19. Headlamp, main beam, R.H.
20. Headlamp, main beam, L.H.
21. Headlamp, dip beam, R.H.
22. Headlamp, dip beam, L.H.
23. Heater motor
24. Horns – 110 models only
25. Horn push switch
26. Main and parking switch
27. Boot lamp switch
28. Boot lamp
29. Rheostat
30. 3-amp fuse, panel illumination
31. Headlamp switch
32. Dipper switch
33. Heater-motor rheostat
34. Horn relay – 110 only
35. Fog and spot lamps, when fitted, shown dotted
36. Clock
37. Map light and switch
38. Door switch, front L.H.
39. Door switch, front R.H.
40. Door switch, rear L.H.
41. Interior light
42. Pillar switch, L.H.
43. Door switch, rear R.H.
44. Interior light
45. Pillar switch, R.H.
46. Windscreen washer – 110 only
47. Windscreen-wiper and washer switch
48. Windscreen-wiper motor
49. A2 and A4 fuses
50. Coil
51. Stop light switch
52. Reversing light switch
53. Flasher warning lamp, R.H.
54. Flasher unit
55. Flasher switch
56. Flasher warning lamp, L.H.
57. 10-volt regulator, water temperature and fuel gauge
58. Water-temperature gauge
59. Fuel gauge
60. Petrol/oil level switch
61. Horn circuit – 95 only – shown dotted
62. Distributor
63. Stop lamp, R.H.
64. Stop lamp, L.H.
65. Reversing lamp
66. Rear flasher, L.H.
67. Front flasher, L.H.
68. Front flasher, R.H.
69. Rear flasher, R.H.
70. Water-temperature transmitter
71. Sump unit
72. Tank unit
73. Oil-pressure warning light
74. Mixture-control warning light and switch
75. Brake-fluid-level switch
76. Fuel-reserve switch
77. 35-amp. fuse for overdrive circuit – 110 only
78. Solenoid – 110 only
79. Column switch – 110 only
80. Throttle switch – 110 only
81. Oil-pressure switch
82. Thermostat, mixture-control
83. Handbrake and fluid-level warning light
84. Handbrake warning-light switch
85. Main fuel pump
86. Reserve fuel pump
87. Gearbox switch
88. Relay
89. Snap and Lucar connections
90. Earth connections

*Feed cables reversed for L.H.D.



103. WIRING DIAGRAM FOR 3-LITRE MARKS I AND Ia

With positive-earth return.

Key to cable colours is as given on page 87.

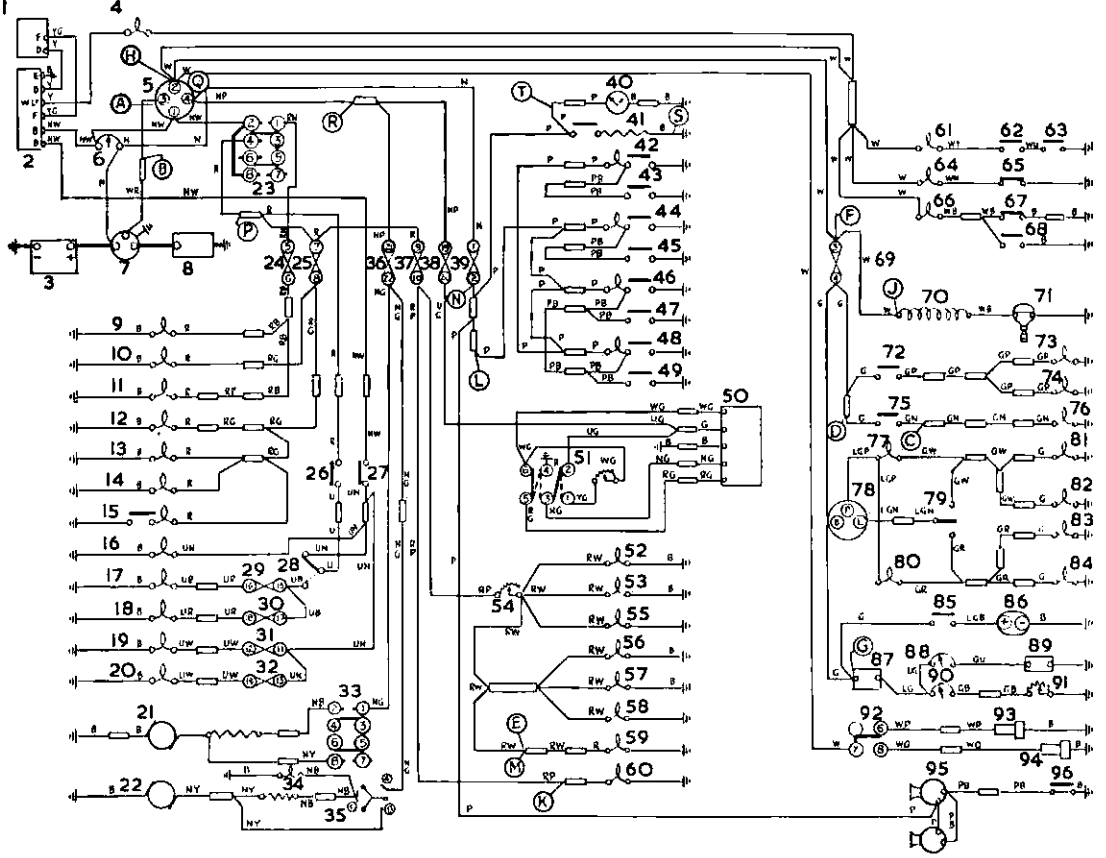
1. Dynamo
2. Voltage control box RB310
3. Starter motor
4. Solenoid-starter switch
5. Side lamp, R.H.
6. Side lamp, L.H.
7. Tail lamp, R.H.
8. Tail lamp, L.H.
9. Number-plate lamp
10. Number-plate lamp
11. Main-beam warning light
12. Headlamp main beam, R.H.
13. Headlamp main beam, L.H.
14. Headlamp dip beam, R.H.
15. Headlamp dip beam, L.H.
16. Ignition warning light
17. Ignition and starter switch
18. Ammeter
19. Battery, 12-volt positive earth
20. Side-lamp switch
21. Boot light
22. Boot-light switch
23. Headlamp switch
24. Dipper switch
25. Electric clock
26. Front interior light, L.H.
27. Door switch, L.H., front
28. Door switch, R.H., rear
29. Door switch, L.H., rear
30. Horn relay
31. Windscreen-wiper switch
32. Front interior light, R.H.
33. Door switch, R.H., front
34. Rear interior light, R.H.
35. Pillar switch, R.H.
36. Rear interior light, L.H.
37. Pillar switch, L.H.
38. Cigar lighter
39. Horn push
40. Horn
41. Horn
42. Windscreen-wiper motor
43. Fuse unit
44. Stop-lamp switch
45. Reverse-light switch
46. Flasher unit
47. Flasher switch
48. Fuel reserve switch
49. Panel-light rheostat
50. Fuel gauge
51. Heater switch
52. Stop lamp, L.H.
53. Stop lamp, R.H.
54. Reverse lamp
55. Flasher warning light
56. Rear-flasher lamp, R.H.
57. Front-flasher lamp, R.H.
58. Front-flasher lamp, L.H.
59. Rear-flasher lamp, L.H.
60. Fuel reserve switch
61. Gear-change illumination. Borg-Warner automatic transmission
62. Clock illumination
63. Grouped instrument panel illumination
64. Panel light, L.H.
65. Panel light, L.H.
66. Speedometer illumination
67. Panel light, R.H.
68. Panel light, R.H.
69. Fuel-tank unit
70. Fuel/oil switch
71. Oil-sump unit
72. Heater motor
73. Oil-pressure warning light
74. Choke warning light
75. Choke warning switch
76. Ignition coil
77. Fuel pump
78. Oil-pressure switch
79. Thermostat
80. Distributor

A – Laycock Overdrive Kick-down Circuit

81. Overdrive fuse box
82. Gearbox switch
83. Throttle switch closed 0–¼
84. Column switch
85. Throttle switch open 0–½
86. Kickdown switch
87. Overdrive solenoid
88. Overdrive relay
89. To fuse unit terminal 3

B – Borg-Warner Automatic Transmission Circuit

90. Selector switch, Borg-Warner automatic transmission
91. To starter switch
92. To harness snap connectors adjacent to ignition and starter switch
93, 94. To reverse-light switch-harness snap connectors, adjacent to selector switch



104. WIRING DIAGRAM FOR 3-LITRE MARK III

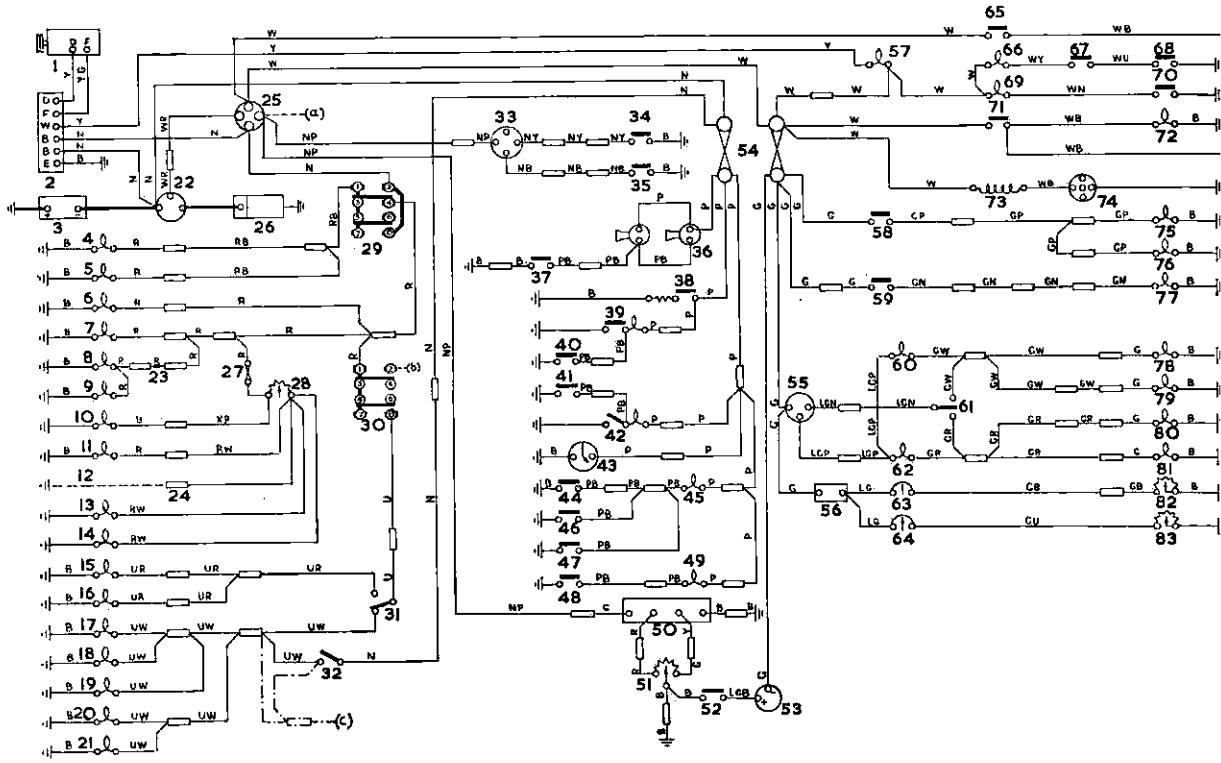
With negative-earth return.

Key to cable colours is as given on page 87.

1. Dynamo
2. Current-voltage regulator
3. Battery
4. Warning light, ignition
5. Switch, ignition and starter
6. Ammeter
7. Starter solenoid
8. Starter motor
9. Side lamp, R.H. (park)
10. Side lamp, L.H.
11. Tail lamp, R.H. (park)
12. Tail lamp, L.H.
13, 14. Rear number plate illumination
15. Switch and lamp, boot
16. Warning light, main beam
17. Headlamp, R.H., dip beam
18. Headlamp, L.H., dip beam
19. Headlamp, R.H., main beam
20. Headlamp, L.H., main beam
21. Heater motor, two-speed, front
22. Heater motor, two-speed, rear
23. Switch, side, tail and park lamps
24. Fuse, 5–6 (5 amp.)
25. Fuse, 7–8 (5 amp.)
26. Switch, headlamp
27. Switch, headlamp-flasher
28. Switch, headlamp-dip
29. Fuse, 15–16 (10 amp.)
30. Fuse, 17–18 (10 amp.)
31. Fuse, 11–12 (10 amp.)
32. Fuse, 13–14 (10 amp.)
33. Switch, heater, front
34. Heater illumination, rear
35. Switch, heater, rear
36. Fuse, 21–22 (15 amp.)
37. Fuse, 9–10 (5 amp.)
38. Fuse, 19–20 (15 amp.)
39. Fuse, 1–2 (35 amp.)
40. Clock
41. Cigar lighter
42. Interior lamp and switch, front, R.H.
43. Switch, front door, R.H.
44. Interior lamp and switch, front, L.H.
45. Switch, front door, L.H.
46. Interior lamp and switch, rear, L.H.
47. Switch, rear door, L.H.
48. Interior lamp and switch, rear, R.H.
49. Switch, rear door, R.H.
50. Screen wiper motor
51. Switches, screen wiper
52, 53. Panel illumination, L.H.
54. Switch, panel illumination
55. Speedometer illumination
56, 57. Panel illumination, R.H.
58. Grouped instrument illumination
59. Clock illumination
60. Cigar lighter, front, illumination
61. Warning light, choke
62. Switch, choke
63. Thermostat, choke
64. Warning light, oil-pressure
65. Switch, oil-pressure
66. Warning light, brake fluid level and handbrake
67. Switch, handbrake
68. Switch, brake-fluid level
69. Fuse, 3–4 (25 amp.)
70. Ignition coil
71. Distributor
72. Switch, stop-light
73. Stop light, R.H.
74. Stop light, L.H.
75. Switch, reverse-light
76. Reverse light
77. Warning light, L.H., direction-indicators
78. Direction indicator unit
79. Switch, direction-indicators
80. Warning light, R.H., direction-indicators
81. Direction indicator, front, R.H.
82. Direction indicator, rear, R.H.
83. Direction indicator, rear, L.H.
84. Direction indicator, front, L.H.
85. Switch, windscreen-washer
86. Windscreen washer
87. Regulator, 10-volt
88. Gauge, water-temperature
89. Transmitter, water-temperature
90. Gauge, fuel
91. Tank unit, fuel
92. Switch, fuel-pump change-over
93. Fuel pump, main
94. Fuel pump, reserve
95. Horns
96. Switch, horns

Encircled letters on diagram are the following pick-up points for additional and optional equipment:

A. Auto trans. inhibitor switch (terminal 1)
B. Auto trans. inhibitor switch (terminal 3)
C. Auto trans. inhibitor switch (terminal 2)
D. Auto trans. inhibitor switch (terminal 4)
E. Gear-change illum. (auto. trans.)
F. Overdrive fuse
G. Oil-pressure gauge and screenwasher switch (Coupé)
H, J. Tachometer
K. Rear-cigar lighter illum. (Coupé)
L. Cigar lighter
M. Nacelle illum. (4 lamps)
N. Bonnet lamp
P. Auxiliary lamp(s)
Q. Radio
R. Heated backlight
S, T. Headrest lamp



105. WIRING DIAGRAM FOR EARLY MODEL 2000

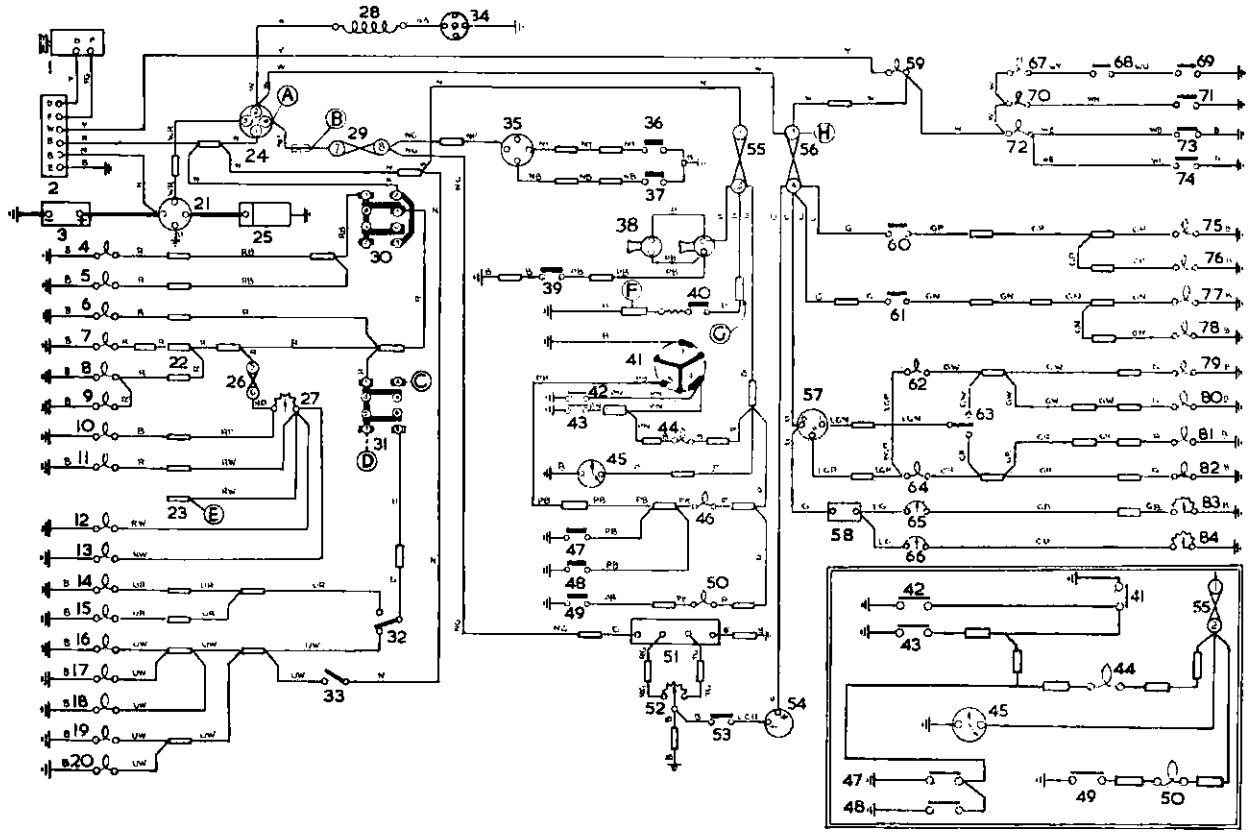
With positive-earth return.

Key to cable colours is as given on page 87.

1. Dynamo
2. Control box
3. Battery
4. Side and park lamp, R.H.
5. Tail and park lamp, R.H.
6. Side lamp, L.H.
7. Tail lamp, L.H.
8. Number-plate lamp
9. Number-plate lamp
10. Cigar-lighter illumination
11. Clock illumination
12. Spare cable
13. Panel light
14. Panel light
15. Headlamp dip beam, L.H.
16. Headlamp dip beam, R.H.
17. Headlamp main beam, R.H.
18. Headlamp main beam, R.H.
19. Main-beam warning light
20. Headlamp main beam, L.H.
21. Headlamp main beam, L.H.
22. Starter solenoid
23. Cable identification tag
24. Spare cable pick-up point
25. Switch, ignition and starter
26. Starter motor
27. In-line fuse
28. Rheostat for panel illumination
29. Switch, side and park
30. Switch, headlamp
31. Switch, headlamp, dip
32. Switch, headlamp, flash
33. Heater blower unit, two-speed
34. Switch, fast-speed heater-blower unit
35. Switch, low-speed heater-blower unit
36. Twin horns
37. Horn push
38. Switch, cigar-lighter
39. Switch, map and courtesy lamp, L.H.
40. Switch, front-door, L.H.
41. Switch, front-door, R.H.
42. Switch, map and courtesy lamp, R.H.
43. Clock
44. Switch, interior-lamp
45. Interior lamp
46. Switch, rear-door, L.H.
47. Switch, rear-door, R.H.
48. Switch, boot-light
49. Boot lamp
50. Screenwiper motor
51. Rheostat for wiper motor
52. Switch, screen-washer
53. Screen washer
54. Fuse unit
55. Direction-indicator unit
56. Bi-metal voltage regulator
57. Warning light, ignition
58. Switch, stop-light
59. Switch, reverse-light
60. Warning light, indicator, L.H.
61. Switch, direction-indicator
62. Warning light, indicator, R.H.
63. Fuel gauge
64. Temperature gauge
65. Switch, handbrake
66. Warning light, choke
67. Switch, choke
68. Switch, choke thermometer
69. Warning light, oil-pressure
70. Switch, oil-pressure
71. Switch, brake-fluid
72. Warning light, brake-fluid level and handbrake
73. Coil
74. Distributor
75. Stop lamp, R.H.
76. Stop lamp, L.H.
77. Reverse lamp
78. Front direction indicator, R.H.
79. Rear direction indicator, R.H.
80. Rear direction indicator, L.H.
81. Front direction indicator, L.H.
82. Tank unit
83. Water temperature transmitter

Feed pick-up points:

(*a*) Radio and illumination feed
(*b*) Fog lamp
(*c*) Auxiliary driving lamps



106. WIRING DIAGRAM FOR LATER MODEL 2000

With negative-earth return.

Key to cable colours is as given on page 87.

1. Dynamo C42
2. Control box, RB 340
3. Battery, 60 amp.-hour
4. Side and park light, R.H.
5. Tail and park light, R.H.
6. Side lamp, L.H.
7. Tail lamp, L.H.
8. Number-plate lamp
9. Number-plate lamp
10. Cigar-lighter illumination
11. Clock illumination
12. Panel light
13. Panel light
14. Headlamp dip beam, L.H.
15. Headlamp dip beam, R.H.
16. Headlamp main beam, R.H.
17. Headlamp main beam, R.H.
18. Main beam warning light
19. Headlamp main beam, L.H.
20. Headlamp main beam, L.H.
21. Starter solenoid
22. Cable identification tag
23. Spare cable pick-up point
24. Switch, ignition and starter
25. Starter motor
26. Fuse, 5–6, 2-amp.
27. Switch for panel illumination
28. Coil
29. Fuse, 7–8, 15-amp.
30. Switch, side and park
31. Switch, headlamp
32. Switch, headlamp dip
33. Switch, headlamp flash
34. Distributor
35. Heater blower unit, two-speed
36. Switch, fast-speed heater-blower
37. Switch, slow-speed heater-blower
38. Twin horns
39. Switch, horn
40. Switch, cigar-lighter
41. Switch, interior-lamps
42. Switch, front door, L.H.
43. Switch, front door, R.H.
44. Interior lamp, front or centre
45. Clock
46. Interior lamp, rear
47. Switch, rear door, L.H.
48. Switch, rear door, R.H.
49. Switch, boot-light
50. Boot light
51. Screen wiper motor
52. Switch screen-wiper
53. Switch, screen-washer
54. Screen washer
55. Fuse, 1–2, 35-amp.
56. Fuse, 3–4, 35-amp.
57. Direction-indicator unit
58. Bi-metal voltage regulator
59. Warning light, ignition
60. Switch, stop-lamp
61. Switch, reverse-light
62. Warning-light indicator, L.H.
63. Switch, direction-indicator
64. Warning-light indicator, R.H.
65. Fuel gauge
66. Temperature gauge
67. Warning light, choke
68. Switch, choke
69. Switch, choke thermometer
70. Warning light, oil-pressure
71. Switch, oil-pressure
72. Warning light, brake-fluid level and handbrake
73. Switch, handbrake
74. Switch, brake-fluid
75. Stop lamp, R.H.
76. Stop lamp, L.H.
77. Reverse lamp, R.H.
78. Reverse lamp, L.H.
79. Front-direction indicator, R.H.
80. Rear-direction indicator, R.H.
81. Rear-direction indicator, L.H.
82. Front-direction indicator, L.H.
83. Tank unit
84. Water-temperature transmitter

Feed pick-up points:

A. Radio and illumination
B. Heated backlight
C. Fog lamps
D. Auxiliary driving lamps
E. Spare
F, G. Rear-passengers' head-rest light
H. Spare

Items encircled at bottom right-hand corner of diagram are for circular interior light at centre of roof.

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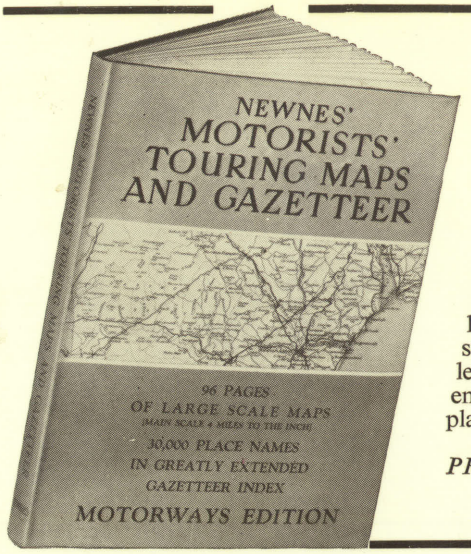

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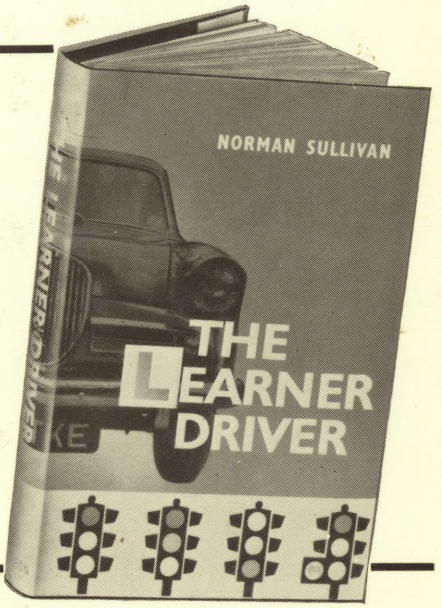

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