

91

The



MIDGET

(Series TD)

AND

(Series TF)

**WORKSHOP
MANUAL**





MIDGET
(Series "TD")
AND
(Series "TF")
WORKSHOP
MANUAL

NOTE

Instructions given in this manual for servicing the M.G. Midget Series "TD" are also applicable in the main to the Series "TF." In cases where components are not common to both Series, the necessary descriptions and instructions for the Series "TF" will be found at the end of the appropriate section.

The following are the main items affected: Instruments and Switches, Carburetors and Air Cleaners, Radiator, Body, Lights.

References in the text to "later models" should be understood to read "later Series 'TD' models and all Series 'TF' models" unless otherwise stated.

Amendments to the manual are only made by the issue of revised sheets, or additional sheets for insertion at the end of each section. It is therefore of the utmost importance to refer to the end of each section *before carrying out any work on the vehicle.*

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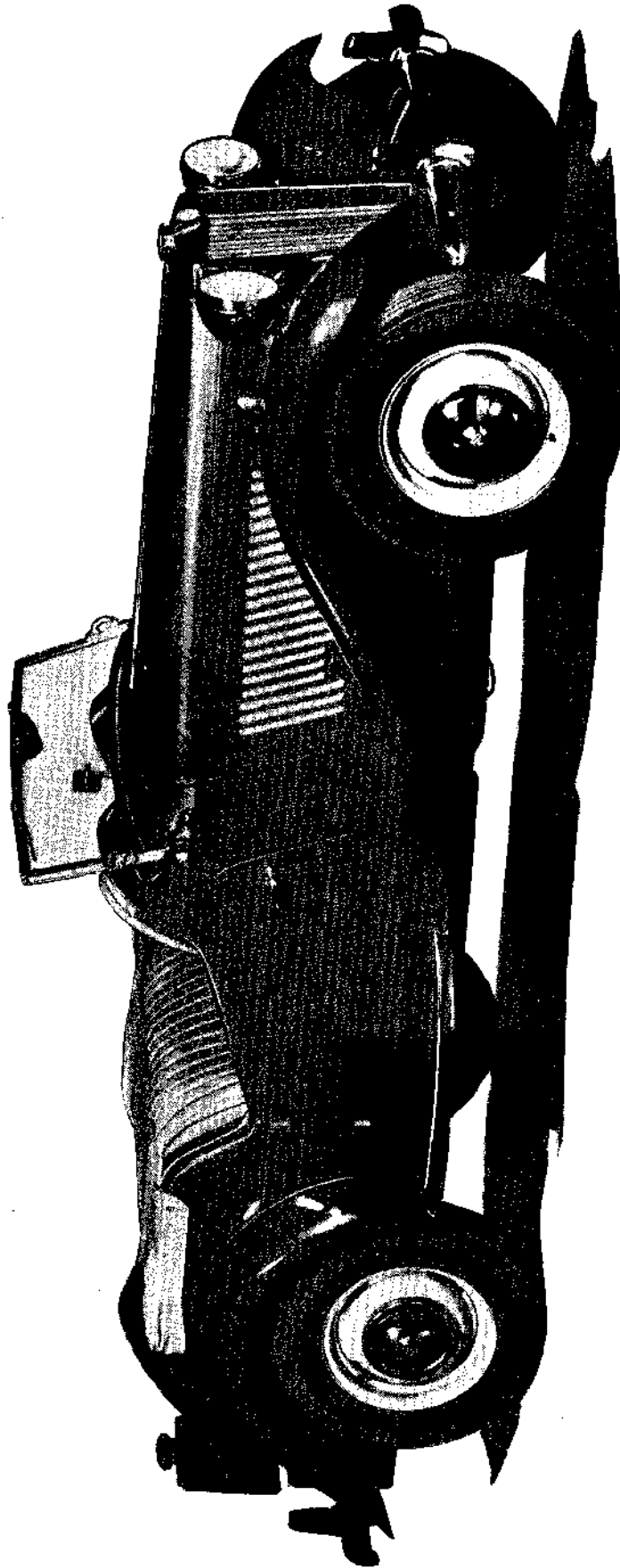
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THE M.G. MIDGET (Series "TD")



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GENERAL DATA (SERIES "TD")

ENGINE TYPE	XPAG/TD up to Engine No. 9407. XPAG/TD/2 from Engine No. 9408.
Number of cylinders	Four.
Capacity	1250 c.c. (76½ cu. in.).
B.H.P.	54.4 at 5,200 r.p.m.
Bore	66.5 mm. (2.618 in.).
Stroke	90 mm. (3.543 in.).
R.A.C. rating	10.97 h.p.
Compression ratio	7.25 to 1.
System of cooling	Thermo-siphon—pump and fan assisted.
Radiator hose top	Length 4 in. (10.16 cm.). Diameter 2 ³ / ₁₆ in. (5.56 cm.).
Radiator hose bottom	Length 2½ in. (5.71 cm.). Diameter 1½ in. (2.86 cm.).
First oversize bore	+0.020 in. (.50 mm.). Actual bore 2.6381 in. (67 mm.).
Second oversize bore	+0.040 in. (1.00 mm.). Actual bore 2.6581 in. (67.5 mm.).
Firing order	1-3-4-2.
Piston clearance at pressure face below oil ring	.0021 in. to .0029 in. (.056 mm. to .071 mm.).
Ring gap	.006 in. to .010 in. (.152 mm. to .254 mm.).
Number of compression rings	Two.
Width of compression rings	2.25 mm. (.0885 in.).
Number of oil rings	One.
Width of oil ring	4.0 mm. (.1575 in.).
Oil pressure relief valve operates	50 to 70 lb. per sq. in. (3.5 to 5.0 kg./cm. ²).
Oil pressure (normal)	40 to 45 lb. per sq. in. (2.8 to 3.2 kg./cm. ²).
Gudgeon pin type	Clamped.
Gudgeon pin diameter	.7087 in. { +.0004 in. { +.0006 in. 18 mm. { +.010 mm. { -.015 mm.
Fit in piston	Double thumb press.
Fit in connecting rod	Clamped.
Crankpin diameter (standard)	1.772 in. (45 mm.).
Crankpin minimum diameter for regrind	1.722 in. (43.75 mm.).
Connecting rod—length between centres	7.008 in. (178 mm.).
Connecting rod—type of bearing	Shimless, steel-backed, white-metal-lined.
Connecting rod—side clearance	.004 in. to .006 in. (.10 mm. to .15 mm.).
Connecting rod—diametrical clearance	.0005 in. to .002 in. (.011 mm. to .056 mm.).
Number of crankshaft bearings	Three.
Type of main bearings	Shimless, steel-backed, white-metal-lined.
Standard main journal diameter	2.047 in. (52 mm.).
Main journals first regrind diameter	2.027 in. (51.49 mm.).
Main journals second regrind diameter (minimum)	2.007 in. (50.98 mm.).
Main bearings—length	Front 1.496 in. (38 mm.). Centre 1.496 in. (38 mm.). Rear 1.575 in. (40 mm.).
Centre main bearing—end clearance	.0014 in. to .0037 in. (.035 mm. to .095 mm.).
Main bearings—diametrical clearance	.0008 in. to .003 in. (.020 mm. to .075 mm.).
Crankshaft—end thrust taken on	Centre bearing.
Number of camshaft bearings	Three.
Type of camshaft bearings	White metal (front). Zinc alloy (rear and centre).

GENERAL DATA—continued

Camshaft—bearing clearance	... ..	Front .0016 in. to .004 in. (.04 mm. to .10 mm.). Rear and centre .0018 in. to .0037 in. (.045 mm. to .095 mm.).
Camshaft—end thrust taken on	... ..	Front end.
Camshaft—end float	... ..	.005 in. to .013 in. (.125 mm. to .325 mm.).
Camshaft—drive (type)	... ..	Duplex chain, $\frac{3}{8}$ in. pitch, 60 pitches, endless.
Valve timing markings	... ..	White chain links and "T" marks on wheels.
Exhaust valve throat diameter	... ..	1.024 in. (26 mm.).
Exhaust valve diameter	... ..	Head 1.221 in. (31 mm.); Stem .315 in. (8 mm.).
Inlet valve throat diameter	... ..	1.181 in. (30 mm.).
Inlet valve diameter	... ..	Head 1.299 in. (33 mm.); Stem .315 in. (8 mm.).
Valve seat angle	... ..	30°.
Tappet type	... ..	Hollow.
Valve lift—inlet	... ..	.315 in. (8 mm.).
Valve lift—exhaust	... ..	.315 in. (8 mm.).
Inlet valve opens	... ..	11° before T.D.C. } From
Inlet valve closes	... ..	57° after B.D.C. } Engine
Exhaust valve opens	... ..	52° before B.D.C. } XPAG/TD/2
Exhaust valve closes	... ..	24° after T.D.C. } No. 24116
Valve spring pressure—shut	... Inner 31 lb. at 1.753 in. (4.453 cm.). Outer 62 lb. at 1.847 in. (4.692 cm.).	Total 93 lb. (42.18 kg.).
Valve spring pressure—open	... Inner 43 lb. at 1.438 in. (3.678 cm.). Outer 80 lb. at 1.532 in. (3.89 cm.).	Total 123 lb. (55.79 kg.).
Inlet and exhaust valve working clearance (hot)	... ..	Engines up to No. XPAG/TD2/24115 : .019 in. (.48 mm.). Engines from No. XPAG/TD2/24116 :
Inlet and exhaust valve working clearance (hot)	... ..	.012 in. (.30 mm.).
Valve guides	... ..	Removable.

FUEL SYSTEM

Fuel tank reserve level	... ..	Warning light on panel.
Fuel delivery	... ..	S.U. electric pump.
Carburettors	... ..	S.U. semi-downdraught.
Carburettor needles	... ..	Standard—ES. Weak—AP. Rich—EM.

CLUTCH

Type (up to Engine No. 9407)	... ..	Borg & Beck 7½ in. (18.4 cm.) diameter. Dry plate.
Type (from Engine No. 9408)	... ..	Borg & Beck 8 in. (20.3 cm.) diameter. Dry plate.
Facing	... ..	Type RYZ on 7 in. diameter clutch. Moulded type on 8 in. diameter clutch.

GEARBOX

Synchromesh	Second, third and top.																														
Ratios	<table border="0" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>Gearbox</th> <th>Overall 8/41</th> <th>Overall 8/39</th> <th>Overall 9/41</th> </tr> </thead> <tbody> <tr> <td>Top</td> <td>1.00</td> <td>5.125</td> <td>4.875</td> <td>4.555</td> </tr> <tr> <td>Third</td> <td>1.385</td> <td>7.098</td> <td>6.752</td> <td>6.309</td> </tr> <tr> <td>Second</td> <td>2.07</td> <td>10.609</td> <td>10.09</td> <td>9.429</td> </tr> <tr> <td>Bottom</td> <td>3.5</td> <td>17.938</td> <td>17.06</td> <td>15.942</td> </tr> <tr> <td>Reverse</td> <td>3.5</td> <td>17.938</td> <td>17.06</td> <td>15.942</td> </tr> </tbody> </table>		Gearbox	Overall 8/41	Overall 8/39	Overall 9/41	Top	1.00	5.125	4.875	4.555	Third	1.385	7.098	6.752	6.309	Second	2.07	10.609	10.09	9.429	Bottom	3.5	17.938	17.06	15.942	Reverse	3.5	17.938	17.06	15.942
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GENERAL DATA—continued

FRONT SUSPENSION AND STEERING

Camber (static position) Nil (tolerance $\pm 1^\circ$).
Castor angle ... ..	... $2^\circ \pm \frac{1}{2}^\circ$ with side-members parallel to road.
Toe-in ... ..	... Nil.
King-pin inclination ... ..	... 9° to $10\frac{1}{2}^\circ$ full bump.
Track ... ..	... Front $47\frac{3}{8}$ in. (1.203 m.). Rear 50 in. (1.27 m.).
Turning circle ... ..	... 31 ft. 3 in. (9.525 m.).
Wheelbase ... ..	... 7 ft. 10 in. (2.388 m.).
Tyre size ... ..	... 5-50—15.
Tyre pressures ... ..	... 18 lb. per sq. in. (1.27 kg./cm. ²).

REAR AXLE

Type of axle ... ..	... Semi-floating.
Type of drive ... ..	... Hypoid.
Ratio ... ..	... 8/41, 8/39 or 9/41.
Adjustment ... ..	... By spacers and special fixtures.

BRAKES

Type ... ..	... Lockheed hydraulic two leading shoe (front) (9 in. dia.).
Type of linings ... ..	... Ferodo MR.19.
Lining size—front ... ..	... 8.75 in. \times 1.5 in. \times 1.87 in. (22.22 cm. \times 3.81 cm. \times 4.7 cm.).
Lining size—rear ... ..	... 8.75 in. \times 1.5 in. \times 1.87 in. (22.22 cm. \times 3.81 cm. \times 4.7 cm.).
Number of rivets ... ..	... Twelve per lining.

SPRINGS (front)

Type ... ..	... Coil.
Free length ... ..	... 9.59 in. $\pm \frac{1}{16}$ in. (24.36 cm. \pm 1.58 mm.).
Mean coil diameter ... ..	... 3.238 in. (8.24 cm.).
Number of effective coils ... ..	... $7\frac{1}{2}$.
Diameter of wire (ground) ... ..	... .498 in. (1.27 cm.).
Maximum deflection ... ..	... 4.24 in. (10.78 cm.).

SPRINGS (rear)

Type ... ..	... Half-elliptic.
Length ... ..	... 42 in. (106.7 cm.).
Width ... ..	... $1\frac{1}{2}$ in. (3.81 cm.).
Number of leaves ... ..	... Seven.
Thickness of leaves ... ..	... $\frac{7}{32}$ in. (5.56 mm.).
Camber (free) ... ..	... 4.1 in. (10.4 cm.).
Working load ... ..	... 500 lb. at $\frac{1}{2}$ in. positive camber. (226.8 kg. at 12.7 mm. positive camber.)

HYDRAULIC DAMPERS

Type Girling or Armstrong.
-------------	---------------------------

ELECTRICAL

Distributor rotation ... ..	... Counter-clockwise.
Automatic advance ... ..	... 32° on crankshaft.
Contact breaker gap (first type) ... ..	... .010 in. to .012 in. (.25 mm. to .30 mm.).
Contact breaker gap (second type) ... ..	... .014 in. to .016 in. (.36 mm. to .41 mm.).
Spark plug (engines prior to No. XPAG/TD2/ 22735) ... ..	... Champion L.10S (standard equipment) (14 mm.). K.L.G. E.80. Lodge HN or HNP.

GENERAL DATA—continued

Spark plug (engines from No. XPAG/TD2/22735)	Champion NA.8.
Spark plug gap ... ..	.020 in. to .022 in. (.50 mm. to .56 mm.).
Ignition timing	T.D.C. (full retard).
Charging system	C.V.C.
Battery	Lucas GTW9A, 51-amp. at 10 hours. 12-volt. Positive earth return.
CAPACITIES	
Sump	9 pints (10.8 U.S. pints ; 5.1 litres) ; from Engine No. 14948, 10½ pints (12.6 U.S. pints ; 5.96 litres).
Gearbox	1½ pints (1.5 U.S. pints ; .71 litre).
Rear axle	2½ pints (2.7 U.S. pints ; 1.3 litres).
Cooling system	12 pints (14.4 U.S. pints ; 6.8 litres).
Brake fluid	1 pint (1.2 U.S. pints ; .57 litre).
Fuel tank	12½ gallons (15 U.S. gallons ; 57 litres).
GENERAL DIMENSIONS	
Length	145 in. (3.683 m.).
Width	58½ in. (1.489 m.).
Height	53 in. (1.346 m.).
Ground clearance	6 in. (15.24 cm.).
Weight (unladen)	18½ cwt. (2,072 lb.) (941 kg.).
Weight (laden and with two passengers)	22 cwt. (2,464 lb.) (1120 kg.).

TORQUE SPANNER DATA

Cylinder head stud nuts	500 lb. in. (5.75 m./kg.).
Connecting rod big-end bolts (to next split pin hole)	320 lb. in. (3.7 m./kg.).
Main bearing cap nuts (to next split pin hole)	750 lb. in. (8.6 m./kg.).
Steering wheel attachment nut	500 lb. in. (5.75 m./kg.).
Gudgeon pin clamp screw	400 lb. in. (4.6 m./kg.).

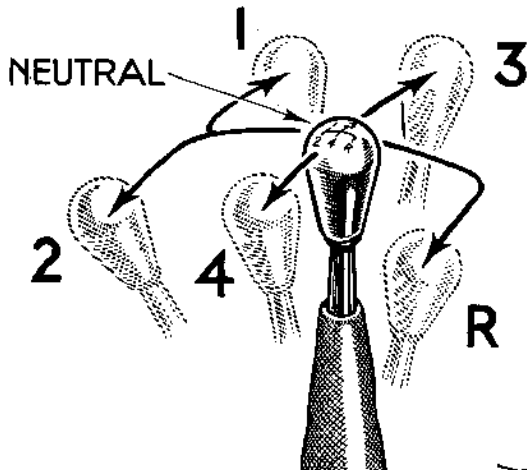
GENERAL INFORMATION

(SERIES "TD")

GEAR POSITIONS

The gearbox has four forward speeds, with synchromesh on second, third and top. The gear lever positions are shown in the illustration below.

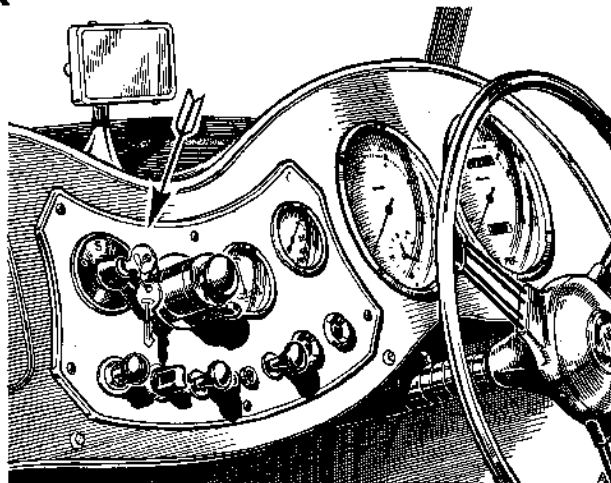
To engage reverse gear, move the gear lever to the extreme right of its neutral position; exert sufficient pressure to overcome the resistance of the spring-loaded stop, and move the lever rearwards.



The positions of the gear lever for selecting the various gears are here indicated.

The location of the gears is also indicated diagrammatically on the top of the gear lever knob.

The instrument panel with the ignition switch key indicated by the arrow. The ignition switch is in the centre of the lighting switch and the remainder of the instruments in the top row are the horn push and dipper switch, the ammeter, and the oil gauge, respectively. Later models have a foot-operated dipping switch, a combined water temperature and oil pressure gauge, and modified speedometer with headlamp beam indicator light and revolution indicator dials.



THE INSTRUMENT PANEL

All switches and instruments except the speedometer and revolution indicator are carried in the central instrument panel, with the exception of the dipping switch fitted to later models.

At the top left is the lighting switch controlling the lamps, in the centre of which is the key-operated ignition switch. Turning the switch clockwise switches on the ignition and the ignition warning light at the bottom right-hand corner of the panel.

To the immediate right of the lighting switch is the combined horn push and headlamp dimming switch. It is clearly marked "D" for the dip position and "H" for the full beams.

Later models are fitted with a foot-operated headlamp beam dipping switch and this switch lever is omitted on such models.

Next to the dipping switch is the ammeter. This is of the usual central zero type indicating both charge and discharge.

The right-hand instrument is the oil gauge. This should normally indicate a pressure in the region of 40 to 45 lb. per sq. in. (2.8 to 3.2 kg./cm.²) at normal running speeds. It will of course show a higher figure when the engine is cold and a lower figure when the engine is running slowly. On later models this is combined with a water temperature gauge.

So long as it is showing a reasonable pressure it may be taken that the circulating system is working satisfactorily.

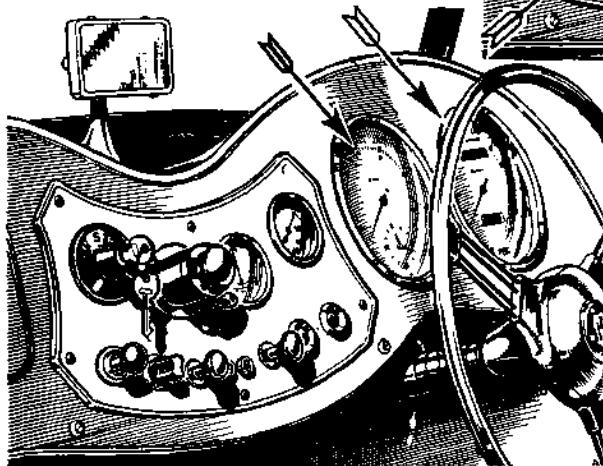
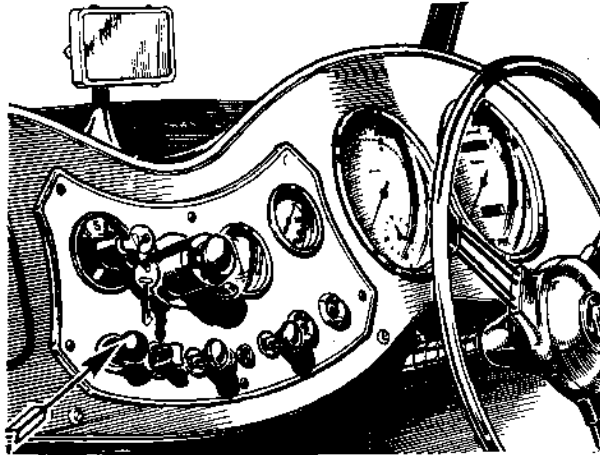
The bottom left-hand switch in the instrument panel is the switch for the panel light. It is of the rotary type.

GENERAL INFORMATION—continued

The next switch, reading from left to right, is the switch operating the fog-lamp. It is of the semi-rotary type. Fog-lamps are not fitted as standard, but the switch is ready-wired so that one may be fitted if desired.

Next is the mixture control knob which pulls out to provide an enriched mixture. It can be locked in several set open positions by turning it anti-clockwise through 90°. It should be returned to the "Off" position as soon as possible once the engine is running. The mixture control is interconnected with the throttle so as to co-ordinate the setting of the two automatically when starting from cold.

The instrument panel with the panel light switch indicated by arrow. The remaining items at the bottom of the panel are the fog-lamp switch, the mixture control, the inspection lamp plugs, the starter switch, the fuel warning light, and the ignition warning light.



On the fascia in front of the driver are the large-diameter revolution indicator and the speedometer.

In the centre of the panel are the two plug sockets for feeding an inspection light when required. They are always live and have no separate switch. The rims of the sockets are coloured red and black, indicating positive and negative in the accepted manner.

To the right of the sockets is the starter switch which is of the pull type. It must always be operated smartly and decisively over its full range of movement.

At the bottom right-hand corner of the instrument panel are two warning lights. The one on the extreme right is the ignition warning lamp which glows when the ignition is switched on, until the engine runs at sufficient speed to cause the dynamo to charge the battery.

The left-hand warning light comes into operation when the fuel in the tank falls to approximately 2½ to 3 gallons (11.3 to 13.5 litres), thus giving warning that the fuel supply is getting low and in need of replenishment at the first opportunity.

Two large instruments are located right in front of the driver on the fascia board. These are the revolution indicator and clock, and the speedometer, respectively.

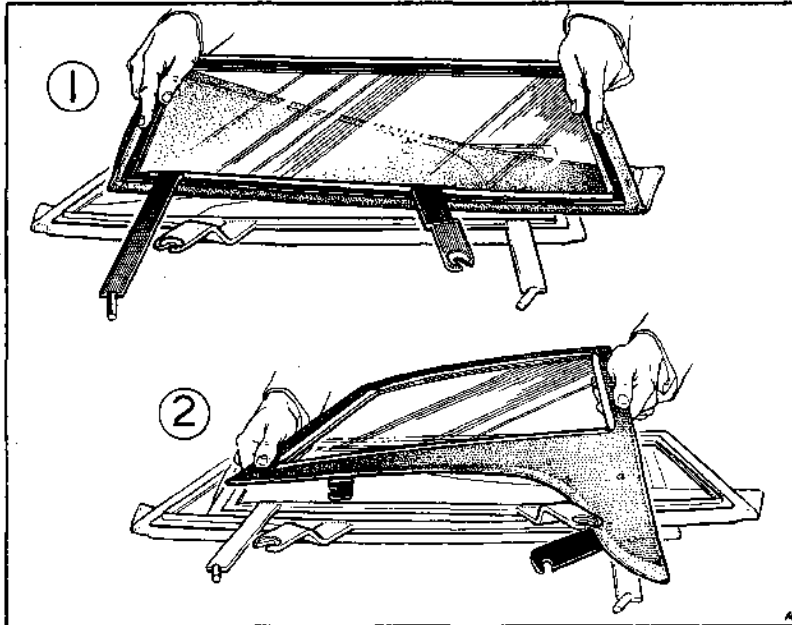
A knob below the speedometer enables the trip recorder scale to be returned to zero when it is pulled downwards and turned, and on later models a headlamp beam warning light is fitted in the speedometer dial which glows when the headlamp beams are in the raised position to give the driver warning to dip his lamps when approaching other traffic.

The clock in the revolution indicator is set by inserting the hand in the hole in the underpanel to reach the knob on the back-plate of the clock.

GENERAL INFORMATION—continued

SIDESCREEN STOWAGE (FIRST TYPE) (For details of second type see pages 17 and 18)

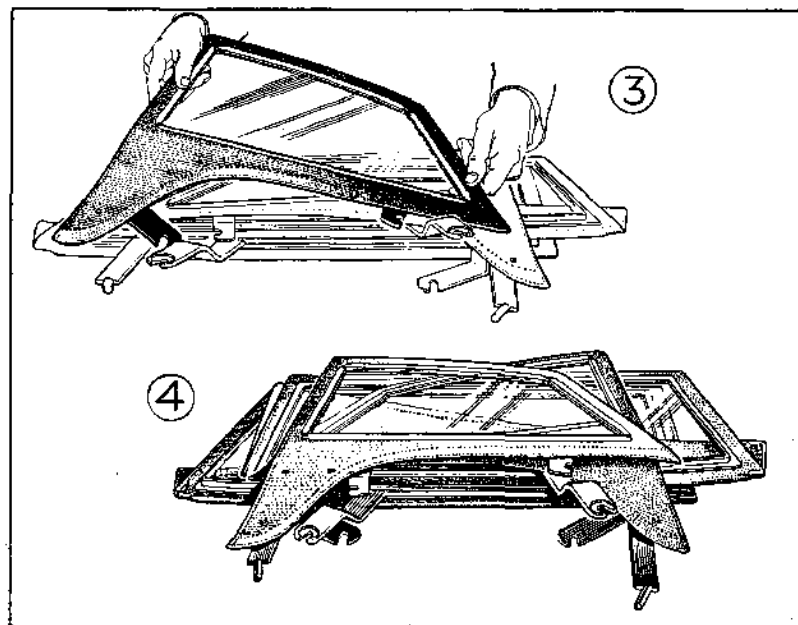
It is of the utmost importance that the sidescreens be packed together exactly as indicated, otherwise it will not be found possible to insert them into the compartment in the boot provided to house them. The necessary sequence is shown below.



Start with the right-hand front sidescreen and lay it down on something flat as indicated in (1), taking care that the stays are the right way up. Then place the left-hand front sidescreen on top of it as shown, with its flap folded under and the stays at opposite ends as illustrated.

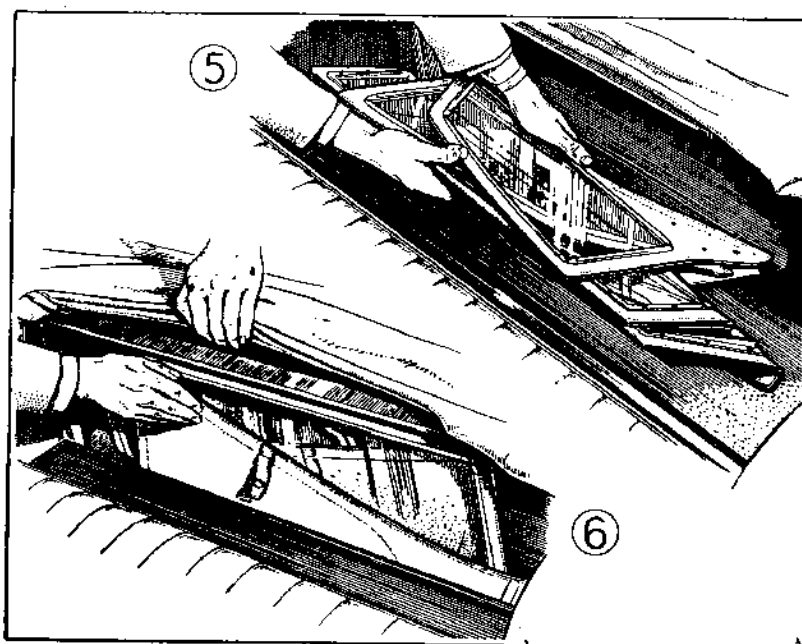
The right-hand rear sidescreen is then placed on top of the other two as shown in (2), tucking its front bracket underneath that of the left-hand front sidescreen, so that it lies flat upon the other, taking up the minimum amount of room.

This is followed by the left-hand rear sidescreen, which is laid upon the others in the opposite direction with its bracket slipped under the cranked stay of the right-hand front sidescreen with which the pack was first started (3). This produces a pack of minimum dimensions, as shown in (4).



GENERAL INFORMATION—continued

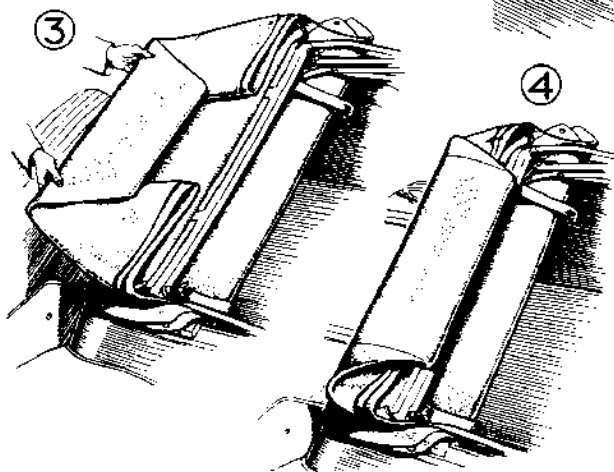
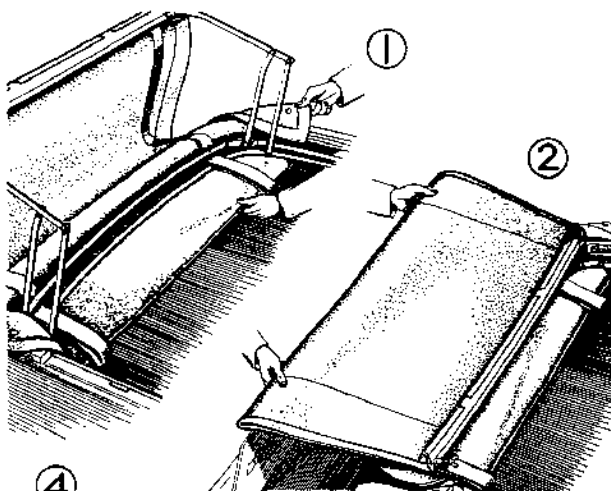
Finally the complete pack of screens (4) is transferred to the space in the body behind the seat provided to house them. They should be inserted into the compartment, brackets first (5), taking care that they are not forced into position or damaged, and holding back the edge of hood to facilitate their insertion as shown at (6).



FOLDING THE HOOD

To ensure that the hood does not receive unnecessary damage it is important that it should be folded correctly when stowed. The four steps for correctly folding the hood are here shown. Never fold the hood when it is damp or wet. Always wait till it dries.

Before folding the hood back, release the press buttons at each side. Make sure that no hood material is trapped between the hood-sticks, and that the rear panel of the hood is pulled well forward, as at (1). Then fold the hood-sticks right down and gently pull the hood material out as at (2).



Now fold the two corners in at right angles, and fold the hood as illustrated in (3). The hood material is then folded over again as shown at (4), and it is then ready for the tonneau cover to be fitted over it.

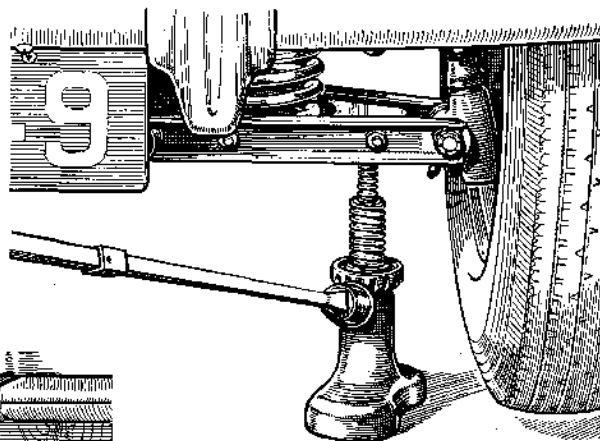
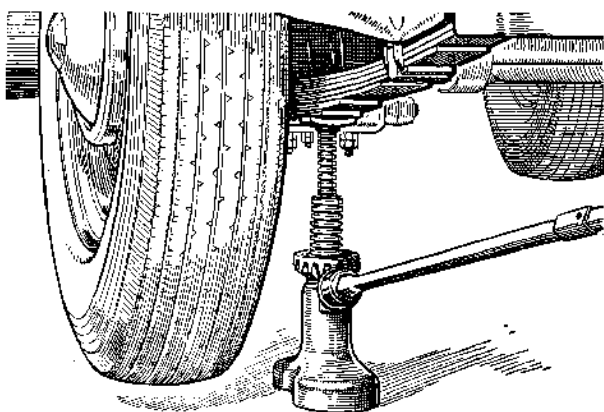
GENERAL INFORMATION—continued

JACKING THE CAR

When jacking the front wheels the jack pad should be located in the hollow on the under side of the outer end of the lower wishbone to avoid the possibility of the jack slipping.

In the case of the rear wheels the most convenient place is under the springs close to the axle as shown in the accompanying illustration.

When jacking the front wheels the jack should be engaged with the hollow of the lower wishbone pan as shown.



When used at the rear the jack is best engaged with the rear spring as close to the axle as possible.

WARMING UP THE ENGINE

As soon as the engine has started, return the mixture control to its half-way position. Do not race the engine while it is cold, but let it run at a fast tick-over—approximately 1,000 r.p.m., corresponding to 15 m.p.h. (24 km.p.h.) in top gear—until it has warmed to allow the oil to circulate properly. Return the mixture control to the completely "Off" position as soon as possible without causing the engine to splutter.

Blanking off the radiator will assist in warming the engine in cold weather, but never run the car with the radiator completely masked.

CHASSIS AND ENGINE NUMBERS

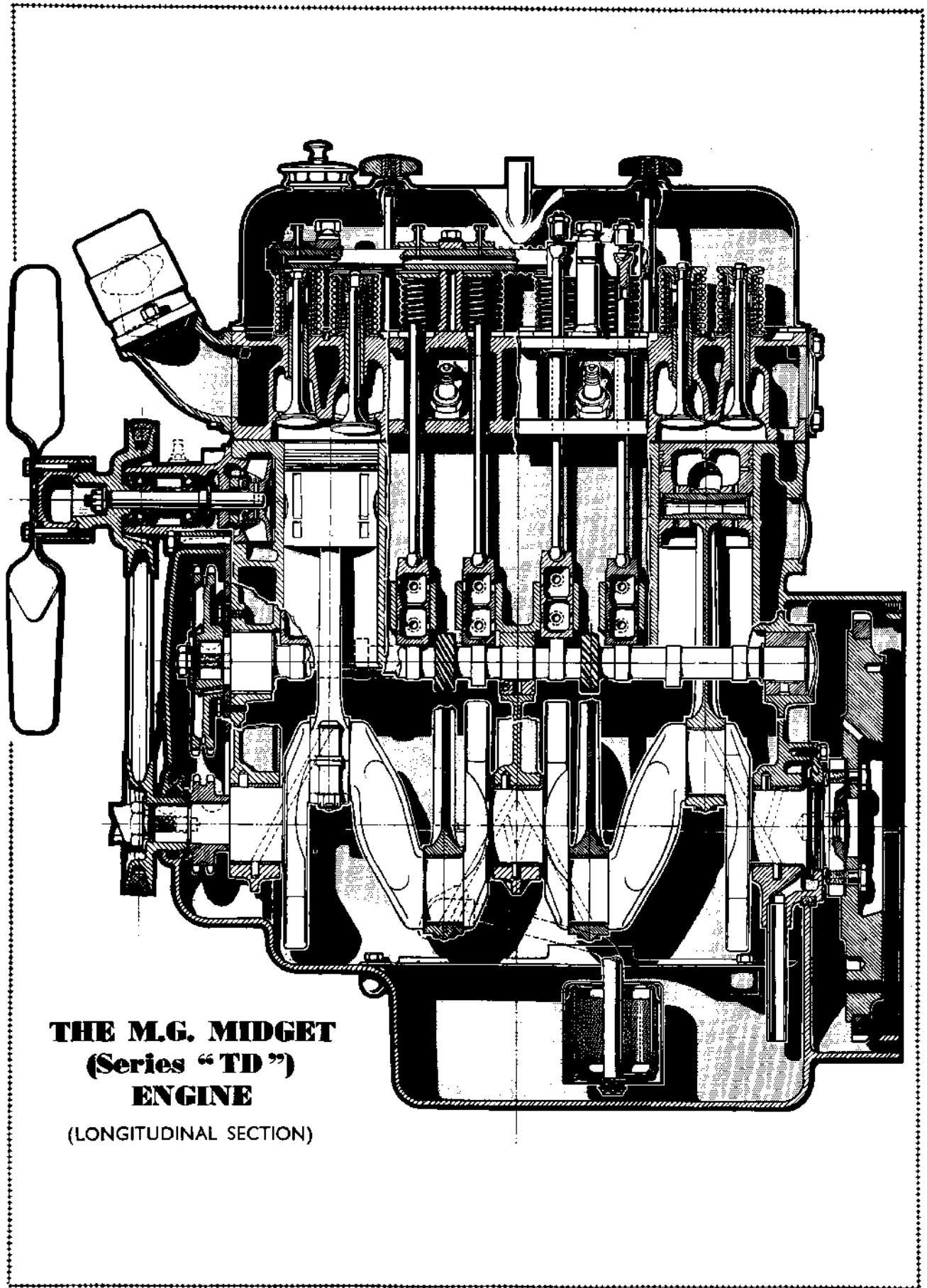
When in communication with the Company or your Dealer, always quote the type of model and the chassis and engine numbers. The registration number is of no assistance and is not required. Write your name and address legibly.

Model. This is stamped on the identification plate which is secured to the left-hand side of the dash panel beneath the bonnet.

Chassis Number. For convenience this is also stamped on the identification plate as well as on the chassis and should be quoted with its prefix.

Engine Number. Every engine carries a number stamped on a disc which is secured to the flywheel housing. This number is also duplicated on the identification plate.

Note.—On later models the model symbols and chassis number are incorporated in a single panel on the identification plate.



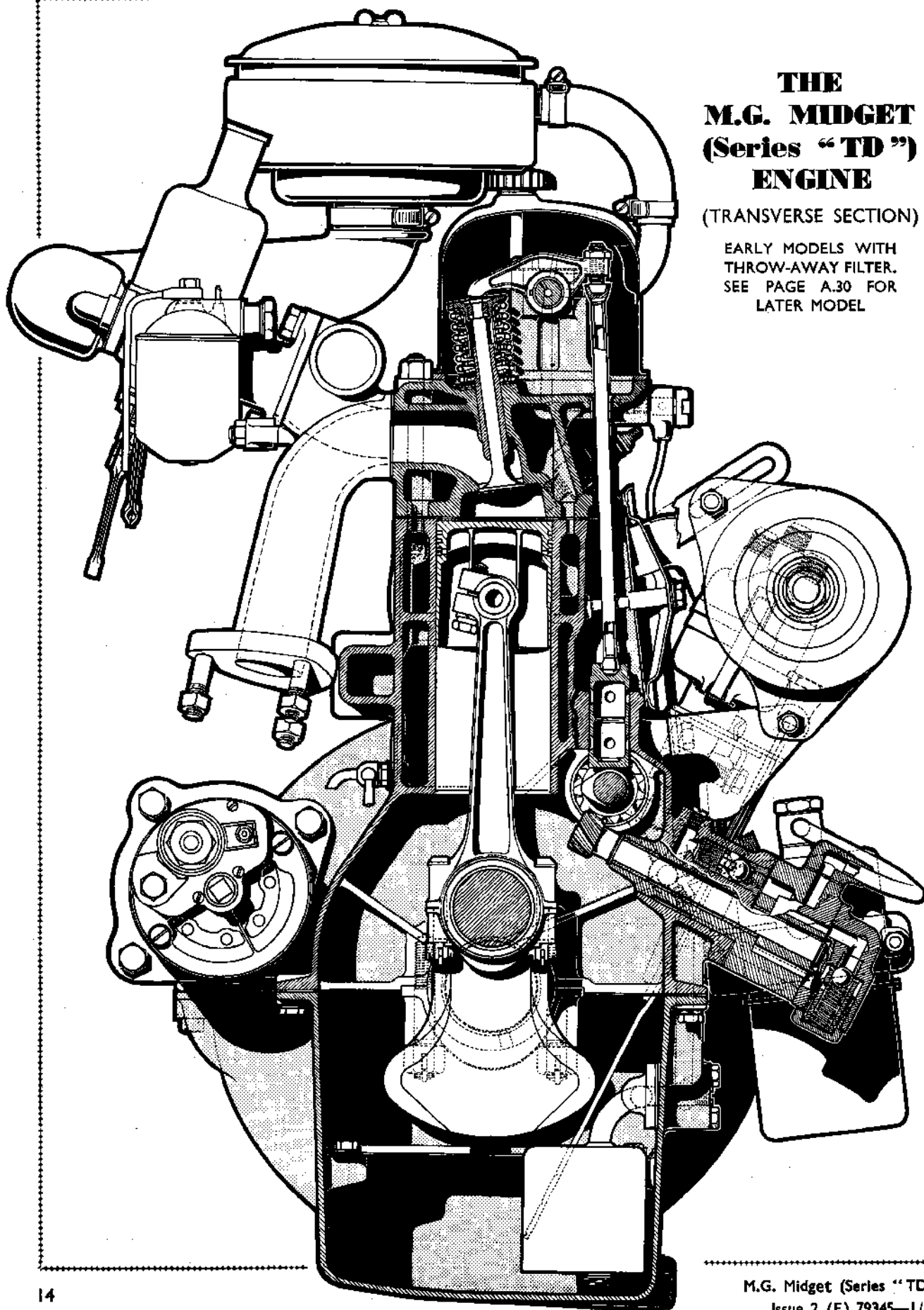
**THE M.G. MIDGET
(Series "TD")
ENGINE**

(LONGITUDINAL SECTION)

**THE
M.G. MIDGET
(Series "TD")
ENGINE**

(TRANSVERSE SECTION)

EARLY MODELS WITH
THROW-AWAY FILTER.
SEE PAGE A.30 FOR
LATER MODEL



MAINTENANCE ATTENTION

FIRST 500 MILES (800 KM.) FREE SERVICE ATTENTION

- (a) Drain sump, gearbox and back axle, and refill with appropriate lubricant.
 - (b) Oil and grease vehicle throughout with appropriate lubricant.
 - Note.**—New lubricants chargeable to customers.
 - (c) Check and, if necessary, adjust :—
 - (1) Ignition timing and automatic controls.
 - (2) Tappet clearances and valve rocker-shaft brackets to recommended pressures.
 - (3) Carburetter control gear, mixture setting and slow-running.
 - (4) Dynamo drive belt.
 - (5) Correct clearance for clutch pedal.
 - (6) Alignment of front wheels.
 - (7) All steering controls.
 - (8) Tyre pressures.
 - (9) Sparking plugs and distributor points.
 - (d) Check brakes functionally, also level of Lockheed fluid in supply tank.
 - (e) Look over and tighten all nuts, particularly cylinder head, manifold, universal joints, wheels, spring clips and body bolts. Also check tightness of all water connections and clips.
 - (f) Top up battery and check working of all electrical equipment.
 - (g) Inspect hydraulic dampers for leaks. Top up oil levels if necessary (piston type only).
 - (h) Check doors for ease of opening and closing. If necessary lightly smear dovetails and striking plates with approved lubricant.
- All this first service is free, only material used being charged for.

PERIODICAL

Every 250 miles (400 km.) : Inspect oil level in engine. Replenish if necessary.

Every 500 miles (800 km.) : Apply grease gun, filled with grease to Ref. D (page P.2) to the following grease nipple fittings, and give pump three or four strokes :—

4 on steering swivel pins. 2 on steering tie-rod arms.

Models with left-hand steering have an extra grease nipple on the clutch and brake pedal shaft. See that radiator is full of water. (See Section D.1).

Test tyre pressures. (See Section O.1.)

Every 1,000 miles (1600 km.) : Inspect oil level in gearbox and rear axle. Replenish if necessary to Ref. B (page P.2).

Apply grease gun filled with grease (Ref. page P.2) to all grease nipples.

Apply grease gun filled with grease to Ref. C (page P.2) to grease nipple on water pump spindle and give two or three strokes.

Examine level in Lockheed brake supply tank and replenish with Lockheed Genuine Brake Fluid if necessary. (See page M.4.)

Top up battery with distilled water.

Make visual inspection of hydraulic lines and pipes. Check brakes and adjust if necessary.

Add a thin engine oil to carburetter piston dashpots to Ref. F (page P.2).

Every 3,000 miles (5000 km.) : Drain engine and refill with fresh oil to Ref. A (page P.2).

Withdraw rotating arm from distributor and add a few drops of oil to the aperture. Lubricate the automatic advance mechanism with engine oil. Smear contact breaker rocker-arm pivot with grease to Ref. D (page P.2), or trace of engine oil.

Use the oilcan, filled with oil to Ref. F (page P.2), sparingly on the door hinges, bonnet locks, carburetter controls, hand brake lever and seat runners.

Remove dynamo lubricator cap and refill with the recommended grease to Ref. C (page P.2).

Clean and re-oil the air cleaner (overseas).

Check dynamo belt tension and adjust if necessary.

Clean petrol pump points. Check contact breaker gap.

Check clutch pedal free movement and adjust if necessary.

MAINTENANCE ATTENTION—continued

Clean and examine the gaps of the sparking plug points and make sure that they are not too wide; they should be .020 in. to .022 in. (.50 mm. to .56 mm.).

Change wheels round to regularise tyre wear.

Every 6,000 miles (10000 km.): Remove filters from carburetters and petrol pump, clean and replace. (See Section B.)

Grease the revolution indicator drive gearbox. Ref. D (page P.2).

Replace external oil filter on early models with a new one. On later models (from Engine No. 14224) fit new filter element.

Clean and re-oil air cleaner (Home).

Drain gearbox and rear axle. Refill with fresh oil.

Remove front wheel covers and give one stroke of grease gun, filled with grease to Ref. C (page P.2), to hub nipple (early models). Remove grease-retaining cap and replenish with grease to Ref. C (later models).

Check valve tappet clearance.

Tighten door hinge and striker plate fixing screws and spring seat bolts.

Check wheel alignment.

Every 12,000 miles (20000 km.): Remove sump. Clean sump and internal oil filter, replace and refill with fresh oil.

Examine fluid level in front and rear dampers, clean and replenish with Girling or Armstrong piston-type fluid if necessary. (See Section L.I.)

Replace sparking plugs with new ones. Check dynamo and starter brushes.

Adjust clutch pedal clearance. (See Section E.I.)

Lubricate steering rack and pinion to Ref. B (page P.2). Drain and flush out radiator.

Check steering and suspension moving parts for wear.

FROST PRECAUTIONS

If the car is not stored in a warmed building, steps must be taken to prevent the cooling water from freezing during frosty weather. Water upon freezing expands, with the result that there is a very considerable risk of bursting either the radiator or the cylinder block by the pressure generated. As a precautionary measure, the water should be drawn from the radiator before the car is stored for the night, or, better still, an anti-freezing solution may be used.

We recommend the use of Smiths "Bluecol," Shell "Snowflake" or Filtrate "Nevafreze" non-corrosive anti-freeze in order to protect the cooling system.

The recommended quantities of anti-freeze for different degrees of frost resistance are:—

	Down to 7° F. (—14° C.)	Down to 0° F. (—18° C.)
Series "TD" Quantity	2½ pints (1.4 litres)	Quantity 3½ pints (2 litres)
Series "TF" Quantity	1½ pints (.85 litre)	Quantity 2 pints (1.14 litres)

Where temperatures below 0° F. or —18° C. are likely to be encountered, a solution of at least 25 per cent. of anti-freeze must be used to ensure immunity from trouble. Consult your local Dealer on this matter.

First decide what degree of frost protection is required before adding anti-freeze to radiator.

Make sure that the cooling system is water-tight and examine all joints, replacing any defective rubber hose with a new one.

Before introducing anti-freeze mixture to the radiator it is advisable to clean out the cooling system thoroughly by draining out the water and swilling out the water passages with a hose inserted in the radiator filler, keeping the drain tap open.

Avoid excessive topping up, otherwise there is a risk of losing valuable anti-freeze due to expansion of the solution. Only top up when cooling system is at its normal running temperature.

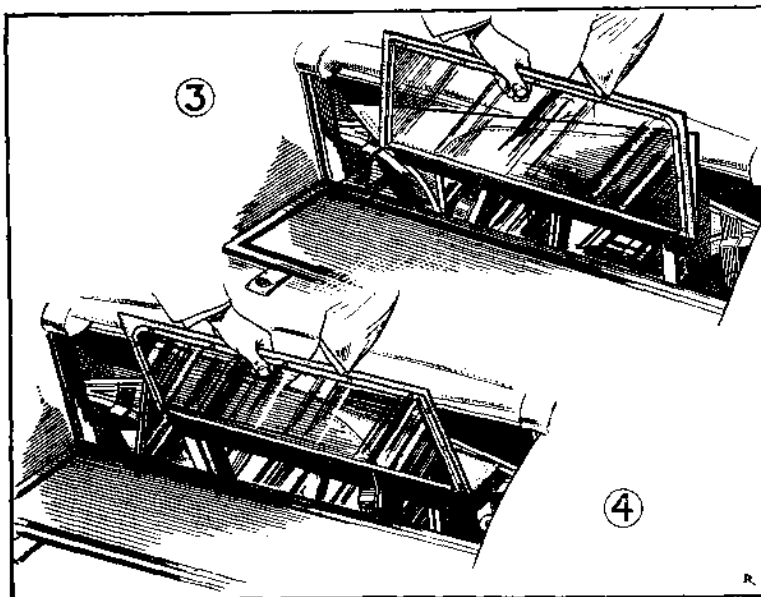
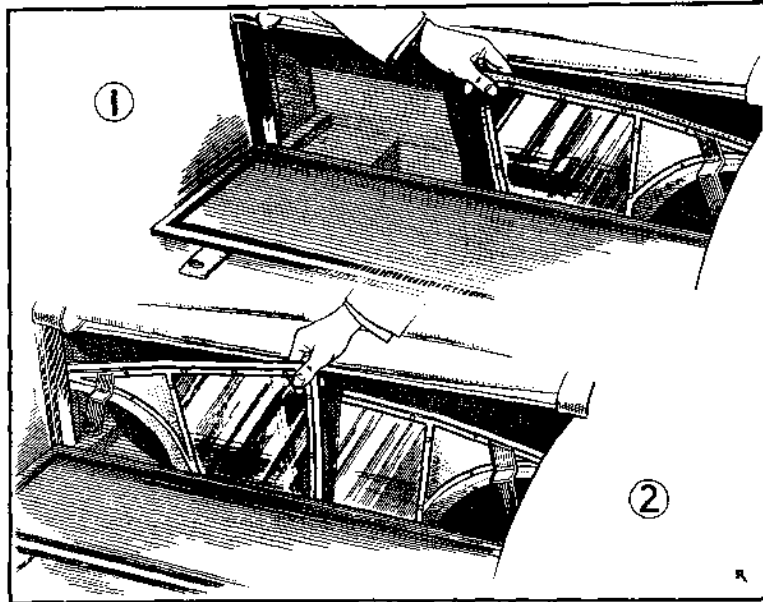
Generally speaking, anti-freeze is not injurious to cellulose paint, provided it is wiped off in reasonable time. It must not, however, be allowed to remain on the paintwork.

GENERAL INFORMATION—continued

SIDESCREEN STOWAGE (SECOND TYPE)

Later models are fitted with a modified hood and deeper sidescreens. The following directions must be followed when carrying out the stowage of the sidescreens on such models, and no attempt must be made to stow them as described on pages 10 and 11.

Start with the left-hand rear sidescreen and place it in the space provided for housing the sidescreens, as in Fig. 1, with the attachment lugs facing towards the front of the car and with the canvas part up against the left-hand body panel. The right-hand rear sidescreen should now be placed in front of the first one, again with the attachment lugs facing towards the front of the car, but with the canvas part up against the right-hand panel, as in Fig. 2.

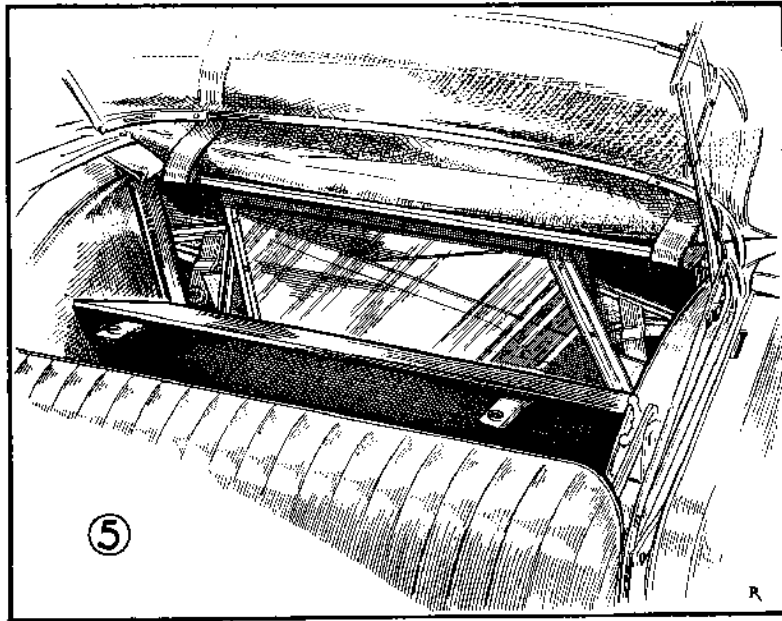


Insert the right-hand front sidescreen as in Fig. 3 with its lugs pointing downwards and its flap folded under towards the rear of the car. Make sure that it is inserted as far downwards as it will go. This is followed by the left-hand front sidescreen, which is also inserted with its attachment lugs to the bottom and its flap folded under to the rear, as in Fig. 4. Be careful not to scratch the transparent

material of which the screens are made. If stowage is carried out correctly the use of force is unnecessary.

GENERAL INFORMATION—continued

Finally, ensure that the screens are inserted fully, as in Fig. 5, when the stowage compartment lid may be closed and secured by means of the two press studs.



FOLDING THE HOOD

The hood on later models is fitted with an extra hood stick in the frame at the front end. This, however, does not affect the folding procedure, and the Instructions given on page 11 may be followed when performing this operation.

GENERAL DATA

(SERIES "TF")

ENGINE TYPE	... ..	XPAG/TF (to Chassis No. 6500). XPEG/TF (from Chassis No. 6501).
Number of cylinders	... ..	Four.
		XPAG/TF XPEG/TF
Capacity	... ..	1250 c.c. (76½ cu. in.) 1466 c.c. (89.4 cu. in.).
Bore	... ..	66.5 mm. (2.618 in.). 72 mm. (2.835 in.).
Stroke	... ..	90 mm. (3.543 in.). 90 mm. (3.543 in.).
Compression ratio	... ..	8.1 : 1. 8.3 : 1.
R.A.C. rating	... ..	10.97 h.p. 12.86 h.p.
B.H.P.	... ..	57 at 5,500 r.p.m. 63 at 5,000 r.p.m.
Compression ratio	... ..	8 to 1.
System of cooling	... ..	Thermo-siphon—pump and fan assisted.
Radiator hose top	... ..	Length 4 ⁵ / ₈ in. (10.95 cm.). Diameter 1½ in. (3.8 cm.).
Radiator hose bottom	... ..	Length 2¼ in. (5.71 cm.). Diameter 1½ in. (2.86 cm.).
First oversize bore	... ..	+0.020 in. (-50 mm.).
Second oversize bore (maximum)	... ..	+0.040 in. (-1.00 mm.).
Firing order	... ..	1-3-4-2.
Piston clearance at pressure face below oil ring	... ..	.0021 in. to .0029 in. (-0.56 mm. to -0.71 mm.).
Ring gap	... ..	.006 in. to .010 in. (-152 mm. to -254 mm.).
Number of compression rings	... ..	Two.
Width of compression rings	... ..	2.25 mm. (-0.885 in.).
Number of oil rings	... ..	One.
Width of oil ring	... ..	4.0 mm. (-1.575 in.).
Oil pressure relief valve operates	... ..	50 to 70 lb. per sq. in. (3.5 to 5.0 kg./cm. ²).
Oil pressure (normal)	... ..	40 to 45 lb. per sq. in. (2.8 to 3.2 kg./cm. ²).
Gudgeon pin type	... ..	Clamped.
Gudgeon pin diameter	... ..	.7087 in. $\left\{ \begin{array}{l} +.0004 \text{ in.} \\ +.0006 \text{ in.} \\ +.010 \text{ mm.} \\ +.015 \text{ mm.} \end{array} \right.$ 18 mm.
Fit in piston	... ..	Double thumb press.
Fit in connecting rod	... ..	Clamped.
Crankpin diameter (standard)	... ..	1.772 in. (45 mm.).
Crankpin minimum diameter for regrind	... ..	1.722 in. (43.75 mm.). No regrind permissible on XPEG.
Connecting rod—length between centres	... ..	7.008 in. (178 mm.).
Connecting rod—type of bearing	... ..	Shimless, steel-backed, white-metal-lined.
Connecting rod—side clearance	... ..	.004 in. to .006 in. (-10 mm. to -15 mm.).
Connecting rod—diametrical clearance	... ..	.0005 in. to .002 in. (-0.11 mm. to -0.56 mm.).
Number of crankshaft bearings	... ..	Three.
Type of main bearings	... ..	Shimless, steel-backed, white-metal-lined.
Standard main journal diameter	... ..	2.047 in. (52 mm.).
Main journals first regrind diameter	... ..	2.027 in. (51.49 mm.). No regrind permissible on XPEG.
Main journals second regrind diameter (minimum)	... ..	2.007 in. (50.98 mm.).
Main bearings—length	... ..	Front 1.496 in. (38 mm.). Centre 1.496 in. (38 mm.). Rear 1.575 in. (40 mm.).
Centre main bearing—end clearance	... ..	.0014 in. to .0037 in. (-0.35 mm. to -0.95 mm.).
Main bearings—diametrical clearance	... ..	.0008 in. to .003 in. (-0.20 mm. to -0.75 mm.).
Crankshaft—end thrust taken on	... ..	Centre bearing.
Number of camshaft bearings	... ..	Three.
Type of camshaft bearings	... ..	White metal (front). Zinc alloy (rear and centre).

GENERAL DATA—continued

Camshaft—bearing clearance	... ..	Front .0016 in. to .004 in. (.04 mm. to .10 mm.). Rear and centre .0018 in. to .0037 in. (.045 mm. to .095 mm.).
Camshaft—end thrust taken on	... ..	Front end.
Camshaft—end float	... ..	.005 in. to .013 in. (.125 mm. to .325 mm.).
Camshaft—drive (type)	... ..	Duplex chain, $\frac{3}{8}$ in. pitch, 60 pitches, endless.
Valve timing markings	... ..	White chain links and "T" marks on wheels.
Exhaust valve throat diameter	... ..	1.126 in. (28.6 mm.).
Exhaust valve diameter	... ..	Head 1.338 in. (34 mm.); Stem .315 in. (8 mm.).
Inlet valve throat diameter	... ..	1.274 in. (32.6 mm.).
Inlet valve diameter	... ..	Head 1.417 in. (36 mm.); Stem .315 in. (8 mm.).
Valve seat angle	... ..	30°.
Tappet type	... ..	Hollow.
Valve lift—Inlet	... ..	.315 in. (8 mm.).
Valve lift—exhaust	... ..	.315 in. (8 mm.).
Inlet valve opens	... ..	5° before T.D.C.
Inlet valve closes	... ..	45° after B.D.C.
Exhaust valve opens	... ..	45° before B.D.C.
Exhaust valve closes	... ..	5° after T.D.C.
Valve spring pressure—shut	... Inner 41.1 lb. at 1.753 in. (18.64 kg. at 4.453 cm.). Outer 73.25 lb. at 1.847 in. (33.23 kg. at 4.692 cm.).	} Total 114.35 lb. (51.87 kg.)
Valve spring pressure—open	... Inner 55 lb. at 1.438 in. (24.95 kg. at 3.678 cm.). Outer 95 lb. at 1.532 in. (43.09 kg. at 3.89 cm.).	
Inlet valve opens—piston traverse	... ..	.009 in. (.23 mm.).
Inlet valve working clearance (hot)	... ..	.012 in. (.30 mm.).
Exhaust valve working clearance (hot)	... ..	.012 in. (.30 mm.).
Valve guides	... ..	Removable.

FUEL SYSTEM

Fuel tank reserve level	... ..	Warning light on panel.
Fuel delivery	... ..	S.U. electric pump.
Carburettors	... ..	S.U. semi-downdraught.
Carburettor needles	... ..	Standard—G.J. Rich—H.I. Weak—G.L.

CLUTCH

Type	... ..	Borg & Beck 8 in. (20.3 cm.) diameter. Dry plate.
Facing	... ..	Woven yarn type.

GEARBOX

Synchromesh	... ..	Second, third and top.
Ratios		<i>Gearbox</i> <i>Overall 8/39</i>
	Top	1.00 4.875
	Third	1.385 6.752
	Second	2.07 10.09
	Bottom	3.5 17.06
	Reverse	3.5 17.06

FRONT SUSPENSION AND STEERING

Camber (static position)	... ..	1° positive (tolerance $\pm 1^\circ$).
Castor angle	... ..	2° $\pm \frac{1}{2}^\circ$ with side-members parallel to road.
Toe-in	... ..	Nil.
King-pin inclination	... ..	9° to 10 $\frac{1}{2}^\circ$ full bump.

GENERAL DATA—continued

Track (disc wheels)	Front 47 $\frac{3}{8}$ in. (1.203 m.).	Rear 50 in. (1.27 m.).
Track (wire wheels)	Front 48 $\frac{3}{8}$ in. (1.224 m.).	Rear 50 $\frac{1}{8}$ in. (1.29 m.).
Turning circle	31 ft. 3 in. (9.525 m.).	
Wheelbase	7 ft. 10 in. (2.388 m.).	
Tyre size	5.50—15.	
Tyre pressures	18 lb. per sq. in. (1.27 kg./cm. ²).	
REAR AXLE		
Type of axle	Semi-floating.	
Type of drive	Hypoid.	
Ratio	8/39 = 4.875 : 1. Alternative ratios 4.55 : 1 and 5.125 : 1.	
Adjustment	By spacers and special fixtures.	
BRAKES		
Type	Lockheed hydraulic two leading shoe (front) (9 in. dia.).	
Type of linings	Ferodo DM.7.	
Lining size—front	8.75 in. × 1.5 in. × .187 in. (22.22 cm. × 3.81 cm. × .47 cm.).	
Lining size—rear	8.75 in. × 1.5 in. × .187 in. (22.22 cm. × 3.81 cm. × .47 cm.).	
Number of rivets	Twelve per lining.	
SPRINGS (front)		
Type	Coil.	
Free length	9.59 in. ± $\frac{1}{16}$ in. (24.36 cm. ± 1.58 mm.).	
Mean coil diameter	3.238 in. (8.24 cm.).	
Number of effective coils	7.5.	
Diameter of wire (ground) ... ..	.498 in. (11.27 cm.).	
Maximum deflection	4.24 in. (10.78 cm.).	
SPRINGS (rear)		
Type	Half-elliptic.	
Length	42 $\frac{1}{2}$ in. (107.95 cm.).	
Width	1 $\frac{1}{2}$ in. (3.81 cm.).	
Number of leaves	Seven.	
Thickness of leaves	$\frac{7}{16}$ in. (5.56 mm.).	
Camber (free)	2.85 in. (7.24 cm.).	
Working load	397 lb. at nil camber.	
HYDRAULIC DAMPERS		
Type	Girling or Armstrong.	
ELECTRICAL		
Distributor rotation	Counter-clockwise.	
Automatic advance	25° on crankshaft at 3,100 r.p.m.	
Contact breaker gap ... ..	.014 in. to .016 in. (.36 mm. to .40 mm.).	
Spark plug	Champion NA.8 (standard equipment) (14 mm.), $\frac{3}{4}$ in. reach.	
Spark plug gap ... ..	.020 in. to .022 in. (.50 mm. to .56 mm.).	
Ignition timing	T.D.C. (full retard).	
Charging system	C.V.C.	
Battery	Lucas GTW9A2, 51-amp. at 10 hours. 12-volt. Positive earth return.	

GENERAL DATA—continued

CAPACITIES

Sump	...	...	...	...	...	10½ pints (12.6 U.S. pints ; 5.96 litres).
Gearbox	...	...	...	...	...	1½ pints (1.5 U.S. pints ; .71 litre).
Rear axle	...	...	...	...	...	2½ pints (2.7 U.S. pints ; 1.3 litres).
Cooling system	...	...	...	...	...	10½ pints (12.3 U.S. pints ; 5.7 litres).
Brake fluid	...	...	...	...	...	1 pint (1.2 U.S. pints ; .57 litre).
Fuel tank	...	...	...	...	...	12 gallons (14.4 U.S. gallons ; 54 litres).

GENERAL DIMENSIONS

Length	...	...	...	...	...	147 in. (3.74 m.).
Width	...	...	...	...	...	59½ in. (1.518 m.).
Height	...	...	...	...	...	52½ in. (1.34 m.).
Ground clearance	...	...	...	...	...	6 in. (15.24 cm.).
Turning circle R.H.	...	...	...	...	...	31 ft. 3 in. (9.525 m.).
Turning circle L.H.	...	...	...	...	...	31 ft. 3 in. (9.525 m.).
Weight (unladen)	...	...	...	...	...	17 cwt. 1 qr. (1,932 lb.) (878 kg.).
Weight (laden and with two passengers)	...	...	...	...	...	22 cwt. (2,464 lb.) (1120 kg.).

TORQUE SPANNER DATA

Cylinder head stud nuts	...	...	...	...	600 lb./in. (6.9 kg./m.) (up to Engine No. XPAG/TF/31727).
					500 lb./in. (5.75 kg./m.) (from Engine No. XPEG/TF/31728).
Connecting rod big-end bolts (to next split pin hole)	...	...	...	...	320 lb./in. (3.7 kg./m.).
Main bearing cap nuts (to next split pin hole)	...	...	...	...	750 lb./in. (8.6 kg./m.).
Steering wheel attachment nut	...	...	...	...	500 lb./in. (5.75 kg./m.).

GENERAL INFORMATION

(SERIES "TF")

THE INSTRUMENT PANEL

All switches and instruments, except the windshield wiper, horn, direction indicator and dipper switches, are carried on the instrument panel.

The top left-hand switch is of the two-position type. When the knob is pulled out to the first stop it switches on the panel illumination lamps. A slight clockwise rotation enables it to be pulled out to the second stop, switching on the map-reading lamps located under the rim of the scuttle.

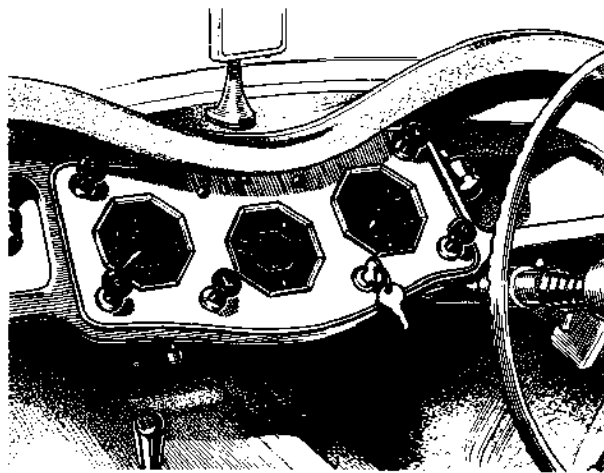
The top right-hand switch marked "A" is for use in conjunction with a fog-lamp when this item of special equipment is fitted. It is already wired into the harness, and the lead for the fog-lamp at the front end is taped to the harness for protection.

The bottom left-hand control knob marked "C" regulates the position of the jets in the carburetters to provide an enriched mixture for cold starting and running. Pull out to enrich the mixture and turn 90° in an anti-clockwise direction to lock. Gradually return the control to the "off" position as rapidly as the warming engine will allow.

The starter control occupies the lower right-hand corner of the panel. It is marked "S" and should be operated smartly and decisively over its full range.

The bottom left-hand centre control knob is marked "L" and is the lamp switch. When it is pulled out to its first stop the sidelamps, number-plate lamp and the stop/tail-lamps are switched on. Rotating it clockwise and pulling it out to its second stop switches on the headlight beams which are then under the additional control of the foot-operated dipping switch.

The ignition switch is the bottom right-hand centre, key-type switch.



The Instrument Panel of the M.G. Midget (Series "TF").

INSTRUMENTS

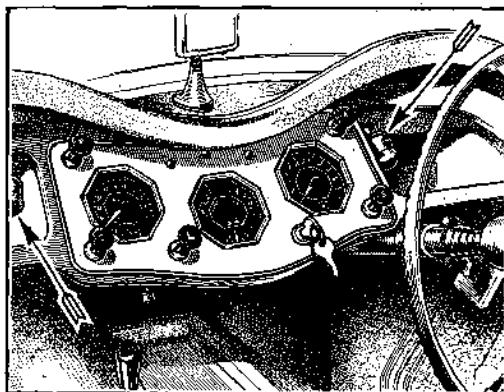
The instruments are grouped in three octagonal dials.

The right-hand dial is the speedometer with total and trip mileage recorders. It also houses the clock.

The centre dial carries the water temperature indicator, the oil pressure gauge and the ammeter.

GENERAL INFORMATION—continued

The left-hand dial is the engine revolution counter calibrated in hundreds of revolutions per minute. At the bottom of the dial is the headlamp main beam warning light which glows red when the beams are in the raised position to warn the driver to dip them when approaching oncoming traffic.



The Windshield Wiper Controls.

CONTROLS ON THE FACIA

At the extreme corner of the facia on the driver's side is a three-position self-cancelling switch operating the direction indicators which are of the flashing type.

The horn switch is located under the rim of the scuttle on the driver's side.

To bring the wiper into operation, push in the knob located inside the glove box on the driver's side and rotate it to bring the wiper arm into the operating position. The arm on the passenger's side is brought into action in a similar way but only operates when the driver's arm is working.

WARNING LIGHTS

There are three warning lights in the top centre of the panel.

The centre one is the ignition warning light (red).

The left-hand one is the fuel warning light indicating that the fuel supply has fallen to approximately two gallons (9.1 litres) and requires replenishing at the first opportunity (blue).

The right-hand warning light provides visual indication that the direction indicators are in action (green).

As already mentioned, the headlamp main beam warning light is at the bottom of the revolution indicator (red).

SETTING THE CLOCK

The hands are set by pressing the knob at the back of the clock to engage the hands, and turning it in the appropriate direction. Access to the knob is obtained through the aperture in the scuttle lining.

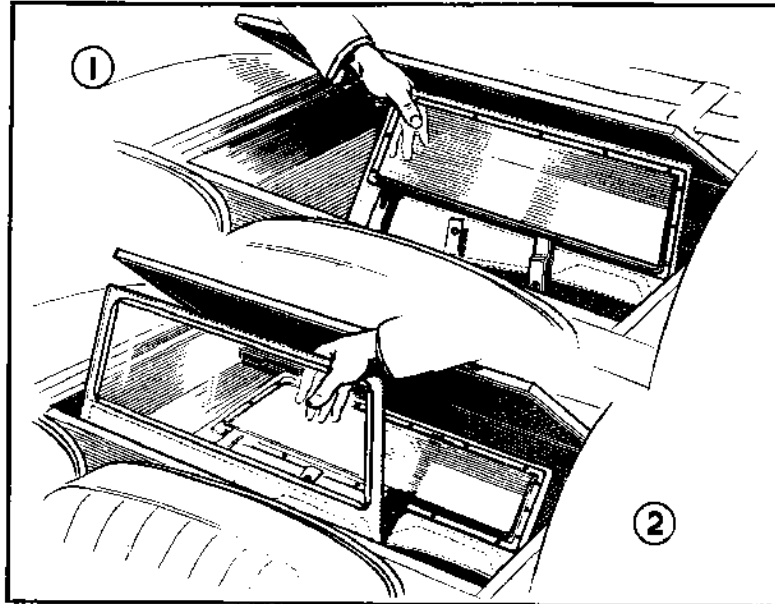
SETTING THE SPEEDOMETER TRIP RECORDER

The speedometer trip recorder is reset by pushing upwards the knob projecting under the facia below the speedometer, and turning it until all the figures are returned to zero.

GENERAL INFORMATION—continued

SIDESCREEN STOWAGE ("TF")

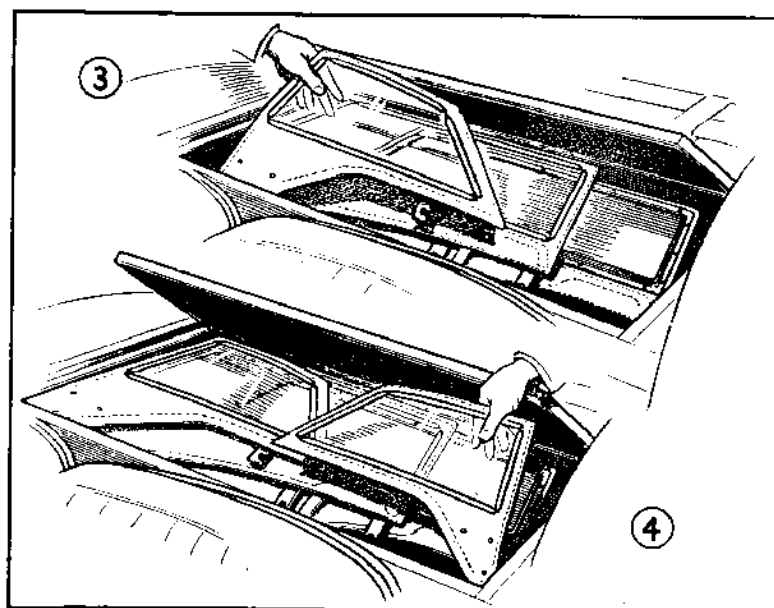
When not in use the sidescreens are stowed in the special locker behind the seats.



It is of the utmost importance that the sidescreens be packed together exactly as indicated, otherwise it will be found difficult to insert them into their compartment.

Start with the left-hand front sidescreen and stow it face downwards with the top edge against the rear of the stowage compartment and the front lower point against the left-hand wheel arch (1).

Place the right-hand front sidescreen on top of the left-hand one with its face side uppermost, the top edge against the rear of the stowage space and its rear edge against the right-hand wheel arch (2).

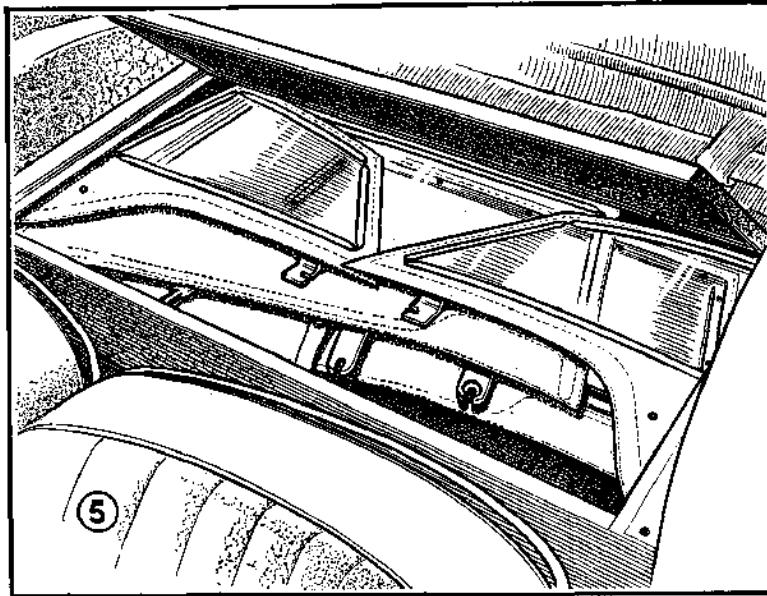


GENERAL INFORMATION—*continued*

The left-hand rear sidescreen is then replaced on top of the front sidescreens with its chromium-plated side uppermost and its front edge against the right-hand wheel arch (3).

Finally Insert the right-hand rear sidescreen with its chromium-plated side uppermost and its front edge against the left-hand wheel arch (4).

The screens are finally stowed as shown below (5).



FOLDING THE HOOD

As for M.G. Midget (Series "TD").

SECTION A

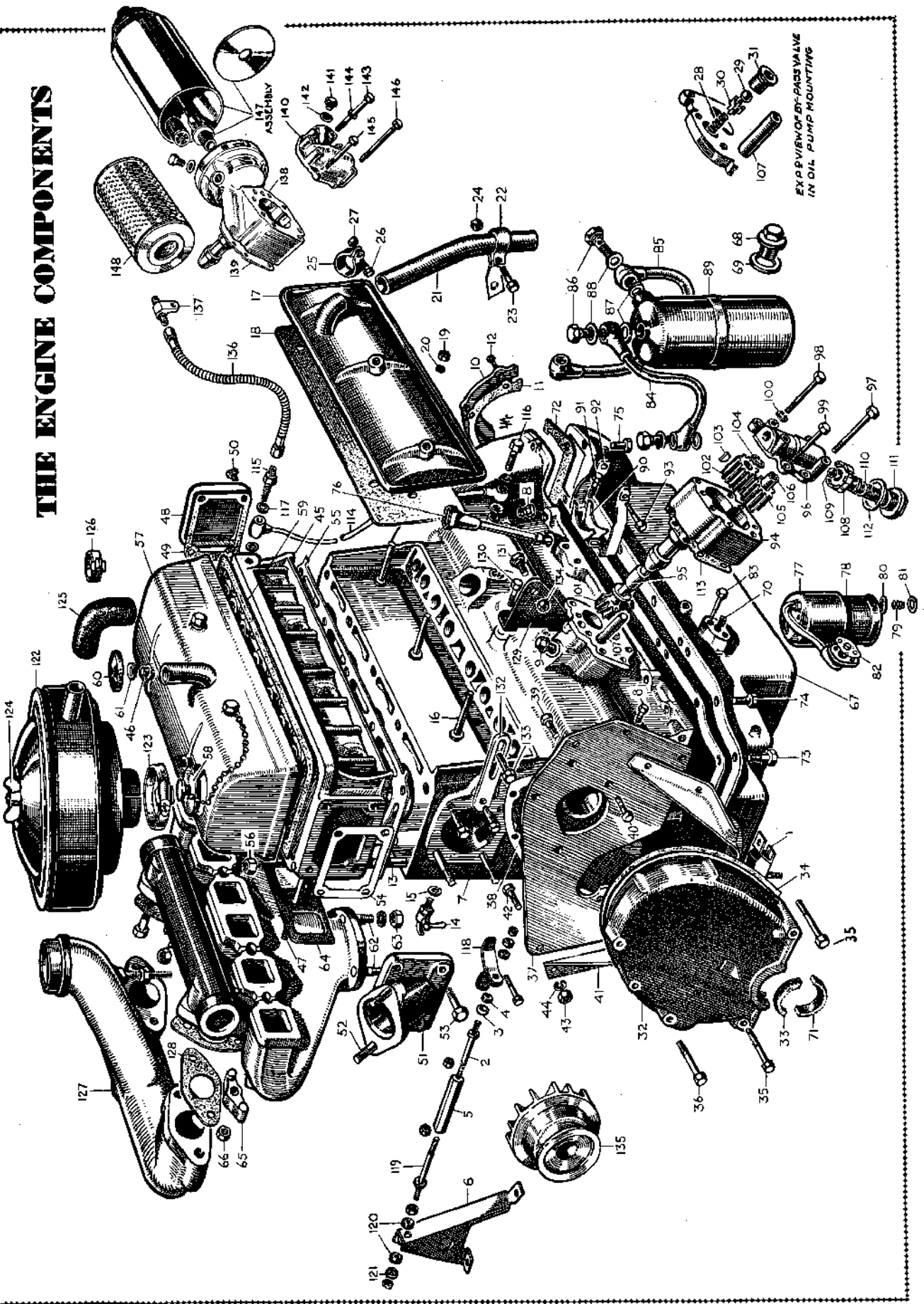
THE ENGINE

General Description.

The Lubrication System.

- Section No. A.1 Draining the engine sump.
- Section No. A.2 Removal and replacement of the sump.
- Section No. A.3 Removal of the oil pump.
- Section No. A.4 Dismantling, reassembling and replacing the oil pump.
- Section No. A.5 Removal and replacement of oil pressure relief valve.
- Section No. A.6 Emergency relief valve.
- Section No. A.7 Removal and replacement of main and big-end bearings.
- Section No. A.8 Removal and replacement of the rocker assembly.
- Section No. A.9 Removal and replacement of the cylinder head.
- Section No. A.10 Removal and replacement of the pistons and connecting rods.
- Section No. A.11 Dismantling and reassembling the piston and connecting rod.
- Section No. A.12 Fitting gudgeon pins.
- Section No. A.13 Removal and replacement of piston rings.
- Section No. A.14 Piston sizes and cylinder bores.
- Section No. A.15 Removal and replacement of carburetters.
- Section No. A.16 Removal of the exhaust and Inlet manifold.
- Section No. A.17 Removal and replacement of the water pump.
- Section No. A.18 Removal of the timing chain case.
- Section No. A.19 Replacement of the timing chain case.
- Section No. A.20 Removal of the timing chain.
- Section No. A.21 Replacement of the timing chain.
- Section No. A.22 The timing chain tensioner.
- Section No. A.23 Removal of the chain tensioner.
- Section No. A.24 Removal and replacement of the tappets.
- Section No. A.25 Removal and replacement of the camshaft.
- Section No. A.26 Camshaft bearings.
- Section No. A.27 Tappet adjustment.
- Section No. A.28 Removing the valves and valve grinding.
- Section No. A.29 Grinding and testing the valves and their seatings.
- Section No. A.30 Removal and replacement of the valve guides.
- Section No. A.31 Removal and replacement of the engine and gearbox
- Section No. A.32 Removal and replacement of the flywheel.
- Section No. A.33 Removal and replacement of crankshaft (engine out of chassis).
- Section No. A.34 Regrinding the crankshaft.
- Section No. A.35 Oil pressure.
- Section No. A.36 Rear main bearing oil seal cover.
- Section No. A.37 Top dead centre mark.
- Section No. A.38 The engine mounting and control link.
- Section No. A.39 Locating troubles.
- Section No. A.40 Excessive oil consumption.
- Section No. A.41 The modified oil pump.
- Section No. A.42 The cylinder head and gasket.
- Section No. A.43 Modified push-rods and adjusting screws.
- Section No. A.44 The modified camshaft.
- Section No. A.45 Modified oil gauge pipe banjo.

THE ENGINE COMPONENTS



EXPLODED VIEW OF OIL PUMP MOUNTING IN OIL PUMP MOUNTING

KEY TO THE ENGINE COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Mounting rubber—engine front.	51.	Water outlet pipe (studded).	101.	Oil pump shaft and gear.
2.	Engine control link—L/H thread.	52.	Stud—thermostat.	102.	Gear—driving.
3.	Cup—link.	53.	Bolt—water outlet pipe.	103.	Key—driving gear.
4.	Link cup rubber.	54.	Joint—water outlet pipe.	104.	Circclip—driving gear.
5.	Adjuster.	55.	Gasket—cylinder head.	105.	Oil pump gear (driven) with bush.
6.	Engine control bracket.	56.	Nut—securing cylinder head.	106.	Bush—oil pump gear.
7.	Cylinder block complete.	57.	Cylinder head cover assembly.	107.	Spindle—driven gear.
8.	Plug—oil feed hole.	58.	Oil filler cap.	108.	Guide—relief valve ball.
9.	Plug—oil hole by-pass.	59.	Joint—cylinder head cover.	109.	Relief valve ball.
10.	Oil seal cover.	60.	Nut—cylinder head cover.	110.	Spring—relief valve.
11.	Gasket—oil seal cover.	61.	Washer—cylinder head cover.	111.	Cover plug—relief valve.
12.	Bolt—cover.	62.	Stud—exhaust manifold flange.	112.	Washer—cover plug.
13.	Studs—cylinder head.	63.	Nut—stud.	113.	Joint—oil pump body.
14.	Water drain tap.	64.	Joint—exhaust manifold.	114.	Oil pipe (gallery to head).
15.	Washer—drain tap.	65.	Clamp—exhaust manifold.	115.	Screw (banjo to head).
16.	Stud—tappet cover.	66.	Nut—exhaust manifold clamp.	116.	Screw (banjo to block).
17.	Tappet inspection cover.	67.	Oil sump.	117.	Washer—screw.
18.	Joint—cover.	68.	Drain plug—sump.	118.	Bracket—engine control link.
19.	Nut—cover stud.	69.	Washer—drain plug.	119.	Engine control link (R/H thread).
20.	Washer—cover stud.	70.	Plug—oil hole.	120.	Rubber bush.
21.	Breather pipe.	71.	Packing.	121.	Cup washer.
22.	Bracket—breather pipe.	72.	Joint—sump to block.	122.	Air cleaner.
23.	Bolt—breather pipe bracket.	73.	Bolt—sump—front.	123.	Clip—air cleaner.
24.	Nut—breather pipe bracket.	74.	Bolt—sump—short.	124.	Wing nut—air cleaner stud.
25.	Clip—breather pipe.	75.	Bolt—sump—long.	125.	Breather hose—air cleaner.
26.	Bolt—breather pipe clip.	76.	Dipstick.	126.	Clip—breather hose.
27.	Nut—clip bolt.	77.	Suction filter assembly.	127.	Pipe to air cleaner.
28.	Spring—oil filter—by-pass.	78.	Filter gauze.	128.	Joint—pipe to carburettor.
29.	Ball—oil filter—by-pass.	79.	Spring—oil suction pipe.	129.	Bracket—dynamo.
30.	Guide—ball.	80.	Fibre washer.	130.	Bolt—dynamo bracket.
31.	Seat—ball.	81.	Washer.	131.	Swivel bolt—short—dynamo.
32.	Timing chain case assembly.	82.	Joint—flange.	132.	Adjusting link.
33.	Packing—chain case.	83.	Bolt.	133.	Bolt—link.
34.	Joint—chain case to plate.	84.	Oil pipe assembly (pump to filter).	134.	Nut—swivel bolt.
35.	Bolt—long—chain case to block.	85.	Oil pipe assembly (filter to block).	135.	Pulley—dynamo.
36.	Bolt—short—chain case to block.	86.	Bolt—banjo.	136.	Flexible connection—oil gauge.
37.	Bearer plate—front.	87.	Washer—small.	137.	Connector—oil pipe.
38.	Joint—plate to block.	88.	Washer—large.	138.	Oil pump body—integral filter head.
39.	Bolt—plate to case.	89.	Oil filter.	139.	Joint—oil pump body.
40.	Bolt—plate to block.	90.	Support bracket for oil filter.	140.	Cover—oil pump.
41.	Bracket—plate.	91.	Bolt—bracket.	141.	Plug—oil pump cover.
42.	Bolt—bracket.	92.	Strap—oil filter bracket.	142.	Washer—oil pump cover plug.
43.	Nut.	93.	Bolt—strap.	143.	Bolt—pump cover (medium).
44.	Spring washer.	94.	Oil pump (bushed).	144.	Washer—pump cover bolt.
45.	Cylinder head (studded) with guides.	95.	Bush—oil pump body.	145.	Bolt—pump cover (short).
46.	Stud—cover.	96.	Oil pump cover with valve seat.	146.	Bolt—pump cover (long).
47.	Stud—manifold.	97.	Bolt—cover (long).	147.	Sump assembly—filter.
48.	Rear cover—cylinder head.	98.	Bolt—cover (medium).	148.	Filter element.
49.	Joint—rear cover—plate.	99.	Bolt—cover (short).		
50.	Screw—rear cover—plate.	100.	Lock washer.		

A THE ENGINE

GENERAL DESCRIPTION

The four-cylinder overhead-valve engine is built in unit construction with a single-plate Borg & Beck dry plate clutch and four-speed gearbox.

It has a four-throw crankshaft carried in three renewable steel-backed dowelled shell bearings fitted without shims. Thrust is taken on the centre bearing.

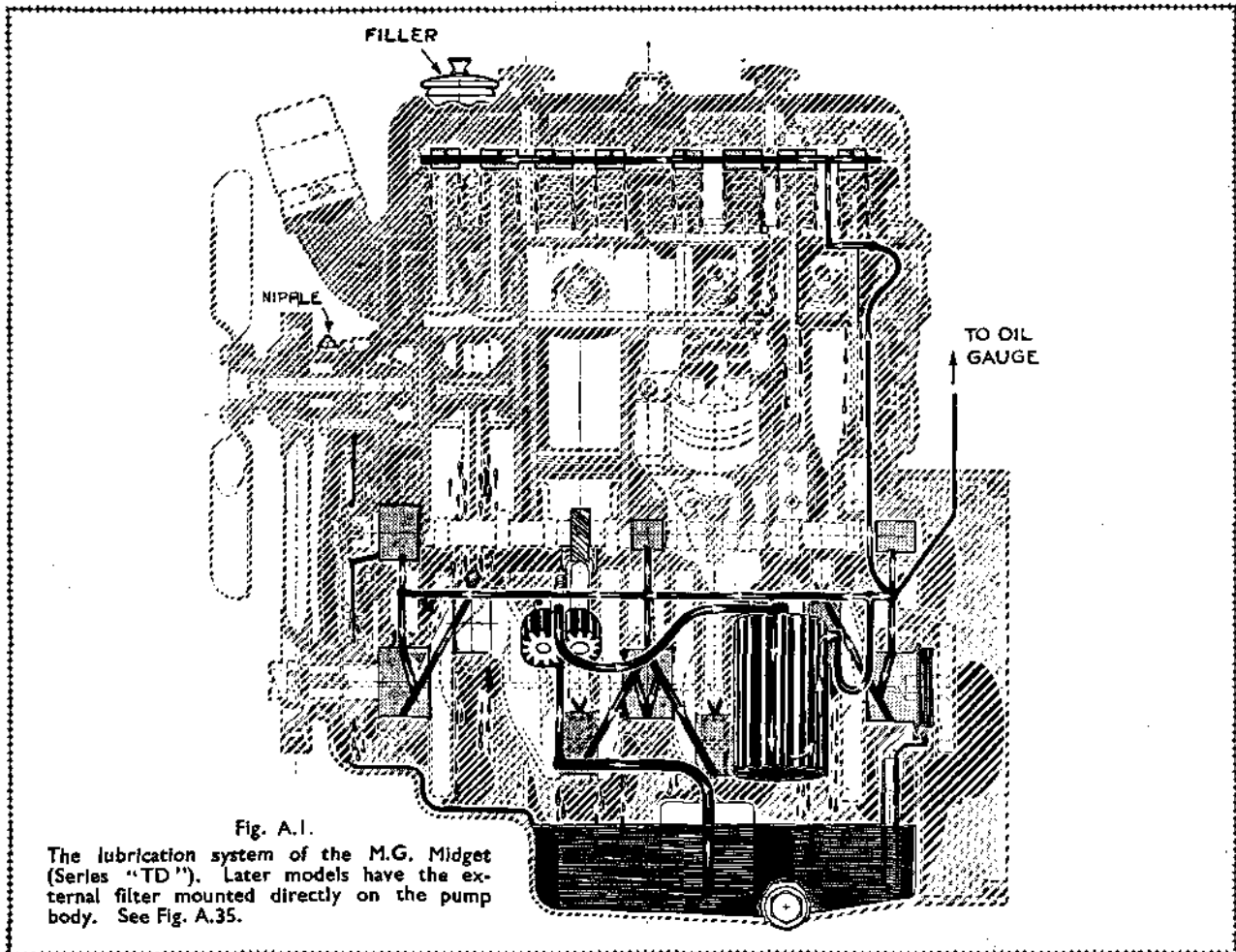
The big-ends are also fitted with renewable steel-backed shell bearings fitted without shims.

ends of the tappets and operate the rockers via adjustable ball-ended screws.

Cooling is by thermo-siphon action, assisted by pump and fan.

A gear-type external oil pump is driven from the camshaft by means of helical gears and draws oil from a submerged filter in the sump. Oil then passes through a full-flow type external filter.

Carburation is by two semi-downdraught S.U.



The gudgeon pin is clamped in the connecting rod by means of a set screw with a lock washer.

Pistons are made of aluminium alloy and fitted with two compression rings and one oil control ring.

The camshaft is supported in three renewable bearings pressed into the block, and is driven from the crankshaft by means of an endless duplex chain which is automatically maintained at the correct tension by a spring-loaded plunger. Oil is fed to each bearing from the internal oil gallery running the whole length of the cylinder block.

The camshaft operates hollow tappets which run directly in the block. Push-rods locate in the concave

carburetters, which are fed with fuel by an S.U. electric pump.

THE LUBRICATION SYSTEM

The main oil supply is carried in a removable aluminium sump. When full, it contains approximately 9 pints (5.1 litres) on engines up to No. 14947, and 10½ pints (5.96 litres) from engine No. 14948, of oil. It is replenished through the filler cap in the front end of the valve cover. The sump drain plug is towards the rear on the left-hand side. Three pints (1.7 litres) of oil must be added before any reading shows on the dipstick.

The gear-type oil pump draws oil from the sump through a gauze strainer which picks up the oil just above the bottom of the sump. Any sludge formed in the oil is thus allowed every opportunity to settle to the bottom.

An oil pressure relief valve, of the spring-loaded ball type, controls a passage formed in the oil pump bottom cover casting between the suction and delivery sides of the pump gears. (See Fig. A.7.) The spring is non-adjustable, and is set to allow the valve to by-pass at 50–70 lb. per sq. in. (3.5–5.0 kg./cm.²).

This provides a normal working pressure of from 40 to 45 lb. per sq. in. (2.8 to 3.2 kg./cm.²). But so long as a reasonable pressure is indicated it may be taken that the circulating system is working satisfactorily.

The oil from the pump is delivered to the full-flow oil filter and then to the oil gallery, whence it is distributed through the engine. There are two possible ways from the pump. First, the normal one, through the filter cleaning element. Second, an emergency path through another spring-loaded relief valve housed in the cylinder block behind the pump body, straight into the oil gallery. The spring of the by-pass valve is such that, provided the filter is attended to periodically (fit new oil filter after the first 3,000 miles or 5000 kilometres and subsequently every 6,000 miles or 10000 kilometres on engines prior to No. 14224 and new filter element on engines from No. 14224 onwards), the valve remains permanently closed. Should the filter become clogged, however, the by-pass valve will open and allow unfiltered oil to reach the engine.

From the oil filter outlet the oil is delivered into the internal oil gallery in the side of the cylinder block. Three drilled passages from this gallery pipe lead the oil to the camshaft and crankshaft bearings.

Taking these passages in order, counting from the front, No. 1 feeds the front main bearing and the camshaft front bearing. The front main bearing feeds No. 1 big-end bearing through a groove cut in the white metal and a passage drilled in the crank web, which, in turn, feeds No. 1 cylinder wall through the spray hole drilled in the right-hand side of the big-end and by splash from the surplus oil exuding from the bearing. A feed is also taken from the front main bearing to the automatic chain tensioner.

The camshaft front bearing has a forward leak passage to the camshaft chain wheel thrust face, and from there passes through three diagonal holes in the gear wheel boss to the inside of the wheel rim, where centrifugal action forces it through radial holes onto the chain links. The three diagonal holes in the sprocket are covered by a baffle plate. This plate

ensures that the oil is deflected to the radial holes at low engine speeds.

Passage No. 2 feeds the camshaft centre bearing and the centre main bearing. The centre main bearing feeds Nos. 2 and 3 big-end bearings by diagonal drillings in the crankshaft and also lubricates the cylinder walls as already described.

Passage No. 3 feeds the rear main bearing and the rear camshaft bearing. The rear main bearing also feeds No. 4 big-end bearing and the cylinder walls through diagonal drillings.

A vertical pipe at the rear end of the oil gallery feeds oil to the rocker-shaft through passages drilled in the cylinder head to register with a hole drilled in the rear rocker-shaft support, which communicates with the inside of the hollow rocker-shaft. The rocker-shaft is drilled at each rocker position to feed oil to the bearings, and oil which passes the bushes finds its way down the push-rod tunnels and drain passages to the sump.

Note.—When the engine is first started up and the oil is cold, higher oil pressure than normal will be indicated by the gauge. It is mainly for this reason that a gauge covering a large range of pressure readings is provided, and the risk of damage to the instrument is thus reduced to a minimum.

In the event of the oil gauge being damaged, or ceasing to function correctly, it must be renewed as soon as possible.

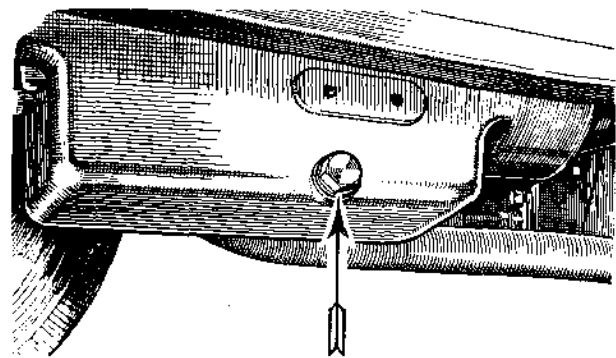


Fig. A.2

The engine sump drain plug is located on the left-hand side of the engine. Make sure that the plug, its washer and the seating are clean when replacing the plug.

Section A.1

DRAINING THE ENGINE SUMP

The sump on new and reconditioned engines must be drained and refilled with new oil after the first 500 miles (800 km.) and then at intervals of 3,000 miles (5000 km.).

The sump should be allowed to drain for at least ten minutes and this is more effective if carried out with

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the engine warm. The drain plug is located on the left-hand side of the engine sump.

Approximately 9 pints (5.1 litres) of oil are necessary to bring the level to the "Full" mark on the dipstick on early models, and slightly more if a new external filter has been fitted. On models commencing with Engine No. 14948 a larger engine sump is fitted, having a capacity of 10½ pints (5.96 litres).

Section A.2

REMOVAL AND REPLACEMENT OF THE ENGINE SUMP

Lower the exhaust system after removing the three nuts which secure the exhaust pipe to the manifold flange and the two set bolts securing the exhaust pipe bracket to the gearbox, and drain the oil from the sump. (See Section A.1.)

Remove the dipstick.

Release the clutch pedal pull-off spring from the return spring bracket.

Remove the split pin and clevis pin securing the intermediate clutch operating lever to the clutch operating rod.

On early models, with a cable-operated clutch, remove the two set bolts and spring washers securing the clutch cable abutment bracket to the sump, remove the split pin and washer and slide off the intermediate clutch operating lever.

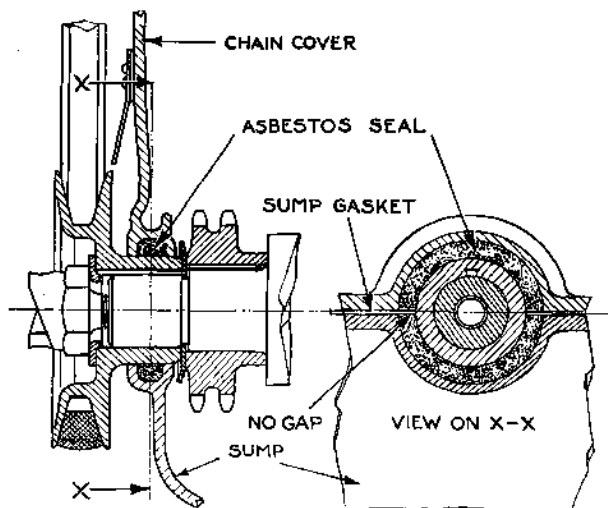


Fig. A.3.

The correct fitting of the seal and sump gasket (front end).

On later models a rod is fitted in place of the clutch operating cable. On these cars remove the split pin and washer from the operating rod lever fulcrum pin and move the operating mechanism clear of the sump.

Remove the bolts and spring washers securing the sump to the cylinder block and flywheel housing, and

lower the sump to the ground. Note that the anchorage for the engine fume pipe is located on the left-hand side of the flywheel housing, on the first set screw below the crankcase and sump joint line. (In breaking the sump joint avoid damaging the gasket, or it will be necessary to fit a new one when the sump is replaced.)

The sump can now be cleaned and dried. When cleaning the sump use a stiff brush—never use rag.

Replacement of the sump is carried out in the reverse manner to that detailed for removal.

Note.—If it is necessary to fit a new sump gasket, refer to Fig. No. A.29 for the method of cutting a replacement. Take care that the portion is left which goes between the rear main bearing cap cork seal and the crankcase. (See Fig. A.4.) This is important.

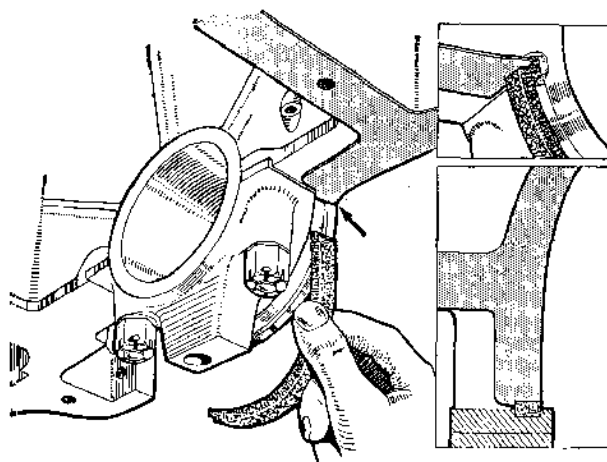


Fig. A.4.

When fitting the cork seal for the rear main bearing it is important that the stepped end be in proper engagement with the sump gasket.

Examine the cork composition packing ring in the groove of the rear main bearing cap, and if damaged fit a new one. See Fig. A.4 for the correct method of fitting this seal in conjunction with the sump gasket; pay special attention to this point to prevent oil leaks. It is important to ensure that the ends of the sump gasket fit snugly into the recesses in the ends of the rear bearing cap cork seal.

Examine the "Karmal" asbestos seal, fitted into the recess at the front of the sump. If replacement is necessary, care should be taken that the ends of the new one are flush or a little above the face of the sump. The sump gasket must go between the ends of seals.

The flanged edges of the sump and the joint faces of the cylinder block should be cleaned before replacing the sump, or difficulty may be experienced in making an oil-tight joint. When all faces are clean, coat the cylinder block flange with an even film of suitable jointing compound, and ensure that the holes in the jointing washer coincide with the bolt holes in

the flange. Put a little grease on the sump flange, this will ensure future easy removal.

Should the engine be turned while the sump is removed or drained, thus emptying the suction passages, the pump will have to be primed with oil by disconnecting the delivery pipe on early engines. Later models have a special priming plug on the oil pump body. The main feed oil gallery may also be primed through the special plug provided for this purpose in the cylinder block above the pump (see Fig. A.8).

Section A.3

REMOVAL OF THE OIL PUMP

Drain the radiator and slack off the top and bottom water hoses.

Remove the front engine mounting bolts holding the engine bracket to the rubber block. Slightly jack up the engine at the front. This allows the pump to clear the frame member.

Note.—On LHD models the steering column passes immediately above the oil pump, and it is not possible to lift the engine without first raising the steering column. To do this, first remove the split pins and nuts from the three bolts at the steering column universal joint; slacken the bolt and nut holding the steering column to the body steady bracket, and take out the nut and bolt from the support clip under the dash. The steering wheel may now be lowered so that the column clears the oil pump, and the engine may be lifted.

Detach the main oil pipe from the filter to the pump on early models, or remove filter bowl and element on later models.

Remove the eight bolts securing the pump to the cylinder block. This will release the cover.

Lift off the cover from the pump body. This will release the driven gear, which can easily be withdrawn.

Remove the pump by gently tapping the side of the body and withdrawing it downwards.

Screw a suitable extractor into the end of the driven gear shaft and withdraw it from the cylinder block if it is required to remove this.

Section A.4

DISMANTLING, REASSEMBLING AND REPLACING THE OIL PUMP

After withdrawing the pump from the cylinder block as described in Section A.3, remove the circlip securing the driving gear to the oil pump shaft and helical gear.

Using a suitable drift, tap the oil pump shaft and gear partly through the driving gear. Extract the key and gear before completely removing the shaft, otherwise the key will damage the bush.

Clean all parts, examine and check for wear.

The gear depth is 1.378 in.—.0016 in.—.0024 in. (35 mm.—.04 mm.—.06 mm.) with a diameter of 1.2678 in.+0.001 in. (32.2 mm.+0.25 mm.).

The housing depth is 1.378 in.+0.0012 in. (35 mm.+0.3 mm.) with a bore of 1.2795 in.+0.001 in.—.0006 in. (32.5 mm.+0.25 mm.—.015 mm.).

This results in a gear end float of .0016 in. to .0035 in. (.04 mm. to .09 mm.) with the end cover fitted, and a radial clearance of .0056 in. to .0064 in. (.145 mm. to .162 mm.). The backlash between the teeth is



Fig. A.5.

Testing the end clearance of the oil pump gears.



Fig. A.6.

Testing the clearance between the oil pump gears and the oil pump body.

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approximately .020 in. to .025 in. (.51 mm. to .63 mm.). (See Figs. A.5 and A.6.)

Renew worn parts as necessary. The pump housing and driven gear are fitted with renewable bushes.

The oil pump is assembled and replaced on the engine in the reverse manner to that detailed for dismantling and removal. Care should be taken to see that the abutting faces of the cylinder block and the pump are clean before replacing, and that the paper gasket between these joints is in good condition. If there is any doubt as to its condition, replace it with a new one. No gasket is fitted between the pump body and the pump cover.

coils $13\frac{1}{2}$, giving a load of 7 lb. (3.17 kilograms) when compressed to 1.063 in. (27 mm.).

It is not adjustable and should be dismantled only for cleaning and examination. The parts are dismantled by unscrewing the retaining plug in the bottom side of the oil pump cover which permits their withdrawal from the pump cover.

Care should be exercised when replacing the parts of the relief valve that the seating sleeve, ball, guide, spring and fibre washer for the plug are correctly replaced, and the fibre washer is in good condition. If there is any doubt as to its condition, replace it with a new one.

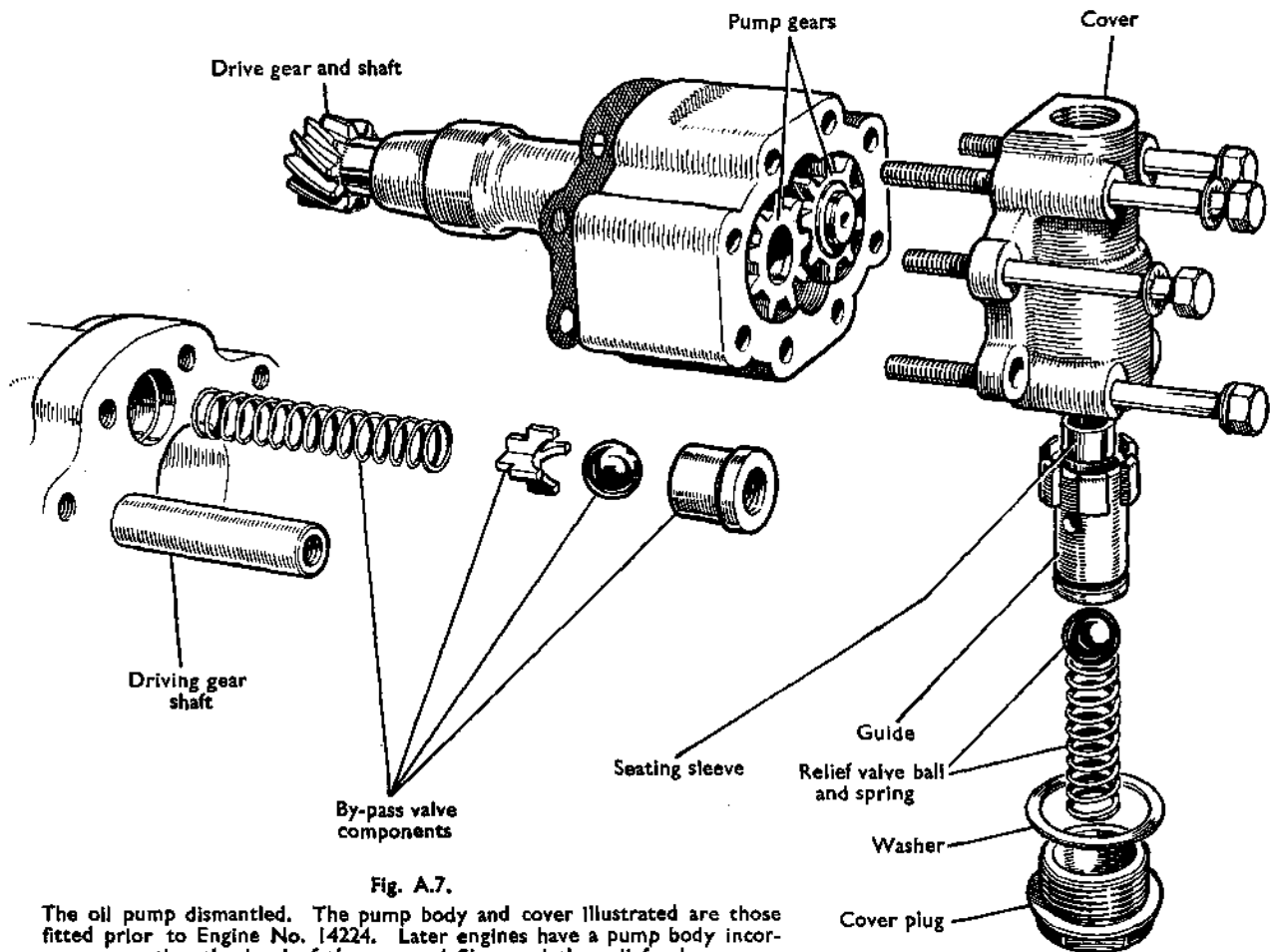


Fig. A.7.

The oil pump dismantled. The pump body and cover illustrated are those fitted prior to Engine No. 14224. Later engines have a pump body incorporating the head of the external filter and the relief valve.

Section A.5

REMOVAL AND REPLACEMENT OF THE OIL PRESSURE RELIEF VALVE

The oil pump automatic relief valve, comprising ball, spring and ball guide, is incorporated in the oil pump cover. The spring should be 17 gauge or .056 in. (1.42 mm.), .500 in. (12.7 mm.) overall diameter, 1.476 in. (37.5 mm.) free length. Total number of

Section A.6

EMERGENCY RELIEF VALVE

If the filter element becomes clogged through neglect, an automatic safety device is provided. This is mounted in the cylinder block above the oil pump. It can be withdrawn by the use of a suitable 8 mm. stud and distance-piece. It consists of a spring-loaded ball valve which allows the oil to by-pass the filter, thus

maintaining engine lubrication until a new filter is fitted.

The spring for this ball valve should be 19 gauge or .040 in. (1.02 mm.), .5354 in. (13.59 mm.) overall diameter, 2.224 in. (56.5 mm.) free length. Total number of coils 12, giving a load of 5 lb. (2.27 kilograms) when compressed to a length of .649 in. (16.5 mm.).

Section A.7

REMOVAL AND REPLACEMENT OF THE MAIN AND BIG-END BEARINGS

The replacement of big-end bearings can be carried out after removal of the sump, without taking the engine from the frame, but in order to replace the main bearings the engine must be removed. Renewable steel-backed bearings are used for both the main crankshaft bearings and the big-end bearings.

It is imperative that no adjustments be made to the bearings. Bearings which are worn should be

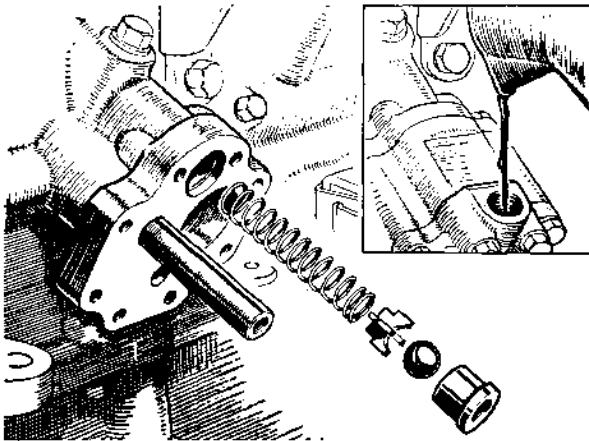


Fig. A.8.

The by-pass relief valve of the oil pump with its components withdrawn, and (inset) priming the early type oil pump through the delivery opening on the pump cover. Later pumps, with integral filter, are also primed through a similar plug, but a certain number of these pumps are not fitted with the special priming plug. (See Section A.41).

renewed. Additionally, if the crankshaft journals are found to be in a worn condition, a service re-ground crankshaft complete with main and big-end bearings, as supplied from the Works, should be fitted. (See Section A.34.)

The big-end bearings are located in position by a small tag on one side of each half-bearing, and the bearings are fitted so that the tags come on the same side of the bearing housing, as shown in the illustration. Main bearings are located in position by dowels in the bearing caps, and in the crankshaft housing.

To detach the big-end bearings, extract the split pins from the big-end bolts, and undo the nuts. Remove the connecting rod caps and extract the bearings. Care should be exercised to see that the

bearing journals and other parts are cleaned before installing new bearings. No scraping is required, as the bearings are machined to give the correct diametrical clearance of between .0005 in. (.011 mm.) and .002 in. (.056 mm.) and a side clearance of from .004 in. to .006 in. (.10 mm. to .15 mm.).

To renew the main bearings it is necessary first to remove the main bearing caps, by removing the split pins from the retaining studs and unscrewing the

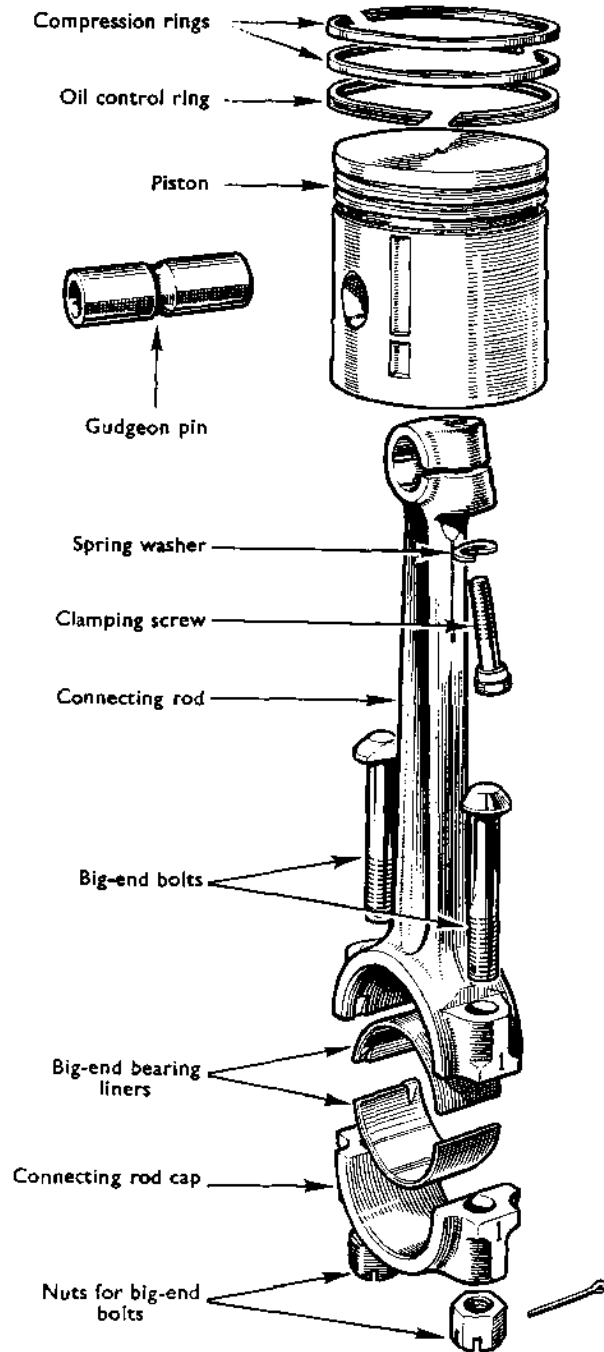


Fig. A.9.

The piston and connecting rod assembly.

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slotted nuts. This enables the crankshaft to be lifted from the crankcase.

Having cleaned the oilways drilled in the crankshaft and the bearing journals, the new bearings are placed in position on their locating dowels, and the crankshaft replaced. No scraping is required as the bearings are machined to give the correct diametrical clearance of from .0008 in. to .003 in. (.02 mm. to .075 mm.) and the side clearance of from .0014 in. to .0037 in. (.035 mm. to .095 mm.) on the centre bearing. The end bearings have no end location.

In the case of a run bearing, it is always advisable to clean out all the oilways in the crankshaft and block. Then wash out the engine base with paraffin.

Section A.8

REMOVAL AND REPLACEMENT OF THE ROCKER ASSEMBLY

Remove the air cleaner. Detach the cylinder head cover by removing the two retaining hand nuts and fibre washers.

Tap back the tabs of the lock washers from the eight rocker-shaft bracket fixing bolts and unscrew the four $\frac{5}{16}$ in. and four $\frac{1}{2}$ in. bolts gradually, a turn at a time, until all load has been taken off the rocker-shaft, then completely unscrew the bolts. **This is important.**

Remove the rocker assembly, complete with bracket and rockers, and withdraw the eight push-rods, marking them so that they may be replaced in the same positions. To dismantle the rocker-shaft assembly, remove the two retaining clips at either end of the shaft and slide the rockers, brackets and springs from the shaft. Care should be taken not to lose the shaft bracket washers and a note made of the fact that the front and rear washers are "D"-shaped, whereas the washers fitted to the centre brackets are of the normal pattern and engage with slots in the shaft.

A note should also be made in the case of later engines, that thrust washers are fitted between the spacing springs and the end bearing faces of the rockers.

Remove the plugs from each end of the shaft so that the oilways may be cleaned.

Reassembly and replacement is a reversal of the above procedure, but care must be taken to replace rockers and springs correctly on the shaft.

Section A.9

REMOVAL AND REPLACEMENT OF THE CYLINDER HEAD

Drain the water system by opening the tap at the bottom of the radiator and the tap in the cylinder block immediately below and in front of the exhaust manifold (see Section D.1).

Remove the bonnet after taking out the two screws at the rear end of the bonnet hinge.

Detach high-tension cables from the sparking plugs.

Remove the sparking plugs, being careful not to break or damage the porcelain insulators.

Disconnect throttle controls and mixture controls.

Uncouple the exhaust pipe from the manifold.

Disconnect the fuel pipe from the fuel pump.

Disconnect the breather pipe connection.

Slacken the hose clips and remove the air cleaner, remembering that the central wing nut also serves to hold the cleaner onto the air intake pipe, and that it is full of oil.

Disconnect the Intake pipe steady on the manifold.

Undo the four bolts holding the intake pipe and remove it complete. Remove the bolt clipping the exhaust pipe to the gearbox.

Remove the four nuts securing the induction and exhaust manifold to the cylinder head and withdraw the clamps and manifold.

Loosen the top clips on the thermostat by-pass pipe.

Take off the top radiator hose and thermostat.

Remove the oil feed pipe for the rocker gear from its attachment to the cylinder head.

It is also necessary to slacken the fume pipe and remove the side inspection cover. If the gasket of this cover is damaged, a new one must be fitted before the engine is run.

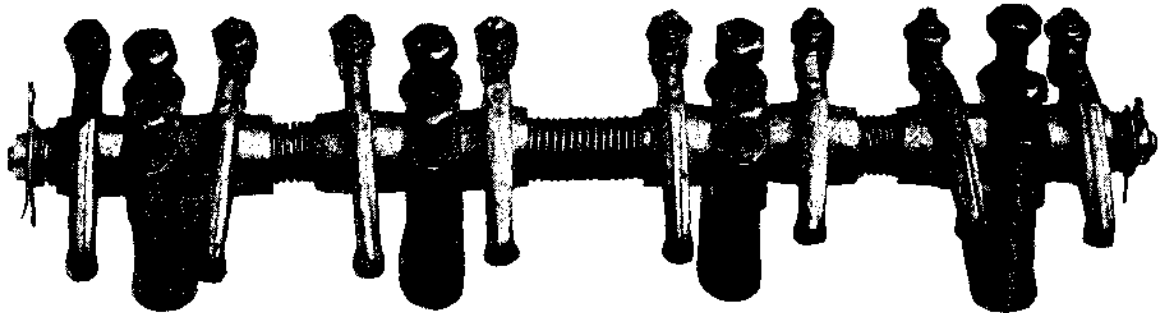


Fig. A.10.

The rocker assembly, showing the correct assembly of its components. Later assemblies have washers inserted between the spacing springs and the rocker end faces.

Remove the valve cover and rocker gear from the cylinder head as indicated in Section A.8, when the push-rods may be withdrawn.

Note.—It is advisable to keep these in order of removal.

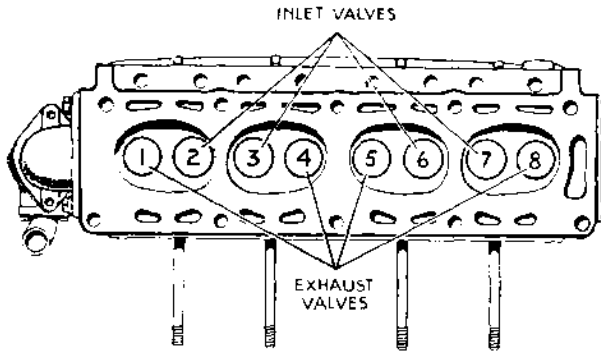


Fig. A.11.

This illustration shows the numbering of the valves.

Release the ten cylinder head nuts a partial turn at a time in the order indicated in Fig. A.12 until they are free for complete removal by hand. (Use the special spanner provided in the tool kit.)

Remove the cylinder head.

Note.—To facilitate breaking the cylinder head joint, tap each side of the head with a hammer, using a piece of wood interposed to take the blow. When lifting the head a direct pull should be given, so that the head is pulled evenly up the studs.

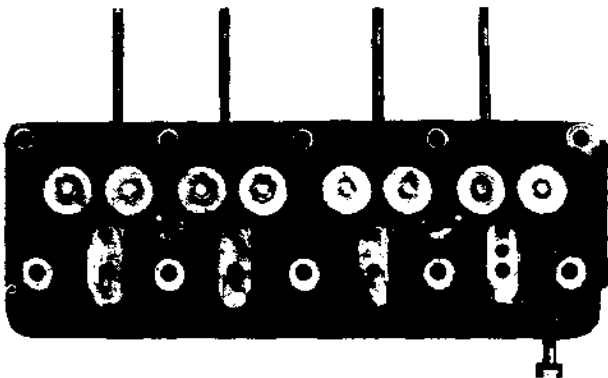


Fig. A.12.

The sequence in which the cylinder head holding-down nuts should be tightened.

Refitting the cylinder head

Make sure that the surfaces of both the cylinder block and cylinder head are clean ; it is not necessary to use jointing compound for the gasket, but it may with advantage be smeared with grease. Having

slipped the gasket over the studs, next lower the cylinder head into position, and fit the cylinder head securing nuts finger-tight. Fig. A.12 shows the correct order for tightening down the securing nuts. It is essential that they should be tightened down gradually half a turn at a time in the order given if a good joint is to be achieved.

Tightening individual nuts completely before the others is liable to distort the cylinder head and makes the achievement of a gas-tight joint impossible.

Note.—Ensure that the gasket is fitted with the elongated hole for the waterways to the rear of the cylinder head.

The push-rods should next be fitted, after which the rocker gear is reassembled. Whenever the head has been disturbed, or the valves have been ground in or otherwise disturbed, it is necessary to check the tappet adjustment and make sure the clearances are adequate ; these, of course, will finally be adjusted after the engine has been completely reassembled and run for a short period.

Now fit the valve cover, not forgetting the cork gasket ; the gasket is not very wide, and care must be taken to see that the cover fits squarely. It is advantageous to stick the cork gasket to the cylinder head with jointing compound, but not to the valve cover.

Reconnect the oil feed pipe to the cylinder head.

Tighten the side inspection cover and fume pipe, making sure that the gasket is satisfactory. Should there be any doubt as to its condition, replace with a new one. Care should be taken that the oil drain holes in the gasket are at the bottom.

Clean out the exhaust manifold if it is carboned up.

Examine the exhaust manifold gaskets and renew if necessary.

Refit the induction and exhaust manifold complete with the carburetter assembly.

The securing nuts holding the manifold should be tightened down evenly.

Fit the mixture control, throttle controls and exhaust pipe to the manifold.

Check and adjust the sparking plugs, replace, and connect the high-tension leads to the plugs.

Replace the thermostat body and radiator connecting hose and tighten the hose clips.

Connect the fuel pipe to the fuel pump, and refit the bonnet.

Switch on the ignition, and check the fuel connections for leaks.

The engine can now be started and allowed to run briskly until the water rises to a temperature between 70° C. and 80° C. or 160° F. and 175° F.

The valve clearances should then be checked carefully (see Section A.27).

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Section A.10

REMOVAL AND REPLACEMENT OF PISTONS AND CONNECTING RODS

Follow the dismantling procedure as set out in Section A.7 and withdraw the piston and connecting rod assembly carefully past the crankshaft on the left-hand side of the engine, rotating the crankshaft as necessary to give the required clearance.

Note.—It is essential that pistons be fitted in the same bores as they were before removal. The gudgeon pin pinch-bolt must be on the right-hand side of the engine. The same connecting rod and cap, complete with bearings, must be fitted to the journal from which they were removed.

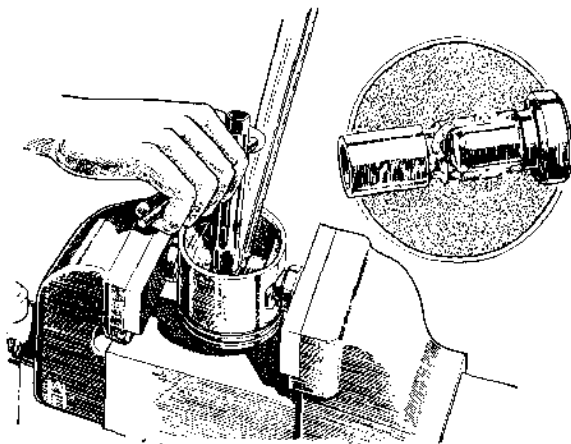


Fig. A.13.

The method of holding the gudgeon pin when taking out the clamp screw.

Section A.11

DISMANTLING AND REASSEMBLING PISTON AND CONNECTING ROD

The gudgeon pin is clamped in the little-end by means of a pinch-bolt engaging the groove in the centre of the gudgeon pin. The pinch-bolt must therefore be removed before the gudgeon pin can be pushed out.

In order to hold the assembly whilst the pinch-bolt is being undone it is essential to use two special shouldered clamping plugs engaging each end of the gudgeon pin as shown in Fig. A.13.

Important.—Care must be taken, when replacing the piston on the connecting rod, that :—

1. The pinch-bolt will screw readily into its threaded hole.
2. The spring washer has sufficient tension.
3. The gudgeon pin is positioned so that the groove clears the pinch-bolt when the latter is screwed into place.

4. The assembly is fitted to the engine with the connecting rod little-end pinch-bolt on the right-hand side.

Section A.12

FITTING THE GUDGEON PINS

Gudgeon pins must be a thumb-push fit for three-quarters of their travel, to be finally tapped home with a raw-hide mallet. For this operation the piston and gudgeon pin must be cold.

Gudgeon pin bores in the piston should not be reamed out because oversize pins are not available or permissible. Gudgeon pins must be fitted by selection.

Section A.13

REMOVAL AND REPLACEMENT OF THE PISTON RINGS

If a special piston ring expander is not available, a piece of thin steel may be used, approximately 3 in. (7 cm.) long by $\frac{1}{2}$ in. (12 mm.) wide by .02 in. (.5 mm.) thick.

This operation is quite simple. One end of the ring should be raised whilst the steel strip is slipped under the end. Next move the strip round the end of the piston and apply a slight upward pressure to the ring until it rests on the land above the ring grooves. It can then be eased off the piston. Do not move the rings down over the piston skirt. Always remove and replace them from the top of the piston.

Before fitting new rings the piston grooves must be cleared of carbon, but be careful not to remove any metal from the piston during the process or excessive side clearance will result.

Note.—New rings must be tested in the cylinder bore to make quite sure they have the correct clearance between the two ends. This clearance must be between .006 in. (.15 mm.) and .010 in. (.25 mm.).

When checking this gap make sure the ring is square to the bore by holding it on top of a piston inserted about 1 in. (2.54 cm.) down the bore while the measurement is being taken.

Section A.14

PISTON SIZES AND CYLINDER BORES

When fitting new pistons selective assembly is necessary, and to facilitate this the pistons are marked on their crowns, with an indication of their bore size. Note particularly that the piston markings indicate the correct size cylinder bore for which they are

suitable, the correct working clearance having been allowed in the grading operation. **The piston size should therefore correspond with the marking on the top face of the cylinder block on the right-hand side, which indicates the actual size of each cylinder bore.**

- The bores and pistons are graded in four sizes :—
- Bores of nominal size ± 000 in. to $+00049$ in.
marked "STD"
 - Bores of nominal size $+0005$ in. to $+00099$ in.
marked $+0005$
 - Bores of nominal size $+0010$ in. to $+00149$ in.
marked $+0010$
 - Bores of nominal size $+0015$ in. to $+00199$ in.
marked $+0015$

The piston clearance is 0021 in. minimum to 0029 in. maximum (056 mm. to 073 mm.), measured at the top

of the skirt, immediately below the oil control ring, and across the thrust faces, i.e. at 90° to the gudgeon pin axis. This is important as the piston skirt is tapered and oval, and the clearance can only be measured in this one position.

To facilitate correct measurement of the bores and pistons, the actual sizes of the various gradings are given in the table below.

The markings on the top face of the cylinder block will indicate these sizes clearly.

Oversize bores on reconditioned engines supplied under the M.G. reconditioned engine scheme are limited to two oversizes :—

- $+020$ in. graded in 4 sizes as the standard grading
- $+040$ " " " "

The actual sizes of these pistons and bores are provided in the following table :—

STANDARD PISTON SIZES		Piston Marking	Suitable for Bore Size			
Production engines with bores 002 in. oversize or over are made into $+010$ in. bores and graded in the same steps as the standard bore engines.			in.	mm.		
				To suit "STD" bore	2-6181 2-6185	(66-500) (66-510)
				To suit $+0005$ bore	2-6186 2-6190	(66-513) (66-523)
				To suit $+0010$ bore	2-6191 2-6195	(66-525) (66-535)
				To suit $+0015$ bore	2-6196 2-6200	(66-538) (66-548)
Piston Marking	Suitable for Bore Size	OVERSIZE PISTON SIZES $+020$ in. RANGE				
					in.	mm.
To suit $+0200$ bore	2-6381 2-6385				(67-008) (67-018)	
To suit $+0205$ bore	2-6386 2-6390				(67-021) (67-031)	
To suit $+0210$ bore	2-6391 2-6395				(67-033) (67-043)	
To suit $+0215$ bore	2-6396 2-6400	(67-046) (67-056)				
OVERSIZE PISTON SIZES		Piston Marking	Suitable for Bore Size			
$+040$ in. RANGE			in.	mm.		
		To suit $+0400$ bore	2-6581 2-6585	(67-516) (67-526)		
		To suit $+0405$ bore	2-6586 2-6590	(67-529) (67-539)		
		To suit $+0410$ bore	2-6591 2-6595	(67-541) (67-551)		
		To suit $+0415$ bore	2-6596 2-6600	(67-554) (67-564)		

Note.—The later-type pistons have oval and tapered skirts, and considerable care must be exercised when making measurements.

A THE ENGINE

Section A.15

REMOVAL AND REPLACEMENT OF THE CARBURETTORS

("TD") Remove the air cleaner by slackening the hose clip from the branch pipe of the cylinder head cover breather and the hose clip attaching it to the air intake pipe. Remove the central wing nut on the cleaner securing it to the air intake pipe.

("TF") Disconnect the breather pipe from the front cleaner.

Unscrew the two bolts securing each cleaner to its carburetter flange, and remove the cleaners.

("TD" and "TF") Take off the float-chamber overflow pipes.

Detach the fuel pipe at the petrol pump union.

Disconnect the mixture control wire from its attachments to the carburetter levers.

Disconnect the throttle control link rod at its attachment to the end of the accelerator lever.

Remove the four bolts holding the carburetters to the induction manifold and lift the carburetter assembly clear of the engine.

Section A.16

REMOVAL OF THE EXHAUST AND INLET MANIFOLD

Take off the carburetters as in Section A.15.

Release the exhaust pipe from the manifold flange.

Undo the four nuts securing the manifolds to the cylinder head and remove the complete assembly.

Section A.17

REMOVAL AND REPLACEMENT OF THE WATER PUMP

Drain the cooling system through the radiator and cylinder block drain taps, and release the dynamo on its mountings so that the driving belt may be withdrawn.

("TF") Remove the valance tie-bar.

Detach the rubber hose at the pump body and remove the fan blades by withdrawing the four attachment set screws complete with spring washers. Undo the four bolts with spring washers attaching the pump body to the cylinder block, noting that they are of different lengths, and withdraw the pump unit.

Reassembly is the reversal of this process, but make sure the flange washer is in good order and that the pump bolts are replaced in their correct positions.

Section A.18

REMOVAL OF THE TIMING CHAIN CASE

To carry out this operation with the engine in the

frame it is necessary to remove the radiator (see Sections D.2 and DD.2).

Remove the fan belt as detailed in Section N.3, "Removal and replacement of the dynamo."

Remove engine control link (see Section A.38).

Note.—Mark or measure the position of the adjuster so that this may be refitted to the same setting.

Remove the water pump as detailed in Section A.17.

Remove the starting handle dog nut, taking care of the packing shims behind it.

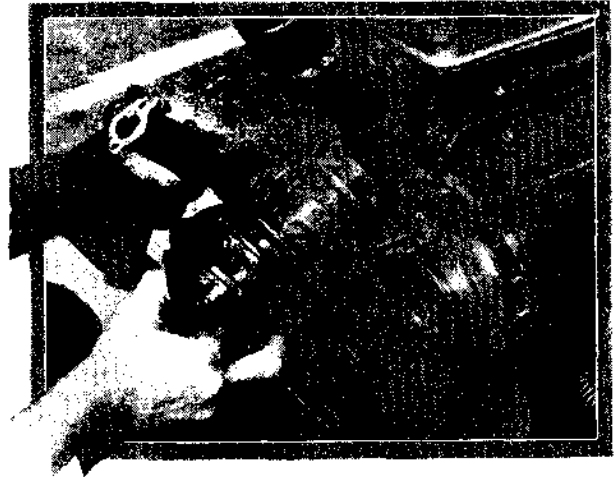


Fig. A.14.

Method of removing the water pump.

Remove the crankshaft fan pulley with a suitable extractor.

Remove the nine set screws securing the timing cover to the crankcase, and withdraw the cover.

Section A.19

REPLACEMENT OF THE TIMING CHAIN CASE

To ensure an oil-tight joint it is essential that the cork washer between the cover and the front plate is in good condition. Renew if necessary.

Examine the face of the engine bearer plate to see that it is smooth and flat. Any distortion or imperfection is likely to prevent the chain cover seating tightly.

Check that the oil thrower is in position on the crankshaft with its dished side facing towards the engine.

Check the asbestos oil seal for the crankshaft. The ends of the seal must not be **below** the mating faces of the chain cover. Coat the mating faces with jointing compound.

Place the timing cover in position, and locate it loosely with two or three fixing bolts. Fit the remainder of the securing bolts and tighten up evenly.

Place the fan driving pulley on the crankshaft, push it home and replace the starting handle dog nut, not forgetting to replace the shims beneath it so that the dogs are in the correct position for easy cranking of the engine.

Replace the water pump. Replace the engine control link and, if the position of the adjuster has not been noted, adjust as detailed in Section A.38.

Replace the fan belt, adjust its tension, and lock the dynamo in this position by tightening its attachment bolts.

Section A.20

REMOVAL OF THE TIMING CHAIN

Remove the sump as in Section A.2.

Remove the timing chain case as in Section A.18.

Remove the bolt securing the camshaft sprocket to the camshaft.

Remove the chain tensioner as detailed in Section A.23.

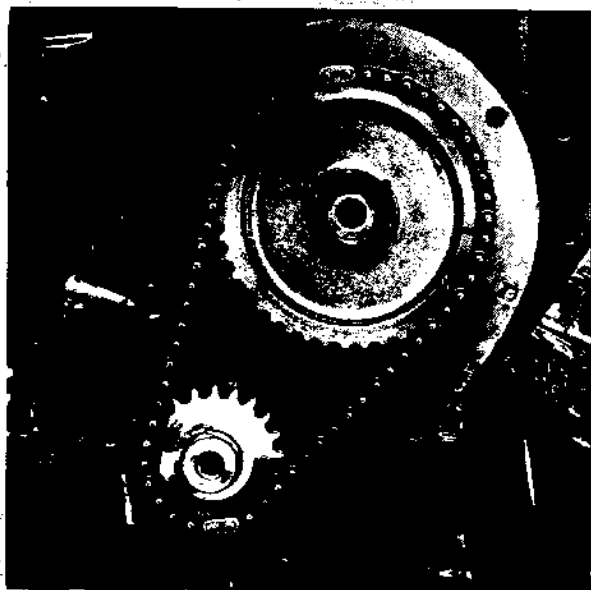


Fig. A.15.

This illustration shows how the bright links on the timing chain engage with the marked chain wheels.

Lever off the crankshaft and camshaft sprockets, complete with the chain, by means of short, flat levers, or Tool No. T.123, taking care not to damage the crankshaft and camshaft front bearings.

Note.—Take care of the chain tensioner slipper and chain tensioner spring.

Section A.21

REPLACEMENT OF THE TIMING CHAIN

The two timing sprockets are secured to the crankshaft and camshaft respectively by single keys. There is therefore only one position in which the sprockets can be fitted to the camshaft and crankshaft.

It will be noticed that the timing chain has two white links, and each of the sprockets has one tooth marked "T." Between the white links are thirteen black ones on one side of the chain and fifteen black links on the other. The thirteen black and the two



Fig. A.16.

The bright links on the timing chain should be brought together to determine the long and short chain sections.

white links are clearly seen in Fig. A.15, which shows one white link of the chain engaged with the tooth of the camshaft sprocket marked "T," while the tooth of the crankshaft sprocket marked "T" is opposite the other white link, thirteen black links behind the first one.

With the shorter portion of the chain to the left (the white links forward) engage the camshaft sprocket tooth marked "T" with the top white link, and the crankshaft sprocket tooth marked "T" with the other white link.

Place the keyways of the crankshaft and camshaft in a suitable position to register with the sprocket keyways and push home the sprockets complete, with the chain in position.

Replace the chain tensioner, checking the paper gasket to make sure an oil-tight joint is achieved.

Replace the bolt securing the camshaft sprocket to the camshaft, and knock over the lock washer into

A THE ENGINE

engagement with the hole in the sprocket and one flat of the nut.

Replace the timing chain case as detailed in Section A.19.

To carry out this operation with the engine in the frame it will be necessary to remove and replace the radiator as detailed in Section D.2.

Note.—The engine requires turning twenty times before the links and marked teeth come back to this position again.

Section A.22

THE TIMING CHAIN TENSIONER

The chain tensioner consists of an hydraulically damped, spring-loaded plunger and combined slipper block, encased in a housing which is bolted to the cylinder block. The slipper is held against the chain by the tension of the spring and the oil pressure.

The spring, which is of 22 gauge (.71 mm.) wire, has a free length of 2.795 in. (71 mm.), an outside diameter of .295 in. (7.5 mm.) and has 35 effective coils. It gives a load of 1.25 lb. (.57 kg.) when compressed to 1.89 in. (48 mm.).

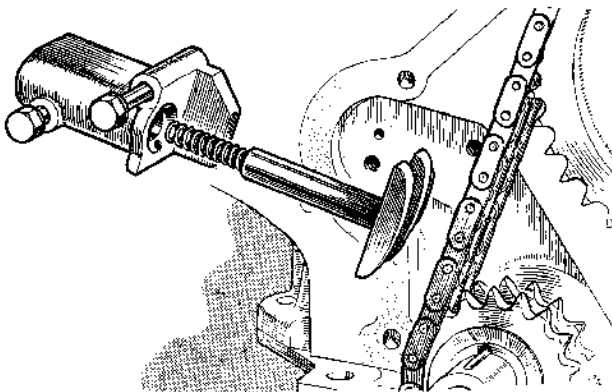


Fig. A.17.
The timing chain tensioner.

The plunger is fed with oil from the crankshaft front main bearing via an oilway drilled through the cylinder block, mating with an oilway in the tensioner housing or feed block. This oilway is then reduced in diameter to .04 in. (1 mm.) and the oil feeds through to the stem of the plunger, which is .43 in. (11 mm.) in diameter, and then through the bleed hole in the plunger, which is .10 in. (2.5 mm.) diameter. This causes an increased pressure and produces a cushioning effect between the chain and the slipper. Oil passing through the bleed hole passes on to the chain and slipper, ensuring effective lubrication between the two.

A.16

Section A.23

REMOVAL OF THE CHAIN TENSIONER

Break the lockwire at the two set screws securing the chain tensioner feed block to the cylinder block and unscrew them, taking care to hold the assembly against the chain to overcome the tension of the spring.

Before replacing, examine the bore of the feed block for wear (this should be $.43 \text{ in.} \pm .004 \text{ in.}$ (11 mm. $\pm .1 \text{ mm.}$)) and make sure that the oilway is clear. Look for any wear on the chain tensioner—the outside diameter of the stem should be $.43 \text{ in.} - .004 \text{ in.}$ to $-.012 \text{ in.}$ (11 mm. $-.1 \text{ mm.}$ to $-.3 \text{ mm.}$). Finally check the tensioner spring, to the details already given in Section A.22. When refitting make sure to rewire the set screws securing the feed block.

Section A.24

REMOVAL AND REPLACEMENT OF THE TAPPETS

Remove the air cleaner.

Remove the cylinder head cover. Unbolt the fume pipe from the engine side cover and remove the cover.

Remove the rocker gear from the cylinder head as indicated in Section A.8, and withdraw the push-rods.

Withdraw the tappets.

Replacement is carried out in the reverse manner to that detailed for removal, and both the push-rods and tappets should be refitted in the same positions they occupied before removal to avoid the need for extensive adjustment. Care should be taken when refitting the side cover to see that the drain holes in its gasket are at the bottom.

Section A.25

REMOVAL AND REPLACEMENT OF THE CAMSHAFT

Drain the radiator.

Remove the bonnet.

Remove the tappets as detailed in Section A.24, otherwise fouling between the cams and tappets is likely to cause damage to the running surfaces.

Remove the sump as detailed in Section A.2.

Disconnect the high-tension leads from the plugs and remove the distributor after removing its location bolt from the side of the cylinder block housing.

Remove the oil pump by removing the bolts securing the body to the cylinder block.

Remove the timing chain case, the timing chain and chain wheels as detailed in Sections A.18 and A.20.

Remove the radiator as indicated in Sections D.2 or DD.2.

Remove the dowel screws which secure the intermediate and rear bearings to the cylinder block.

Remove the front thrust plate.

Remove the camshaft by drawing it forward through the front bearing, carrying the centre bearing with it. This should be removed from the camshaft when the camshaft has been withdrawn far enough to bring the centre bearing free from its housing.

Replacement is carried out in the reverse manner to that detailed for removal, but the following points must be observed carefully:—

Ensure that all oilways are clear by removing the blanking screws from the crankcase and testing the oilways with compressed air.

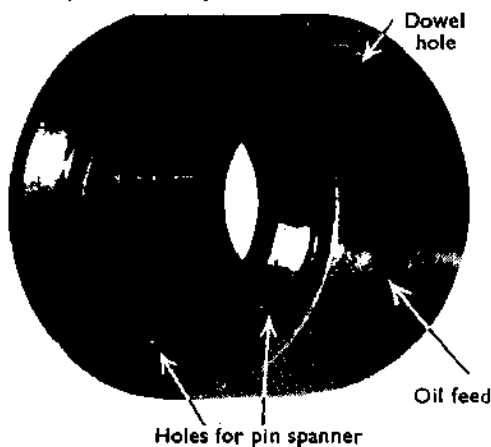


Fig. A.18.

The relative positions of the holes in the camshaft centre bearing.

The split centre bearing may easily be fitted incorrectly. Ensure that the dowel hole in the bearing is in line with that in the crankcase and that the oilway through the bearing is correctly aligned with the oil passage in the crankcase. When correctly fitted the two pin-spanner holes in the side should be towards the front of the engine in the lower half of the bearing. (See Figs. A.18 and A.19.)

It is essential to make quite sure that the dowel hole in the bearing is exactly in register with the dowel bolt hole in the crankcase before attempting to replace the dowel bolt or it may shear the edge of the hole in the bearing.

After replacing and tightening the dowel locating the centre bearing make sure that the camshaft is still free to rotate, i.e. that the dowel bolt does not "bottom" in its hole and so squeeze the bearing.

The whole of this operation is more easily carried out with the engine out of the car and the crankshaft, flywheel, pistons and connecting rods removed. Do not forget to rewire the two bearing dowel bolts.

Section A.26

CAMSHAFT BEARINGS

When fitting new camshaft bearings it will be found that the centre and rear bearings can be simply fitted as strict replacements, but when the front bearing is pressed into the housing this will need reaming in line with the centre and rear bearings with Tool No. T.111. The bearing must have the locking nick knocked into the crankcase slot.

The end float of the camshaft is taken in both directions by a plate which is interposed between the back of the camshaft chain wheel and the shoulder of the camshaft front journal.

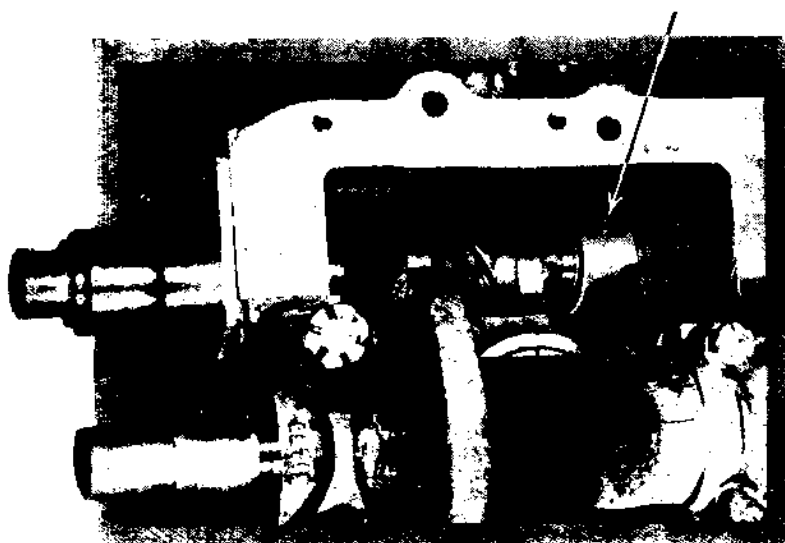


Fig. A.19.

In this photograph the camshaft has been partly inserted. Note the position of the centre bearing.

Section A.27

TAPPET ADJUSTMENT

Remove the air cleaner and rocker cover.

The tappet clearance should be set to .019 in. (.48 mm.) (on engines prior to No. XPAG/TD2/24116, and on engines from this number onwards the clearance should be .012 in. (.30 mm.)) for both inlet and exhaust valves with the engine hot. (See Section A.44.)

If the engine is cold an extra .001 in. (.025 mm.) should be allowed. It is important that the clearance is set when the tappet is exactly on the heel of the cam, owing to the type of cam contour employed.

To reduce the number of times the engine need be rotated, the table on page A.18 will be useful when setting the tappets.

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Adjust No. 1 rocker with No. 8 valve wide open
" " 3 " " " 6 " " " "
" " 5 " " " 4 " " " "
" " 2 " " " 7 " " " "
" " 8 " " " 1 " " " "
" " 6 " " " 3 " " " "
" " 4 " " " 5 " " " "
" " 7 " " " 2 " " " "

Provision for adjusting the valve clearance is made in the rocker-arm by an adjustable screw and locknut.

The tappet adjusting screw is released by slackening off the hexagon locknut with a spanner, while holding the screw against rotation with a screwdriver.

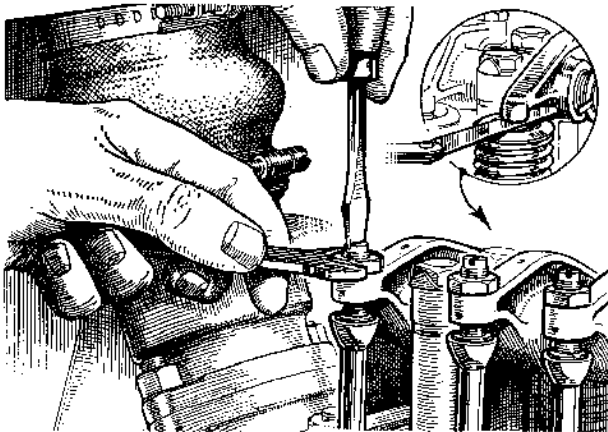


Fig. A.20.

The method of setting the tappets.

When the locknut is released the valve clearance can be set by rotating the adjusting screw with the screwdriver and setting the clearance, by means of a feeler gauge, to $.019$ in. ($.48$ mm.) as indicated in the inset.

The valve clearance can then be set by rotating the screw carefully while checking the clearance with a feeler gauge at the valve stem.

The tappet screw is then relocked by tightening the hexagon locknut, again holding the tappet screw against rotation with the screwdriver. Test the clearance again to ensure it has not changed.

Section A.28

REMOVING AND GRINDING THE VALVES

The valve springs are secured by cups and split conical cotters. In order to remove a valve the head must be removed as indicated in Section A.9, placed face downwards on the bench with a block of wood filling the combustion space so that the valve head is resting on it. If the spring is then depressed, the collets are exposed and may be removed, together with the valve springs. On the valve stem there is a small synthetic rubber oil seal which slips off easily. A wood

block with packing pieces for each combustion chamber and a bench-type spring compressor greatly facilitate the carrying out of this operation. (See Fig. A.22.)

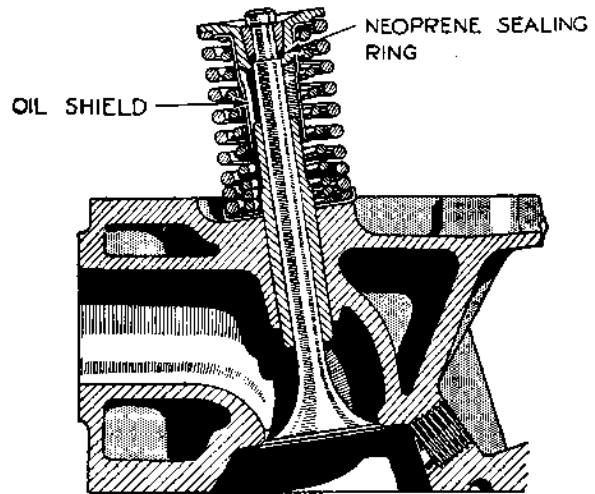


Fig. A.21.

The valve springs should always be replaced with the closed coils against the cylinder head.

A suitable bench spring compressor, special tool Part No. 67456, is available.

When the valves are refitted after attention, it is essential to fit **new** neoprene rubber sealing rings on the valve stems to avoid excessive oil consumption. Ordinary rubber is useless.



Fig. A.22.

The bench-type valve spring compressor.

Section A.29

GRINDING AND TESTING THE VALVES AND THEIR SEATINGS

Each valve must be cleaned thoroughly and carefully examined for pitting. Valves in a pitted condition should be refaced with a suitable grinder or alternatively replaced with new valves.

If the valve seats show signs of pitting or unevenness, they should be trued by the use of a suitable grinder or a special cutter such as Tool No. 301075 (Section Q). When using a cutter, care should be exercised to remove only as little metal as is necessary to ensure a true surface.



Fig. A.23.

Uneven valve seats can be trued with a special cutter.

All valves, when fitted at the factory, are numbered on their heads from 1 to 8, and should be replaced in the corresponding valve ports, No. 1 valve being fitted to the port nearest the front of the engine. When replacement valves are fitted, they should be numbered to identify the port to which they belong.

The valve face should be smeared lightly with fine or medium grade carborundum paste, and then ground to its seat, using the suction grinder, Part No. 66893. Avoid the use of excessive quantities of grinding paste; see that it remains in the region of the valve seating only and does not reach the working surfaces of the engine. A light coil spring placed under the valve head will assist considerably in the process of grinding. The valve should be lapped to its seat with a semi-rotary motion and occasionally allowed to rise by the pressure of the light coil spring. This assists in spreading the paste evenly over the valve face and

seat. It is necessary to carry out the grinding operation until a dull, even matt surface, free from blemish, is produced on the valve seat and face. If the valve seat, which is at 30°, is found to be wide, it should be reduced with a 15° cutter to a width of 2 mm. (.080 in.) for the exhaust and 1.1 mm. (.043 in.) for the inlet seats.

On completion, the valve seats and ports should be cleaned thoroughly with paraffin-soaked rag, dried, and then thoroughly cleaned by compressed air. The valves should be washed in paraffin (kerosene), and all traces of grinding paste removed.



Fig. A.24.

This photograph shows the suction valve grinding tool in operation with a light spring under the valve head.

Section A.30

REMOVAL AND REPLACEMENT OF VALVE GUIDES

Remove the cylinder head and valves as detailed under Sections A.9 and A.28.

Rest the head with its machined face downwards on a clean, flat surface and drive the valve guides downwards into the combustion chamber, using a suitably sized shouldered drift. This should take the form of a hardened steel punch $\frac{1}{2}$ in. (12.7 mm.) in diameter and not less than 6 in. (15 cm.) in length with a locating spigot $\frac{5}{8}$ in. (8 mm.) in diameter machined on one end for a length of 1 in. (2.5 cm.) to engage the bore of the guide.

When fitting the new valve guides, press them in until .945 in. (24 mm.) is protruding above the machined surface of the cylinder head.

From Engine Nos. XPAG/TD2/27867 and XPAG/TD3/27996 both valve guides are .964 in. (24.5 mm.) above cylinder head.

Note.—The inlet valve guides are $\frac{7}{32}$ in. (5.56 mm.) longer than the exhaust valve guides, but all valve guides project the same distance above the valve spring seating, namely .945 in. (24 mm.).

Recut the valve seat from the new guide, if necessary, to ensure that the valve seats correctly.

Section A.31

REMOVAL AND REPLACEMENT OF ENGINE AND GEARBOX

Drain the cooling system through the radiator and cylinder block taps.

Remove the bonnet and radiator (see Section D.2).

Disconnect the battery earth lead.

Detach the fuel line at the fuel pump.

Uncouple the high-tension lead from the coil and remove the low-tension wire from the distributor body.

Disconnect the mixture control inner and outer cables at the rear carburetter attachments.

Disconnect the throttle ball joint at the forward end of the accelerator pedal arm.

Detach the accelerator control spring and release the starter cable from the starter terminal.

Remove the three brass nuts holding the exhaust pipe to the manifold and undo the clip holding the exhaust pipe to the gearbox. This will allow the front of the exhaust pipe to drop clear of the manifold.

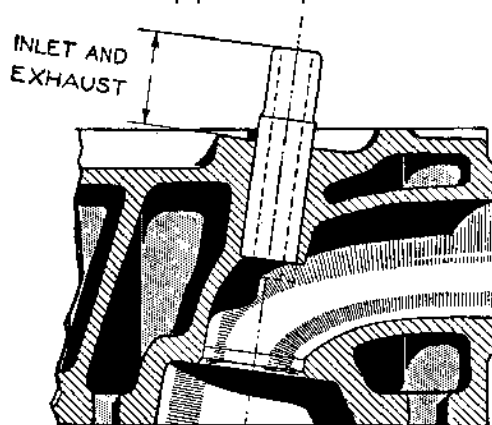


Fig. A.25.

The correct position of the valve guide in the cylinder head is shown in this illustration. The measurement between the arrows should be 24 mm. on early engines and 24.5 mm. on later engines. See Section A.30.

Undo the oil pressure gauge pipe at the cylinder block and detach the revolution counter drive from the rear end of the dynamo.

Disconnect the dynamo leads, noting that the green wire on the dynamo goes to the field terminal "F."

Remove the two bolts holding the front engine mounting to its rubber block.

Take off the outer nut on the engine steady.

Detach the clutch-operating mechanism from the side of the sump.

Remove the starter motor and take off the air cleaner and carburetters (see Section A.15). When removing the cleaner remember that the wing nut at the top holds the unit to the intake pipe.

A.20

Disconnect the earthing strip between the engine and chassis. On early models this is connected to the breather pipe and on later models to the flywheel housing.



Fig. A.26.

The rear end of the engine unit prior to removal.

Remove the seats as explained in Section R.8.

Take up the carpets and detach the toeboard on the passenger's side.

Remove both floorboards, the gear lever knob and the gearbox cowl.

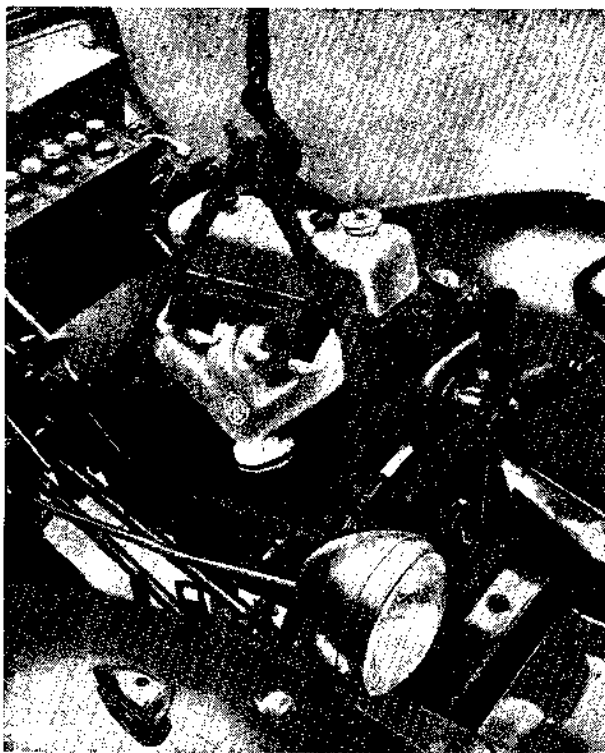


Fig. A.27.

The engine ready for removal.

Take off the gearbox top cover complete and secure a piece of cardboard over the gearbox opening in order to prevent dirt reaching the inside.

Note.—Great care must be taken when removing or refitting the gear change lever and its housing. If the selector shaft is withdrawn past the first stop the synchromesh mechanism will slide apart and the synchro-balls will drop to the bottom of the gearbox. This means the complete gearbox must be dismantled.

Later boxes are fitted with an extended 1st and 3rd selector shaft with a retaining circlip at the forward end which overcomes this.

Unscrew the screws round the pedal draught excluder and disconnect the speedometer drive.

Detach the forward end of the propeller shaft, marking the flanges so that they can be reassembled in the same position.

On LHD models it is necessary to disconnect and lift the steering column clear (see Section A.3).

Disconnect the rear engine mounting and place a sling round the unit, just behind the front mounting and also just forward of the flywheel housing.

Remove the unit by lifting it forward and upward, taking care to disengage the steady link from its bracket.

Note.—See Section A.38 for adjustment of engine mounting.

Section A.32

REMOVAL AND REPLACEMENT OF FLYWHEEL

In order to take off the flywheel the engine and gearbox unit should be removed from the car as detailed in Section A.31.

It is advised not to disturb the flywheel unnecessarily as it is essential for it to run absolutely true.

Remove the clutch as detailed in Section E.2.

Remove the locking wire on the flywheel fixing bolts. Take out the fixing bolts.

Pull off the flywheel with a suitable extractor, taking care not to damage the locating dowels.

Replacement is a reversal of this process.

Check the flywheel for accuracy. It should be no more than .002 in. (.05 mm.) out of truth at any point when rotated with a dial gauge in contact with the clutch face.

Section A.33

REMOVAL AND REPLACEMENT OF CRANKSHAFT (Engine out of Chassis)

Remove the sump as detailed under Section A.2.

Remove the fan driving pulley and timing chain case as detailed under Section A.18.

Remove the timing chain as detailed under Section A.20.

Remove the pistons and connecting rods as detailed under Section A.10.

Remove the two securing nuts from each main bearing cap and remove the caps and bearings.

Note.—It is advisable to mark each bearing cap and bearing to ensure their correct position for subsequent replacement.

Remove the crankshaft and flywheel.

If necessary remove the flywheel as detailed under Section A.32, but only if necessary.

Replacement of the crankshaft is carried out in the reverse manner to that detailed for removal, but before doing so, clean the oilways in the crankshaft.

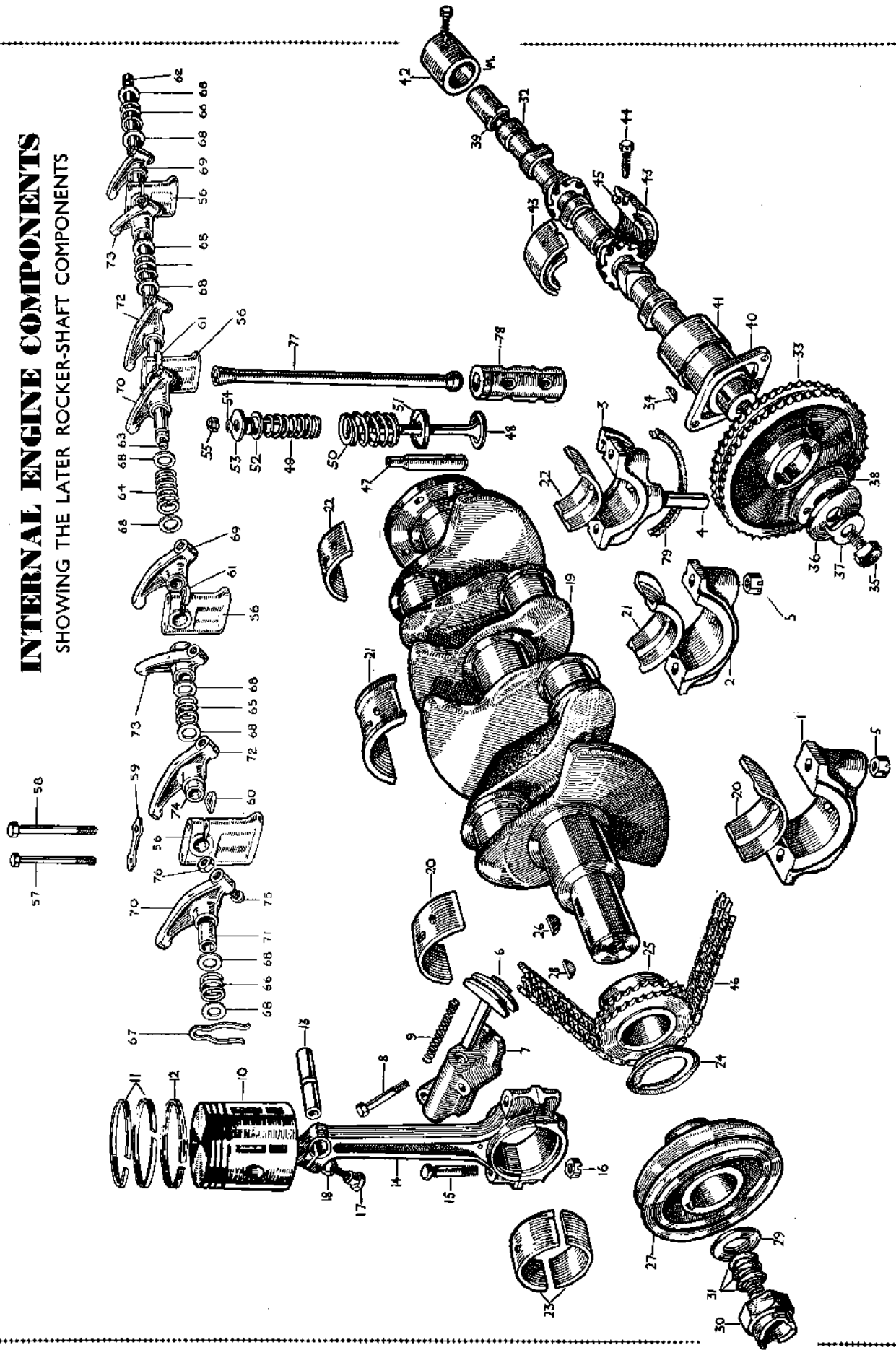
In order to clean out the oilways in the crankcase, the camshaft, filter, oil pump and pipes should be removed.

All bearings and other parts should be cleaned carefully before replacement, and care must be taken

Bearing and crankshaft diameter undersize	Reference	Crankshaft main journal standard and regrind sizes	Crankpin journal standard and regrind sizes	Main bearings standard and regrind sizes
Standard	Standard	52.00 mm.	45.00 mm.	52.020 mm. 52.005 mm.
-.5 mm.	R.2	51.5 mm.	44.5 mm.	51.520 mm. 51.505 mm.
1.00 mm.	R.4	51.00 mm.	44.00 mm.	51.020 mm. 51.005 mm.

INTERNAL ENGINE COMPONENTS

SHOWING THE LATER ROCKER-SHAFT COMPONENTS



KEY TO INTERNAL ENGINE COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Main bearing cap—front.	27.	Pulley—on crankshaft.	53.	Cap—spring—top.
2.	Main bearing cap—centre.	28.	Key—crankshaft pulley.	54.	Packing ring—valve.
3.	Main bearing cap—rear.	29.	Washer.	55.	Split cotters—valve spring.
4.	Pipe—rear cap.	30.	Nut—crankshaft.	56.	Support bracket—rocker-shaft.
5.	Nuts—bearing cap.	31.	Shims—nut.	57.	Bolt—support bracket (8 mm.).
6.	Tensioner—chain.	32.	Camshaft.	58.	Bolt—support bracket (10 mm.).
7.	Feed block—tensioner.	33.	Chain sprocket.	59.	Lock plate—support bracket bolts.
8.	Bolt—feed block.	34.	Key—chain sprocket.	60.	Washer—Nos. 1 and 5 brackets.
9.	Spring—tensioner.	35.	Bolt—camshaft.	61.	Washer—Nos. 2 and 3 brackets.
10.	Piston complete (with rings and gudgeon pin).	36.	Washer—chain sprocket.	62.	Rocker-shaft with plugs.
11.	Piston rings (compression).	37.	Lock washer—chain sprocket.	63.	Plug—rocker-shaft.
12.	Piston ring (oil control).	38.	Oil thrower—camshaft.	64.	Spacer spring—long—centre.
13.	Gudgeon pin.	39.	Circlip—camshaft—rear.	65.	Spacer spring—medium—outer.
14.	Connecting rod with cap and bolts.	40.	Thrust plate—camshaft.	66.	Spacer spring—short—front and rear.
15.	Bolt—connecting rod cap.	41.	Bearing—camshaft—front.	67.	Spring clip—rocker-shaft.
16.	Nut—connecting rod cap bolt.	42.	Bearing—camshaft—rear.	68.	Washer—spring clip.
17.	Clamp screw—gudgeon pin.	43.	Bearing—camshaft—intermediate.	69.	Valve rocker with bush (Nos. 4 and 8 valves).
18.	Spring washer—clamp screw.	44.	Screw dowel—bearing.	70.	Valve rocker with bush (Nos. 1 and 5 valves).
19.	Crankshaft complete (with main big-end bearings).	45.	Plain dowel—bearing.	71.	Bush for valve rocker (Nos. 1, 4, 5 and 8 valves).
20.	Bearing—front.	46.	Timing chain.	72.	Valve rocker with bush (Nos. 2 and 6 valves).
21.	Bearing—intermediate.	47.	Valve guide—inlet and exhaust.	73.	Valve rocker with bush (Nos. 3 and 7 valves).
22.	Bearing—rear.	48.	Valve—inlet and exhaust.	74.	Bush for valve rocker (Nos. 2, 3, 6 and 7 valves).
23.	Bearing—connecting rod.	49.	Spring—valve—inner.	75.	Adjusting screw—rocker.
24.	Oil thrower—crankshaft.	50.	Spring—valve—outer.	76.	Locknut—adjusting screw.
25.	Chain sprocket.	51.	Cap—spring—bottom.	77.	Push-rod assembly.
26.	Key—chain sprocket.	52.	Oil deflector—valve.	78.	Valve tappet.
				79.	Seal—rear bearing.

A THE ENGINE

to reassemble the main bearing shells to the correct bearings. Oil all parts with clean oil before assembly.

Section A.34

REGRINDING THE CRANKSHAFT

If the crankshaft journals are found to be worn, scored or oval, they must be reground undersize or alternatively the engine must be fitted with a replacement crankshaft.

The table on page A.21 gives details of the various sizes available for regrinding to ensure the supply of bearings to match.

On XPEG engines the crankshaft cannot be reground but may be exchanged for a new one (Part No. 168557).

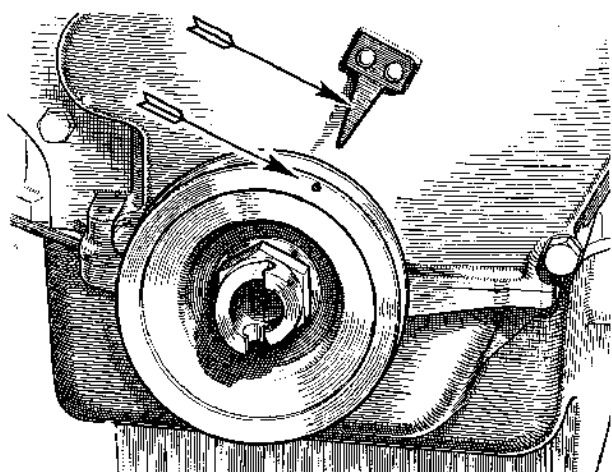


Fig. A.28.

The method of determining top dead centre.

Section A.35

OIL PRESSURE

Under normal running conditions the oil pressure should not drop below 40 lb. per sq. in. (2.8 kg./cm.²) on the gauge, whilst approximately 20 lb. per sq. in. (1.4 kg./cm.²) should be shown when the engine is idling.

Should there be a noticeable lack of pressure, the following points should be checked :—

1. That there is a good supply of the correct grade of oil in the engine sump.
2. That the pump gears are in order and have the correct clearances. (See Section A.4.)
3. That the gauze oil pump filter is clean and not choked with sludge.
4. That the external filter element is clean.
5. That the bearings on the delivery side to which oil is fed under pressure have the correct working clearance. Should the bearings be worn and the clearances excessive, the oil will

escape more readily from the sides of the bearings, particularly when the oil is warm and fluid. This will cause a drop in the pressure recorded on the gauge, as compared with that shown when the bearings are in good order.

Note.—The automatic release valve deals with any excessive oil pressure when the engine and oil are cold.

Cold running and unnecessary use of the mixture control are often causes of serious oil dilution by petrol, and a consequent drop in pressure.

New engines with new oil will give considerably higher pressure readings than those given above.

Particular attention is called to the recommended change of oil every 3,000 miles (5000 km.). This is a most important factor in attaining long and trouble-free service from the engine.

Section A.36

REAR MAIN BEARING OIL SEAL COVER

This half cover is dowelled and bolted to the cylinder block, and to prevent oil leaks it is important that the extreme ends of the cover mate with the top face of the rear main bearing block. Jointing should be put between these faces when assembling. Renew the gasket (Fig. A.29) if it is damaged in any way.

Section A.37

TOP DEAD CENTRE MARK

An indicating arrow is fitted on the timing chain case and a hole is drilled or a groove cut in the outer face of the crankshaft fan pulley. Turn the engine until the hole or groove in the pulley is in line with the arrow on the cover for top dead centre on No. 1 and No. 4 cylinders (see Fig. A.28).

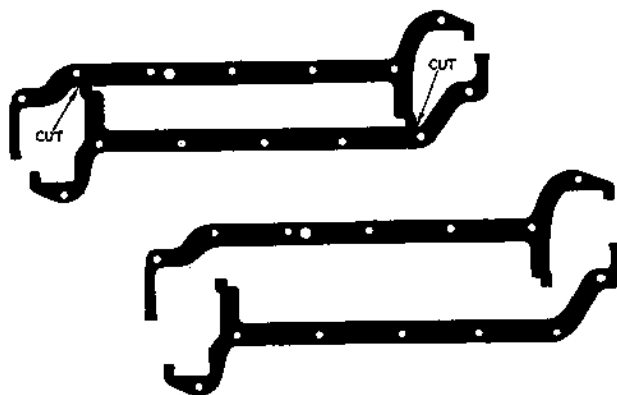


Fig. A.29.

This is the correct method of cutting the new sump gasket. It is important that the small ears are left on the projecting portions of the gasket.

Section A.38

THE ENGINE MOUNTING AND CONTROL LINK

The power unit is flexibly mounted to the chassis frame on a rubber block at the front and on two rubber blocks underneath the gearbox at the rear. As the location of these rubber mountings would permit a large rocking movement of the power unit under certain circumstances, a control link is fitted at the forward end to control the torque reaction effects on the power unit.

The rear mounting consists of two loose rubber blocks on which the engine rests and which are

the adjuster in the appropriate direction, allowing the assembly to be removed complete with inner rubbers and cups by rocking the engine.

Refitting the control link

Screw the adjuster locknuts right home on the threads of the two adjusting rods and screw the rods into the adjuster barrel as far as they will go. Place the two inner cups and rubbers on the ends of the adjusting rods. Insert one end of the assembly through the bracket on the engine and, holding it with its rubber tight against the bracket, rock the engine towards the left of the car on its rubber mounting to enable the other end of the adjusting rod assembly to be entered into the frame bracket.

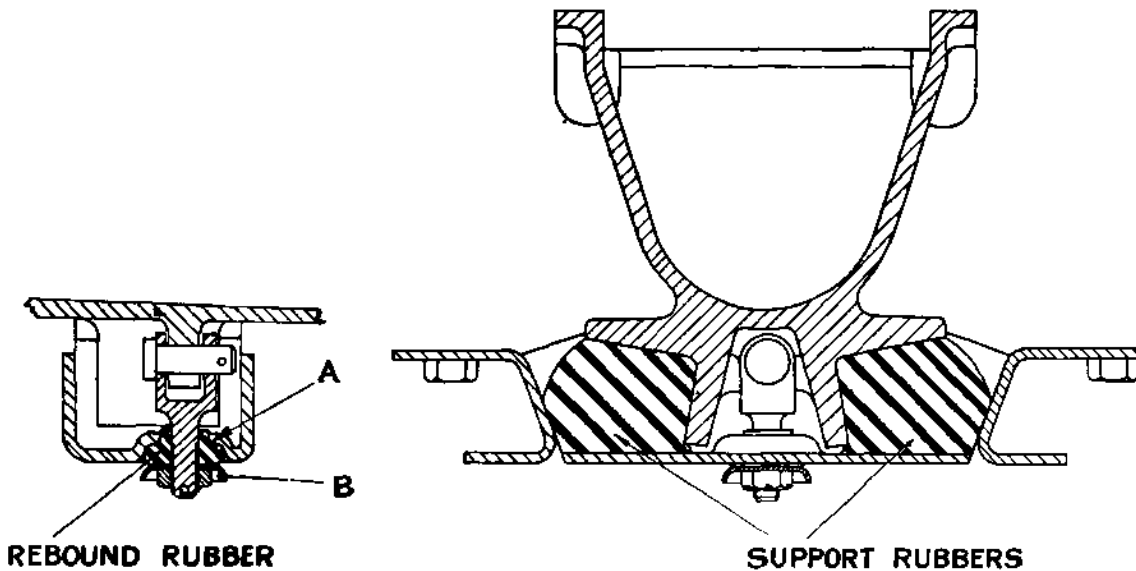


Fig. A.30.
Rear engine mounting.

housed in a cradle on the chassis frame cross-member. A rebound rubber is also provided to limit the upward movements.

The exhaust system is rigidly attached to the exhaust manifold and the side of the gearbox, but attached to the chassis frame by a flexible mounting. This allows the exhaust system to float with the power unit.

Removing the control link

The engine control link is removed by withdrawing the split pins from the slotted nuts at each end, unscrewing the nuts, withdrawing the flat washers, and the cups and rubbers. If the locknuts of the central adjuster are slackened back (right- and left-hand threads) the link can be shortened by screwing

Release the engine and, to ensure that it is in the natural position on its mountings, rock it gently from side to side a few times. As an additional precaution the exhaust pipe should be uncoupled from its attachments to the exhaust manifold and gearbox bracket clip while this is done.

If a noise or knock is heard when the engine is rocked gently, suggesting a foul, examine the installation to make sure there is ample clearance everywhere. Couple up the exhaust system.

Lengthen out the adjuster until the rubbers at each end are bearing lightly but firmly against the faces of the control link brackets, without disturbing the position of the engine. Fit the outer cups and rubbers, the flat washers, and finally the slotted nuts.

A THE ENGINE

Tighten up the slotted nuts only just sufficiently to nip the rubbers and insert the split pins through the nearest slot.

Note.—The engine control link is only to control engine movement and it must on no account be subjected

to constant load through being too long or too short. It is most important therefore that it should be adjusted as explained above so that it carries no load, to ensure the minimum of engine vibration.

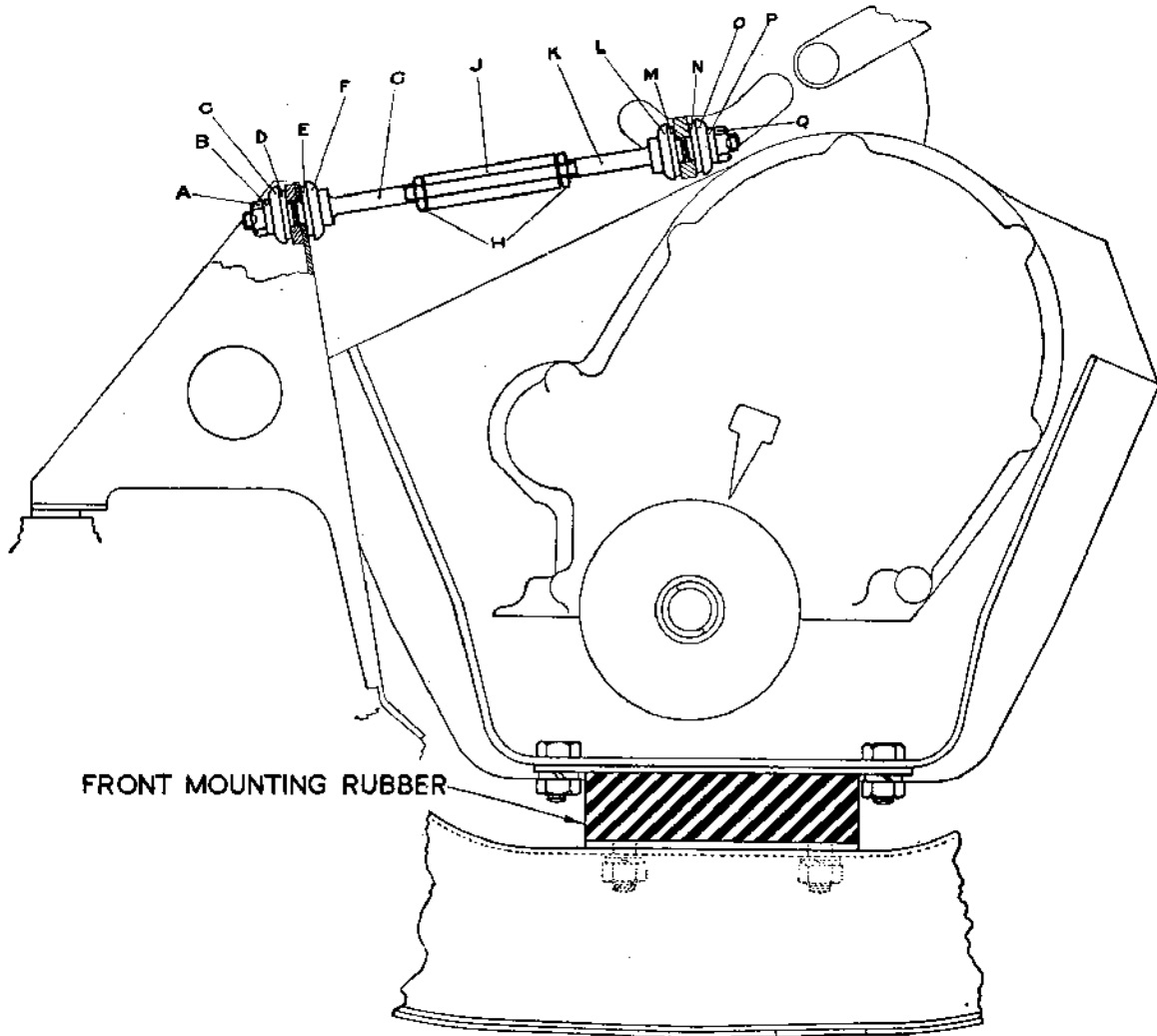


Fig. A.31.

Showing engine control link and front engine support rubber.

- | | |
|-----------------|-----------------|
| A. Slotted nut. | J. Adjuster. |
| B. Washer. | K. Link rod. |
| C. Cup. | L. Cup. |
| D. Rubber. | M. Rubber. |
| E. Rubber. | N. Rubber. |
| F. Cup. | O. Cup. |
| G. Link rod. | P. Washer. |
| H. Locknuts. | Q. Slotted nut. |

Section A.39

LOCATING TROUBLES

Engine will not start

- A. If the starter will not turn the engine, check the following :—
1. Battery discharged, and/or defective.
 2. Disconnected or broken leads.
 3. Faulty starter switch.
 4. Faulty starter motor.
 5. Starter cables shorting to earth.
 6. Battery terminals badly corroded or battery leads loose.
- B. If starter turns engine very slowly, check :—
1. Partly discharged battery.
 2. Loose terminals or connections.
 3. Dirty or corroded connections.
 4. Faulty insulation on starter cables.
 5. Tightness in engine.
 6. Faulty starter brushes.
- C. If starter turns engine smartly, but it will not fire, check :—
1. Plugs not sparking.
 2. Spark at the coil. If the coil gives good spark, check :—
 - (a) Gaps in plugs too wide or too close.
 - (b) Plugs oiled up.
 - (c) Plug insulators damaged, or dirty.
 3. If poor spark at coil, check :—
 - (a) Low-tension or high-tension leads from coil to distributor loose or corroded.
 - (b) Distributor points dry, worn or out of adjustment.
 - (c) Carbon brush not making contact.
 - (d) Rotor cracked.
 - (e) Faulty condenser (substitute a condenser known to be in order).
 - (f) Faulty coil (substitute a coil known to be in order).
 4. Check the carburetters for fuel supply. If no fuel in float-chambers, check :—
 - (a) Functioning of the fuel pump.
 - (b) Air leak in pipe line, indicated by rapid action of the pump.
 - (c) Float-chamber needle sticking.
 5. If fuel is reaching float-chamber, check :—
 - (a) For choked jets.
 - (b) Water in the fuel.
 - (c) Dirt in the carburetters.
 - (d) Air leak in induction system.
 - (e) Check adjustment of carburetter control.

If engine starts, but runs erratically

- A. Check the following ignition points :—
1. Loose high-tension leads to sparking plugs.
 2. Incorrect setting of plug points.
 3. Damaged plug or moisture on plugs.
 4. Loose connection on battery or in ignition circuit.
 5. Faulty high-tension leads.
 6. Battery charge low.
 7. Battery connections faulty.
 8. Defective contact breaker.
 9. Defective distributor.
 10. Faulty condenser.
- B. Check the following carburetter points :—
1. Water in the float-chambers.
 2. Choked filters in carburetters or fuel pump, indicated by slow pumping of fuel pump.
 3. Action of fuel pump. Suspect if sluggish.
 4. Jet partially choked.
 5. Carburetters set too rich, indicated by sooty exhaust.
 6. Fuel tank filler-cap vent choked.
 7. Obstruction in fuel feed pipe.
 8. Air leak into induction system.
- C. Check the following mechanical points :—
1. Sticking valves.
 2. Incorrect valve clearances.
 3. Burnt or broken valves.
 4. Incorrect valve timing.
 5. Incorrect ignition timing.
 6. Broken or weak valve spring.
 7. Valve guides worn, causing air leaks.
 8. Cylinder head gasket for leaks.
 9. Back-pressure due to damaged exhaust system.

If engine starts and stops

- A. Check the following ignition points :—
1. Loose low-tension leads.
 2. Loose distributor clamp screw.
 3. Faulty ignition switch contact.
- B. Check the following carburetter points :—
1. Incorrect setting of carburetter controls.
 2. Blocked fuel pipe.
 3. Water in float-chambers.
 4. Sticking needle valves.
 5. Fuel pump failing to function regularly.
 6. Air leak into fuel line.
 7. Fuel level low in tank.

A THE ENGINE

If engine will not idle or run slowly

A. Check the following carburettor points :—

1. Throttle stop screws incorrectly set.
2. Throttle controls incorrectly set.
3. Weak mixture or over-rich mixture.
4. Faulty functioning of fuel pump.
5. Carburettors not properly synchronised.

B. Check the following mechanical points :—

1. Sticking valves.
2. Incorrect valve clearance.
3. Air leak in Induction system.

CHECKING METHODS

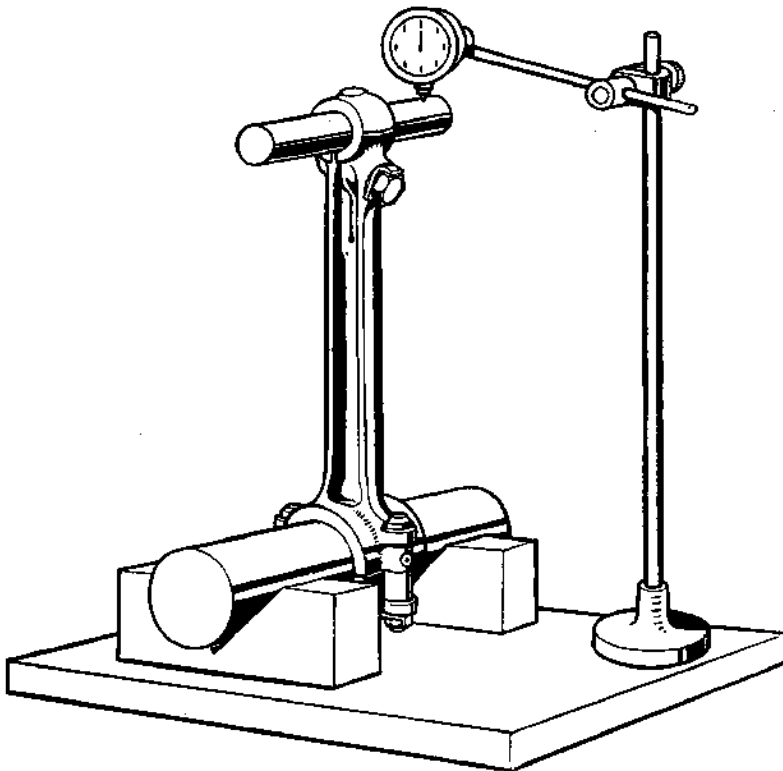


Fig. A.32.

Checking the connecting rod for alignment. The indicator dial should give the same reading at each end of the test bar clamped in the little-end.

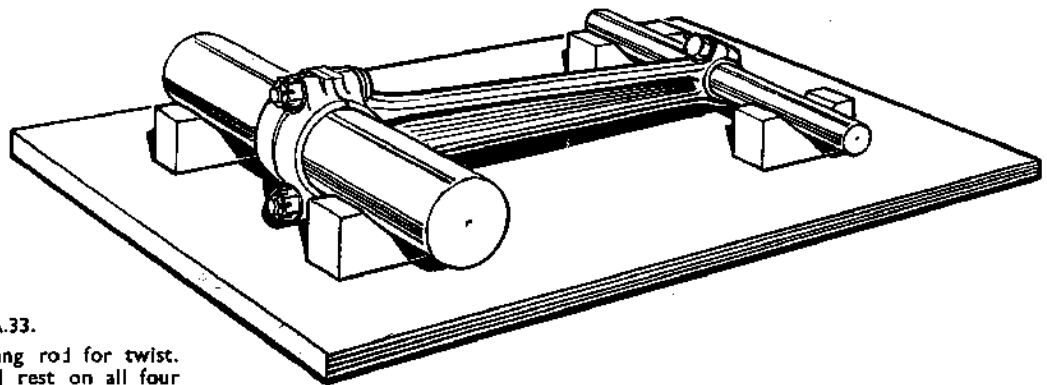


Fig. A.33.

Testing the connecting rod for twist. The test bars should rest on all four "V" blocks.

Section A.40

EXCESSIVE OIL CONSUMPTION

Some early cars of the "TD" series have been observed to have a heavy oil consumption.

In some cases this has been found to be due to oil

passing from the valve cover into the air cleaner and being consumed in the engine.

This can be prevented by inserting a restrictor or washer in the air cleaner engine breather pipe as indicated in Fig. A.34.

Later production engines have this modification incorporated as standard.

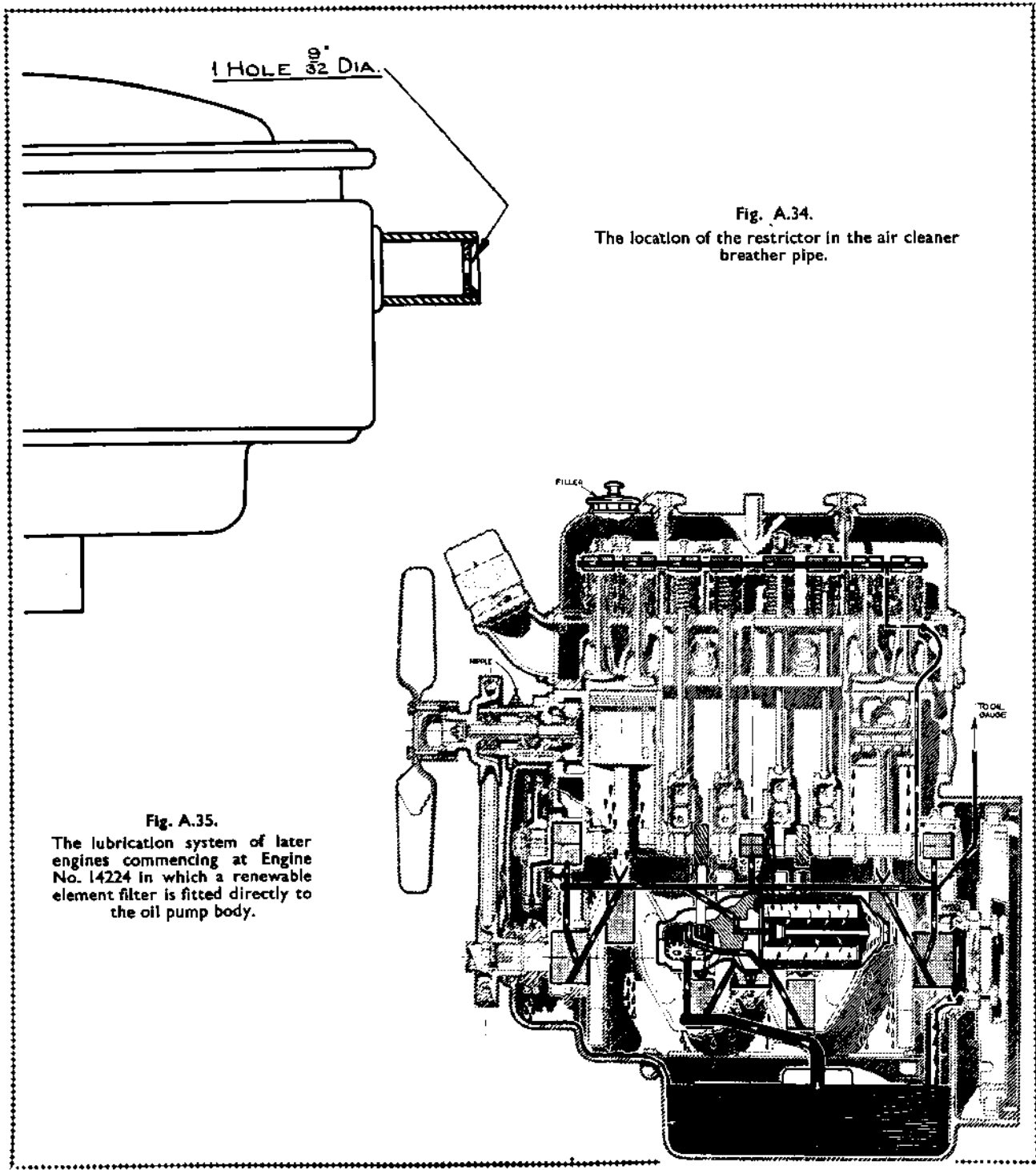
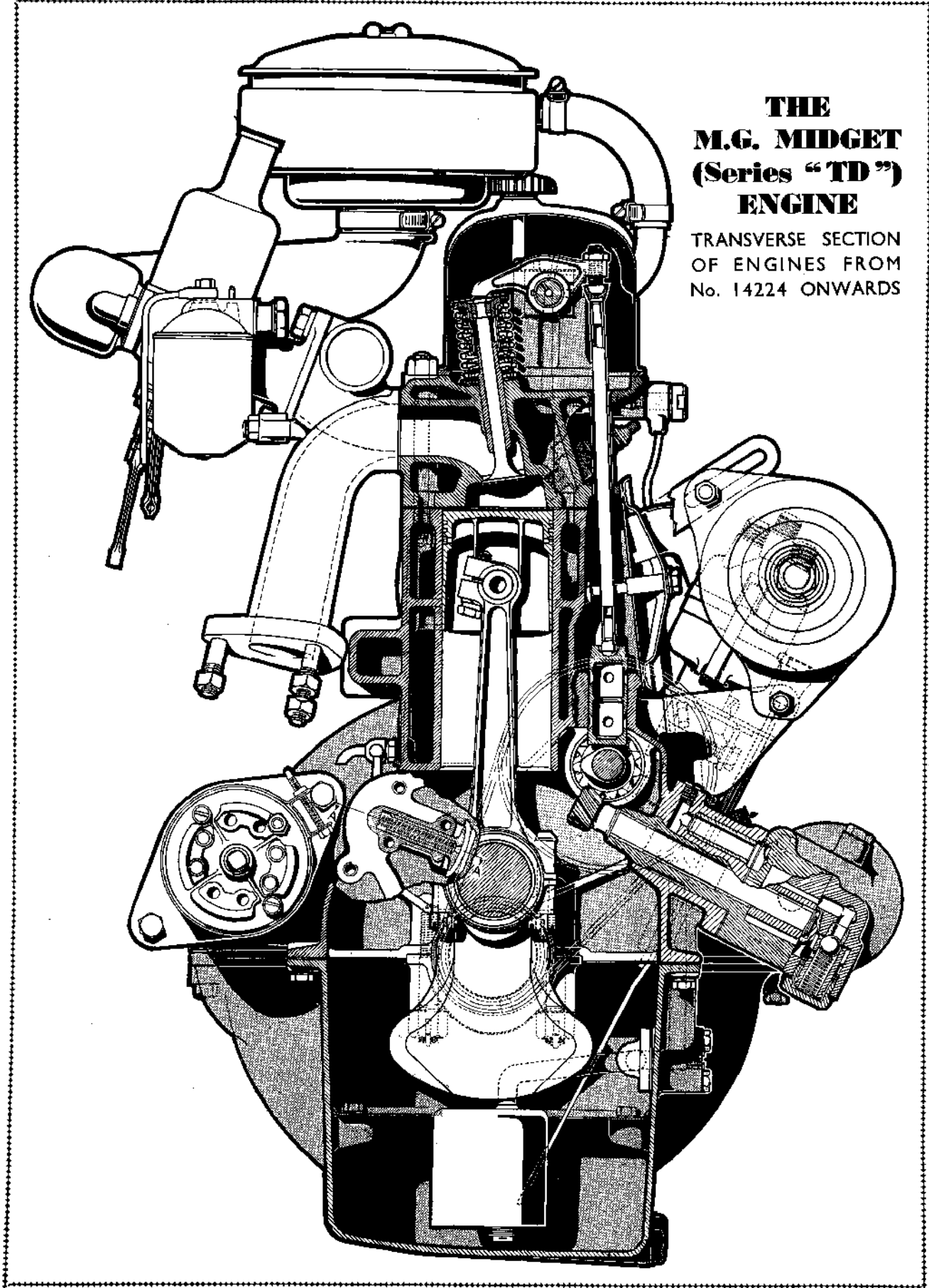


Fig. A.34.
The location of the restrictor in the air cleaner breather pipe.

Fig. A.35.
The lubrication system of later engines commencing at Engine No. 14224 in which a renewable element filter is fitted directly to the oil pump body.



**THE
M.G. MIDGET
(Series "TD")
ENGINE**

TRANSVERSE SECTION
OF ENGINES FROM
No. 14224 ONWARDS

Section A.41

THE MODIFIED OIL PUMP

Commencing at Engine No. XPAG/TD2/14224 a modified oil pump, incorporating the external oil filter head, has been fitted.

This has eliminated all possibility of fracture of oil pipes and introduces the advantage of a renewable filter element.

The filter element should be removed and cleaned at intervals of 3,000 miles (5000 km.) and a new filter element should be fitted every 6,000 miles (10000 km.). The filter element is a Tecalemit FG2381 (Part No. 162451), or a Purolator element (Part No. 162429).

From Engine No. XPAG/TD2/20972 a special priming plug has been fitted to the pump cover to permit the pump to be primed when the lubrication system has been drained completely.

Section A.42

CYLINDER HEAD AND CYLINDER BLOCK MODIFICATIONS

Starting at Engine No. XPAG/TD/17969, a modified cylinder block (Part No. SA2404/11) is fitted in conjunction with cylinder head gasket (Part No. X24481). This gasket is illustrated in Fig. A.37, and it will also service all engines prior to that quoted above and will be issued against all orders for replacement gaskets.

Engines from No. XPAG/TD2/22735 onwards are fitted with the modified cylinder block SA2404/11 and a modified cylinder head (Part No. SA2403/10). Such engines have a new gasket (Part No. 168423), and only this gasket may be used on these engines. In addition, they are fitted with Champion NA.8 sparking plugs instead of the Champion L.10.S previously used.

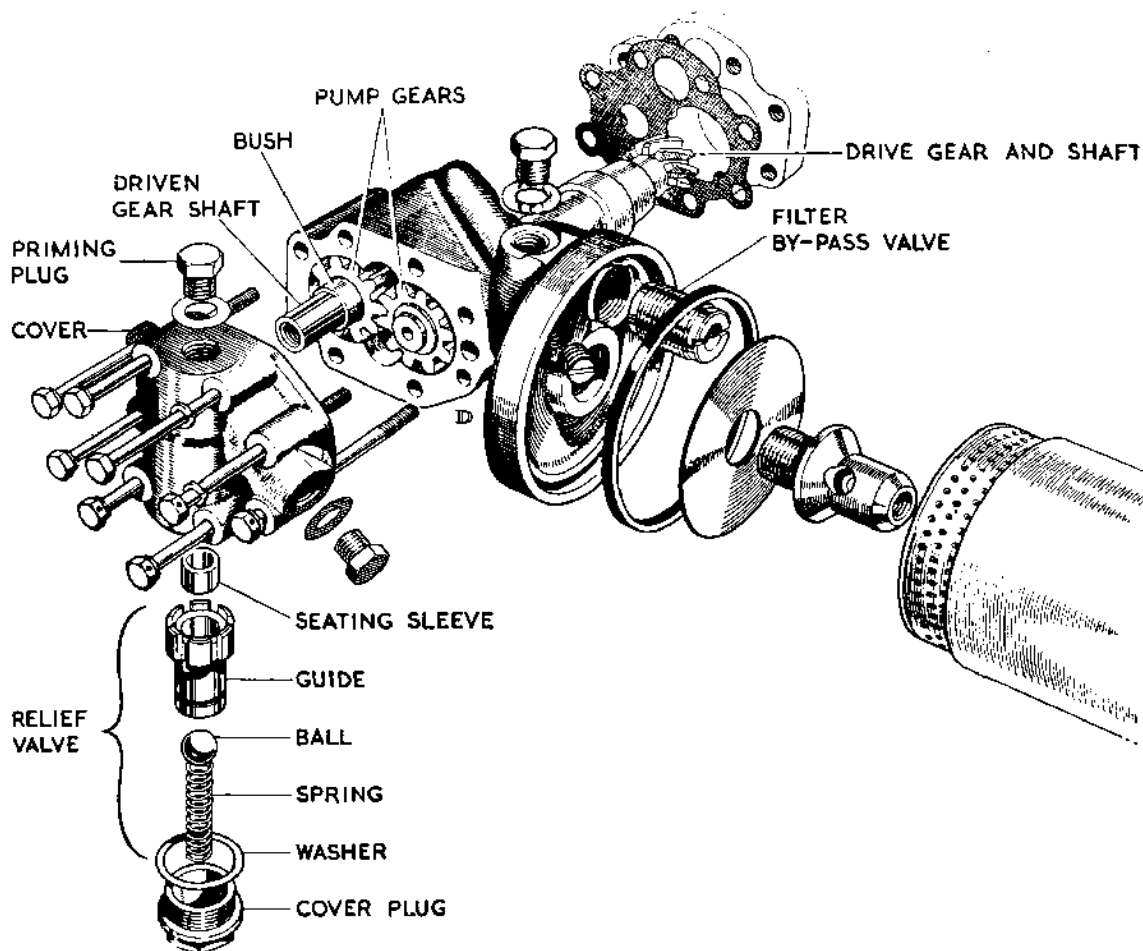


Fig. A.36.

The components of the modified oil pump.

A THE ENGINE

Section A.43

MODIFIED PUSH-RODS AND ADJUSTING SCREWS

Operating in conjunction with longer adjusting screws, the push-rods on all engines starting at No. XPAG/TD2/17298 are shorter in length. Care must therefore be taken when ordering replacement push-rods or rocker adjusting screws. The new components bear the following Part Nos. :—

Push-rod assembly : 168431.

Adjusting screw for rocker : X21231.

Section A.44

THE MODIFIED CAMSHAFT

Commencing at Engine No. XPAG/TD2/24116, a new camshaft has been fitted, with different cam contours.

With this camshaft the valve clearance has been altered from $\cdot 019$ in. ($\cdot 48$ mm.) to $\cdot 012$ in. ($\cdot 30$ mm.).

The new camshaft is Part No. 168553, and is fitted in conjunction with a new cylinder head cover assembly (Part No. SA2407/3), and a new valve clearance plate (Part No. 162279).

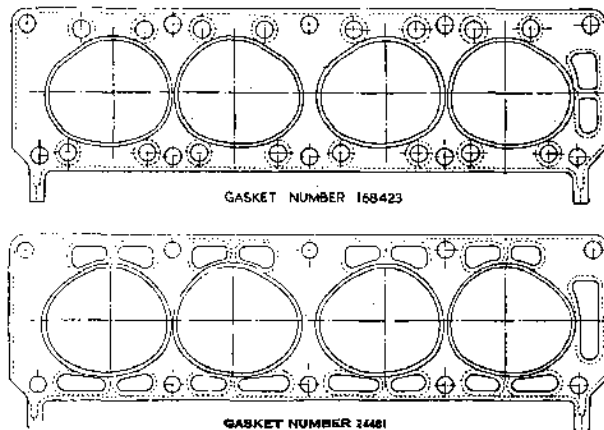


Fig. A.37.

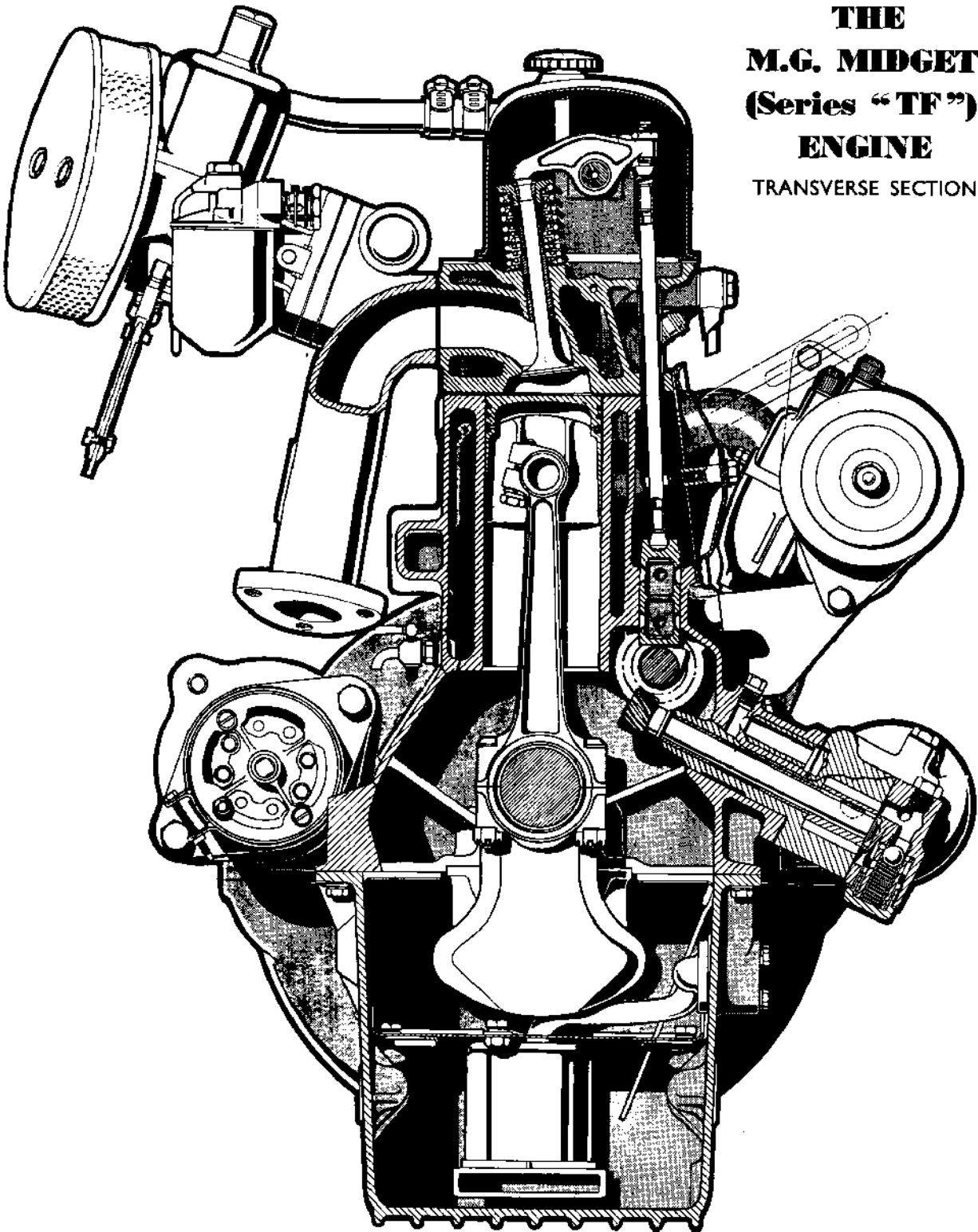
The modified gaskets. They can readily be identified by the difference in the shape of the water passage apertures.

Section A.45

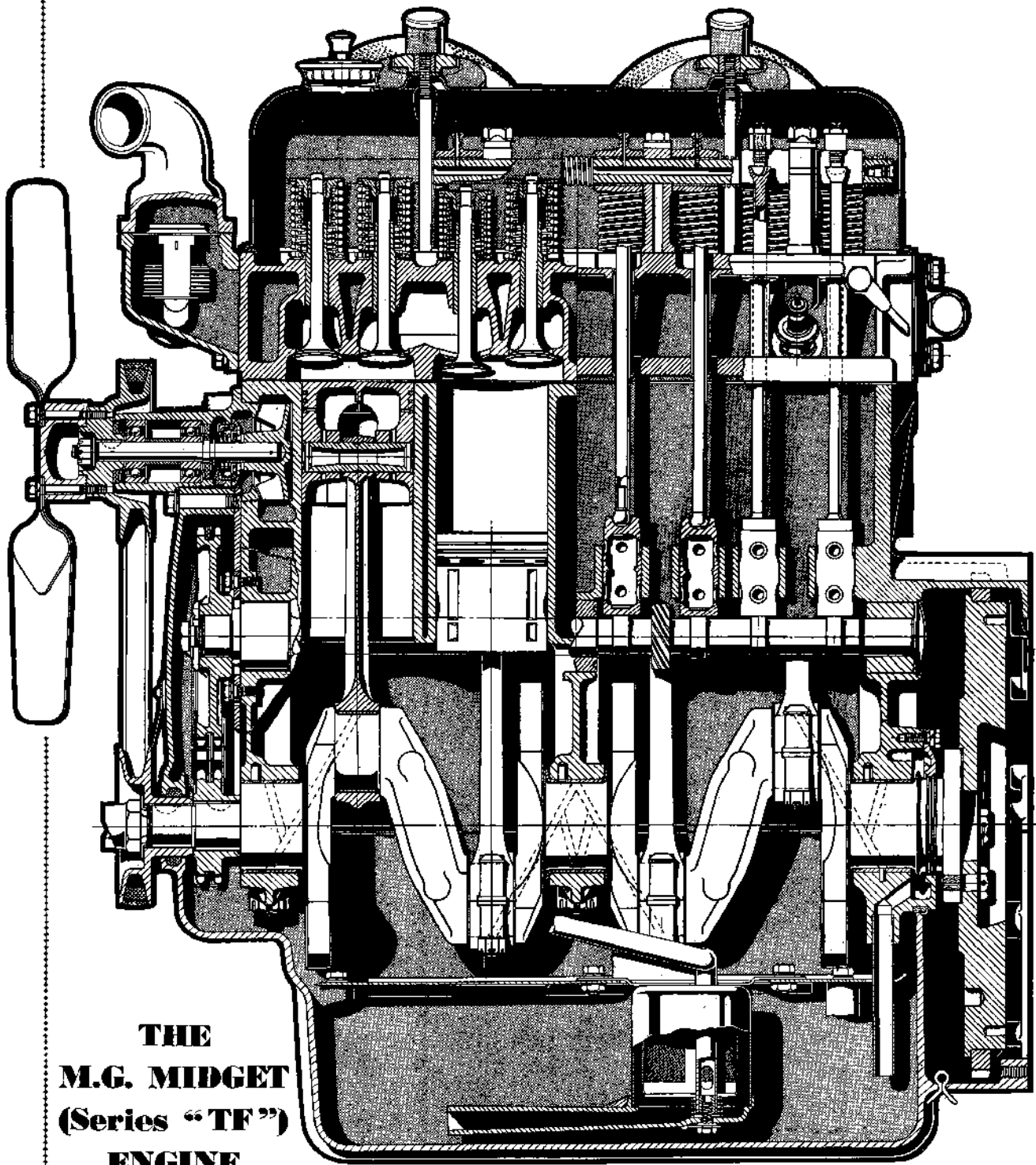
MODIFIED OIL GAUGE PIPE BANJO

Commencing at Engine No. 31943 the lower banjo coupling on the oil pipe (gallery to head) has the internal diameter reduced to $\cdot 055$ in. ($1\cdot 39$ mm). This is to prevent the possibility of a hydraulic knock in the oil pipe which was encountered on some earlier models.

**THE
M.G. MIDGET
(Series "TF")
ENGINE**
TRANSVERSE SECTION



A



**THE
M.G. MIDGET
(Series "TF")
ENGINE**

LONGITUDINAL
SECTION

SECTION B

THE FUEL SYSTEM

Section No. B.1	To remove the fuel tank.
Section No. B.2	Construction of the fuel pump.
Section No. B.3	Action of the fuel pump.
Section No. B.4	To dismantle and reassemble the fuel pump.
Section No. B.5	Fuel pump adjustment.
Section No. B.6	Tracing fuel pump troubles.
Section No. B.7	Fuel pump maintenance.
Section No. B.8	The carburetters.
Section No. B.9	Setting the twin carburetters.
Section No. B.10	Carburetter details.
Section No. B.11	Centring the jet.
Section No. B.12	Sources of carburetter trouble.
Section No. B.13	The "TF" carburetters.
Section No. B.14	Removing the "TF" fuel tank.
Section No. B.15	Late type fuel pumps.

Section B.1

TO REMOVE THE FUEL TANK

Take off the spare wheel. Slacken off the tank retaining straps at their lower ends and undo the four chromium-plated dome nuts at the top of the spare wheel carrier. Remove the bolts from the inside of the car.

Drain the tank, detach the fuel-line and remove the clamps at the lower ends of the spare wheel carrier. Remove the tank retaining straps and the rubber strips.

Allow the wheel carrier to fall away towards the rear of the car.

Disconnect the electric cable for the fuel gauge unit and lift out the tank.

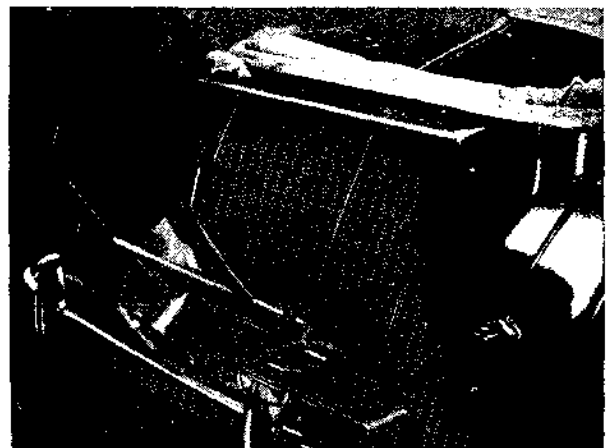


Fig. B.1.
Removing the fuel tank from the car.

B THE FUEL SYSTEM

Section B.2

CONSTRUCTION OF THE FUEL PUMP

The 12-volt S.U. electric fuel pump, type L, consists of three main assemblies, the magnet assembly, the contact breaker and an alloy body, die-cast in two pieces, the joint between them being sealed by a gasket.

The body is composed of a hollow stamping or

fibre washers (2) and (6). In the top of the delivery cage is the delivery valve, a thin brass disc (4) held in position by a spring clip (3). Inserted in the bottom of the cage is the suction valve (7), being a similar disc to (4) and resting on a seating machined in the body. Holes connect the space between the valves to the pumping chamber, which is a shallow depression on the forward face of the body. This space is closed by a diaphragm assembly (9) which is clamped at its outside edge between the magnet housing (27) and body (8) and at its centre between the retaining plate

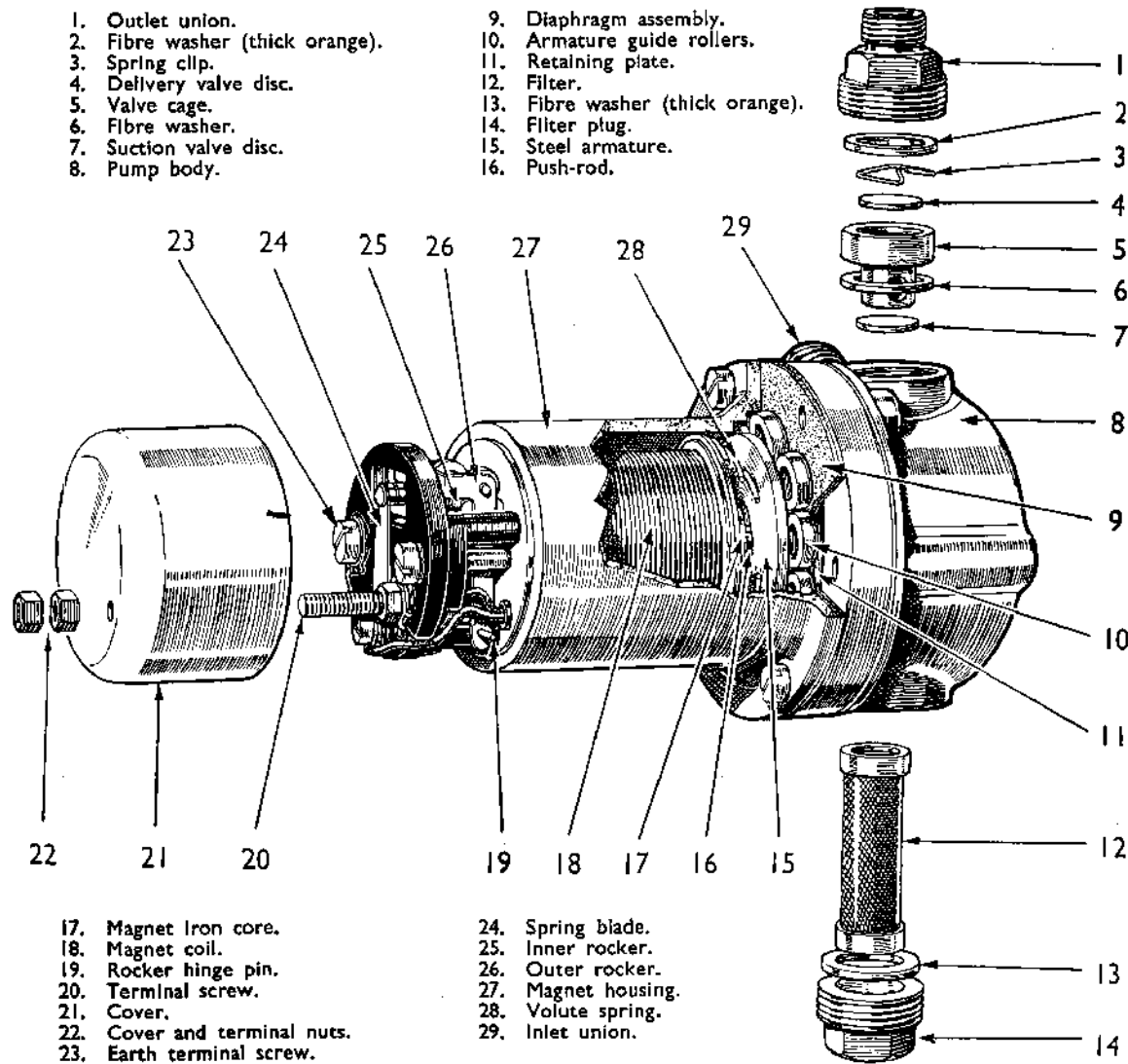


Fig. B.2.
The S.U. fuel pump.

casting (8), into the bottom of which the filter (12) is screwed. The pump inlet union (29) is screwed in at an angle on one side. The outlet union (1) is screwed into the top and tightens down on the delivery valve cage (5) which is clamped between the two

and the steel armature (15). A bronze rod (16) is screwed through the centre of the armature, to which the diaphragm is attached, and it passes through the magnet core to the contact breaker, which is located at the other end. A volute spring (28) is interposed

between the armature and the end plate of the coil to return the armature and diaphragm.

The magnet consists of a cast-iron pot having an iron core (17), on which is wound a coil of copper wire which energises the magnet. Between the magnet housing and the armature are fitted eleven spherical-edged brass rollers (10). These locate the armature centrally within the magnet at all times, and allow absolute freedom of movement in a longitudinal direction. The contact breaker consists of a small bakelite moulding carrying two rockers, (25) and (26), which are both hinged to the moulding at one end and are connected together at the top end by two small springs, arranged to give a "throw over" action. A trunnion is fitted into the centre of the inner rocker, and the bronze push-rod (16) connected to the armature is screwed into this. The outer rocker (26) is fitted with a tungsten point, which makes contact with a further tungsten point on a spring blade (24). This spring blade is connected to one end of the coil, and the other end of the coil is connected to the terminal (20), which also serves to hold the bakelite moulding on the magnet housing.

A short length of flexible wire is connected to the outer rocker and to the other terminal (23) to provide the earth return when the contacts are closed.

The rocker mechanism is insulated by fibre bushes. Two fibre bushes are fitted to one of the spindles of the "throw over" mechanism in order to silence the operation of the contact breaker.

A good earth is essential, and this is provided on early models by one of the body attachment screws which is extended to form a terminal post. Later models have a separate earthing screw in a boss cast on the magnet housing.

Section B.3

ACTION OF THE FUEL PUMP

The action of the pump is as follows:—

When the pump is at rest, the outer rocker lies in the outer position and the tungsten points are in contact. The current passes from the terminal through the coil back to the blade, through the points and to the earth return, thus energising the magnet and attracting the armature. This comes forward, bringing the diaphragm with it and sucking fuel through the suction valve into the pumping chamber. When the armature has advanced nearly to the end of its stroke the "throw over" mechanism operates, and the outer rocker flies back, separating the points and breaking the circuit. The spring (28) then pushes the armature and diaphragm back, forcing petrol through the delivery valve at a rate determined

by the requirements of the engine. As soon as the armature gets near the end of this stroke the "throw over" mechanism again operates, the points again make contact, and the cycle of operations is repeated.

Section B.4

TO DISMANTLE AND REASSEMBLE THE FUEL PUMP

When a pump comes in for reconditioning the first thing to do is to determine whether it has been in contact with gum formation in the fuel, resulting in the parts in contact with the fuel becoming coated with a substance similar to varnish. These deposits also cause the eventual destruction of the neoprene diaphragm. The easiest way to identify this deposit is by the sense of smell. Place the outlet union of the pump close to one nostril, put a finger over the other nostril and breathe. If an unpleasant, stale smell is noticed it will indicate that there is some gum present in the pump. The ordinary sharp acrid smell of petrol denotes that no gum is present.

Assuming that trouble with gum formation is indicated, the whole of the parts coming into contact with petrol will have to be dismantled, boiled in 20 per cent. caustic soda solution, given a dip in strong nitric acid and then washed in boiling water, with the exception of aluminium body castings, of course, which should be cleaned in methylated spirits only.

To dismantle the pump

First undo the filter plug, remove the filter plug washer and the filter. The latter may be found to be clogged completely with gum. Next the inlet union and its washer should be removed, followed by the outlet union, outlet union washer, valve cage, valve cage washer and suction valve. The valve cage should then be dismantled by removing the circlip retaining the delivery valve in place, and the valve itself can then be withdrawn.

Next undo the six screws holding the two main components of the pump together. All the components of the pump body—with the exception of the washer, but including the pump body itself—should now be given the caustic soda and nitric acid treatment, with the exception of aluminium bodies.

New fibre washers should be used on replacement.

If there is no evidence of gum formation, proceed as follows:—First undo the six screws holding the two parts of the pump together. The action of the valves can then be checked by blowing and sucking in the inlet union, which will check the suction valve; carrying out the same procedure with the outlet union will check the delivery valve. In the case of the former

B THE FUEL SYSTEM

you should be able to blow freely but not be able to suck air back, and with the latter you should be able to suck freely and not blow air back. If these are in order it is best to leave the valves alone.

Clean the filter in fuel with a brush and swill out the body of the pump.

Next unscrew the diaphragm assembly from its trunnion in the contact breaker. This is done by rotating the whole assembly in an anti-clockwise direction. While doing this, care should be taken not to lose the brass rollers fitted behind the diaphragm. The easiest method is to hold the body in the left hand and to rotate the diaphragm.

Now remove the contact breaker cover by taking off the nut which holds it in place on the terminal, and then undo the farther nut on the terminal, which acts as a seating for the cover. Beneath this will be found a lead washer which is squeezed into the thread on the terminal. This should be cut away with a pocket knife, allowing the terminal to be pushed down a short way so that the tag on the coil end is free on the terminal.

The 5 B.A. screw holding the contact blade in position should now be removed, together with its spring washer and the contact blade.

The two long 2 B.A. screws holding the bakelite pedestal in place should now be removed, together with their spring washers. This will enable the

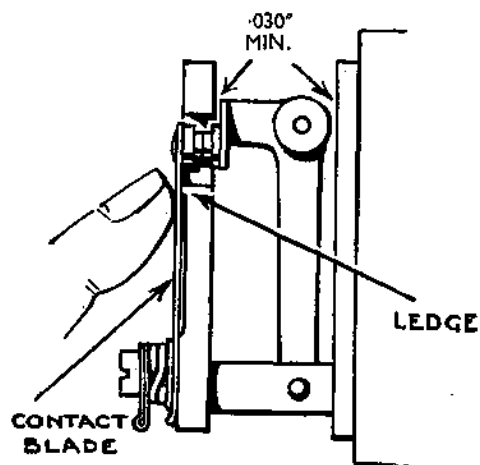


Fig. B.3.
The correct setting for the contact breaker points is clearly indicated in this illustration.

contact breaker assembly to be taken off, using great care to get the coil end tag over the terminal without damaging the coil end.

The hinge pin on which the rockers pivot can now be pushed out sideways and the pump is completely dismantled, since the rocker mechanism is not supplied in broken-down sections but only as a complete assembly.

Under no circumstances should any attempt be made to disturb the core of the magnet. The core can only be located in position correctly with special press tools, and in any case should not need to be interfered with.

To reassemble the pump

When reassembling, see that all parts are clean. The valves (4) and (7) should be fitted with the smooth side downwards. Care should be taken that the valve retaining clip (3) in the delivery valve cage (5) is correctly located in its groove. The thin hard red fibre washer (6) should be fitted under the valve cage and a thick orange-coloured one (2) above the valve cage and also above the filter plug. The washer on the inlet union (29) is a thick red fibre one.

The contact breaker should be assembled on its pedestal in such a manner that the rockers are free in their mountings, without appreciable side play. Any excessive side play on the outer rocker will allow

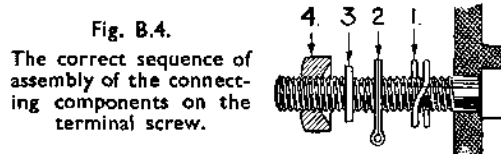


Fig. B.4.
The correct sequence of assembly of the connecting components on the terminal screw.

the points to get out of line, while excessive tightness will make the action of the contact breaker sluggish and interfere with its action. To obtain the required freedom in cases of tightness, it may be necessary to square the outer rocker up with a pair of thin-nosed pliers. The hinge pin is case-hardened and on no account should ordinary wire be used as a replacement. Always use the correct hardened pin.

Should the spring contact-breaker blade be removed, it should always be replaced bearing directly against the bakelite pedestal, i.e. underneath the tag.

When properly fitted the blade should rest against the ledge formed below the opening in the pedestal for the contact points, with the points separated, and it should not be sufficiently stiff to prevent the outer rocker from coming right forward when the points are in contact. The points should make contact when the rocker is in its midway position. The most simple way to check this is to hold the blade in contact with the pedestal, taking care not to press on the overhanging portion, and see that you can get a .030 in. (.76 mm.) feeler between the white rollers and the cast-iron body of the pump (see Fig. B.3). If necessary the tip of the blade may be set to give the correct clearance.

Note.—The spring washer on the B.A. screw, to which the earth connection is made, should be fitted between the tag and the pedestal. The reason for this is that the

spring washer is not a reliable conductor, and the brass tag must therefore bear directly against the head of the screw.

All four connections, namely the two ends of the earthing tag and the two ends of the coil, should be soldered. The coil end leading to the terminal should be soldered to its tag and not to the retaining nut. In the case of the terminal screw which holds the bakelite cover in position, similar considerations apply, the assembly being :—Spring washer (1), wiring tag (2), lead washer (3), and recessed nut (4) (see Fig. B.4). A lead washer has been found necessary at this point as some few cases of bad connection have been found. Under no circumstances

2. Fit the impact washer in the recess of armature.
3. Screw the armature in position.
4. Place the eleven guide rollers in position around the armature. **No jointing compound may be used on the diaphragm.**
5. Hold the magnet assembly in the left hand, in an approximately horizontal position.
6. Push armature in with the thumb of the right hand, pushing firmly but steadily. If the contact breaker throws over, the armature should be screwed in farther until it ceases to do so ; it should then be unscrewed one-sixth of a turn at a time, until a position is found where the contact breaker rocker just throws

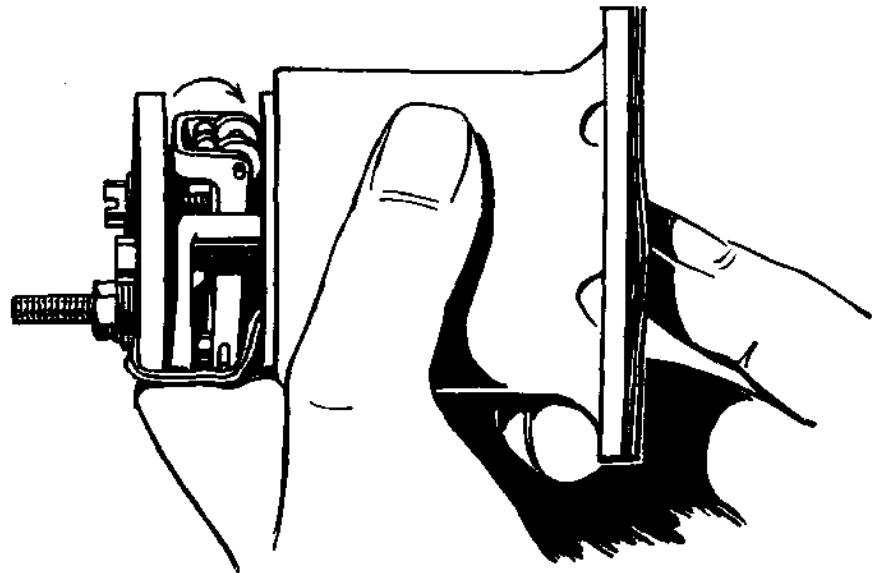


Fig. B.5.
The method which should be employed to check the correct setting of the armature.

must the spring washer be omitted, or the assembly shortened in any way. Any attempt to do so is likely to lead to breakage of the pedestal when the nut retaining the cover in position is tightened up.

The armature return spring should be fitted with its larger diameter towards the coil and its smaller diameter resting against the armature. This spring must not be stretched or otherwise interfered with, or the action of the pump will be affected.

Section B.5

FUEL PUMP ADJUSTMENT

The correct adjustment for the armature, if it has been removed, is carried out as follows :—

1. Swing the contact blade on the pedestal to one side while the adjustment is being made.

over, care being taken to avoid jerking the armature. It should be pressed in steadily (see Fig. B.5). The armature should then be unscrewed a further two-thirds of a turn when the setting is correct. **Do not forget that this setting must be carried out.**

When a new diaphragm is fitted, it is probable that considerable pressure will be required to push the armature right home. If there is any doubt concerning the point at which the contact breaker throws over, come back one-sixth of a turn.

7. Place the cast-iron body in position on the main body, taking care to see that the drain hole in the cast-iron body is at the bottom in line with the filter plug of the main body, and that all the rollers are still in their correct positions.

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If a roller drops out of position it will get trapped between the two ports, and this will cut a hole in the diaphragm.

Make sure that the cast-iron body is seating properly on the main body, and insert the five coupling screws and the earth terminal screw. These screws should not be screwed up tightly in the first instance as it is absolutely necessary at this stage to stretch the diaphragm to its outermost position. This is best effected by using a special forked wedge to keep the armature in its extreme position (Fig. B.6). The wedge is inserted between the white rollers of the outer rocker and pressed under

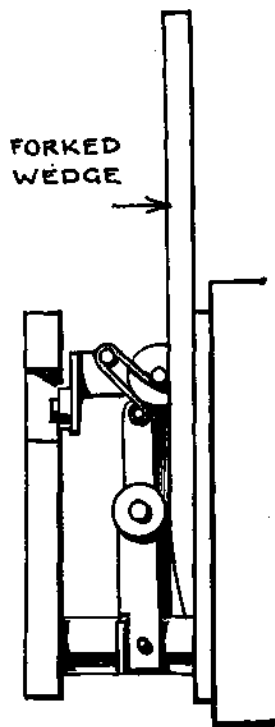


Fig. B.6.

The use of a forked wedge to keep the armature in the correct position for fitting the diaphragm.

the tips of the inner rocker until it lifts the trunnion in the centre of the inner rocker as far as it will go. If this wedge is not available the diaphragm may be stretched by holding the points in contact by inserting a matchstick under one of the white fibre rollers and passing the current through the pump. This will excite the magnet, actuate the armature, stretching the diaphragm, and the screws may then be tightened down fully while the diaphragm is held in this position.

The spring blade rests against a small projection on the bakelite moulding, and it should be so set that when the points are in contact it is deflected back from the moulding. The width of the gap at the points is approximately .030 in. (.76 mm.).

8. The pump should now be placed on test, using a cut-away cover to enable the contact breaker action to be observed, and at the same time prevent the rocker hinge pin from falling out.

A test rig of the type illustrated in Fig. B.7 is advised; either fuel or kerosene may be used for testing purposes, and the pump should be mounted approximately 3 ft. (91 cm.) above the test tank. The use of a glass tube and rubber connections between the pump and the test tank is advised. When the pump is switched on it should prime itself promptly, and the fuel, which is normally used for testing, should rise in the glass container until it flows over the top of the pipe having the $\frac{5}{32}$ in. (4 mm.) hole drilled in it 2 in. (5 cm.) below the top of the pipe. If the output of the pump is not up to normal, the $\frac{5}{32}$ in. (4 mm.) diameter hole will be able to deal with all the fuel pumped and the liquid will not flow over the top of the pipe. If a time test is used, one pint (.57 litre) of fuel per minute should be pumped.

This, therefore, constitutes a simple form of flow-meter which establishes in a simple manner whether the pump is giving a sufficient output or not. If there is any air leak in the pump or in its connections, bubbles will be seen coming out of the pipe projecting downwards into the flow-meter. Bubbles will certainly come through here for a short while after starting up, but they should cease after the pump has been running for a minute or so. The tap should then be turned right off and the pump should stand without repeating its action for at least 15 seconds. If it repeats within this time, the suction valve is not seating correctly.

The tap should then be turned off slowly to see if the pump idles satisfactorily, and that the outer rocker comes forward till it makes contact with the pedestal, and while it is in this position the tip of the blade should be pressed inwards to reduce the stroke of the pump gradually. However much this stroke is reduced the pump should go on pumping normally until it fails altogether owing to there being no gap left. If instead of pumping it buzzes, it usually indicates excessive flexibility in the diaphragm. This, of course, is not likely to be experienced with a new diaphragm. The tap should then be turned on again and the pump tested on 9 volts (or on $4\frac{1}{2}$ volts if it is a 6-volt pump) and it should work satisfactorily under these conditions, although probably with a reduced output.

It is as well to let the pump run for ten minutes or so before carrying out these various tests. The cover, which is black for 12-volt and brown for 6-volt, should then be fitted and held in place with an ordinary brass nut and an insulated dome nut fitted on the end

2. To press firmly and steadily on the armature. Instead of jerking it, while obtaining the setting.
3. Omission to stretch the diaphragm to the limit of its stroke while tightening up the body screws.

Section B.6

TRACING FUEL PUMP TROUBLES

Should the pump cease to function, first disconnect the fuel delivery pipe from the pump. If the pump then works the most likely cause of the trouble is a sticking needle in the float-chamber of the carburettor. Should the pump not work, disconnect the lead from the terminal and strike it against the body of the pump after switching on the ignition. If a spark occurs it indicates that the necessary current is available at the

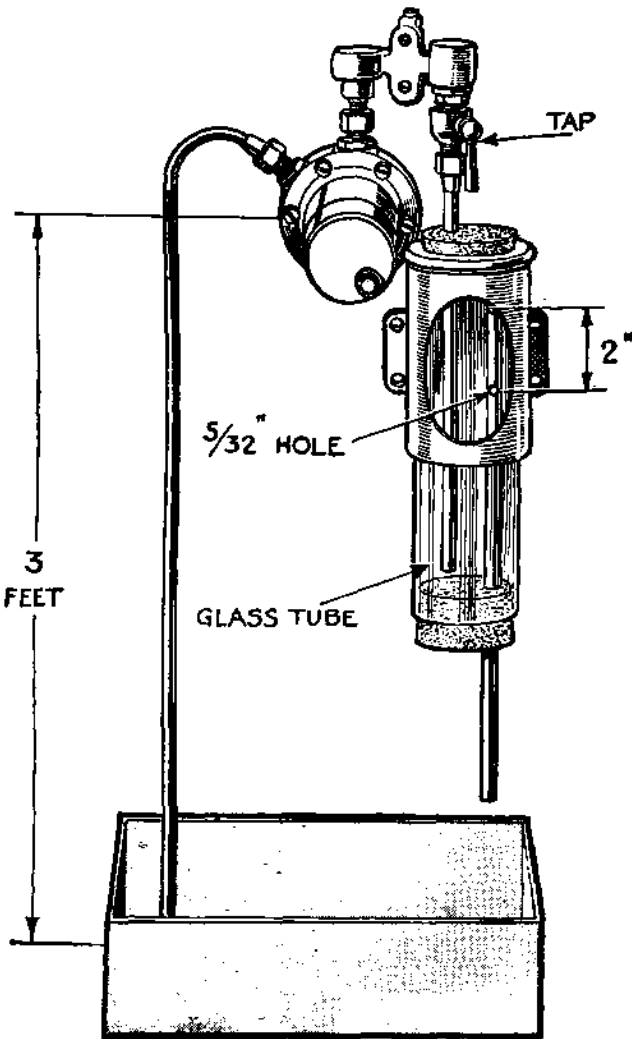


Fig. B.7.

The checking rig. This can usually be constructed from items available locally, but the complete rig is obtainable from the Service Parts Department of The M.G. Car Co. Ltd. or your local Distributor.

of the terminal. The voltage of the pump can always be identified by the colour of the sleeving on the coil ends, this being red for 12-volt and green for 6-volt.

Note.—There are three important points which are repeatedly overlooked by operators. These seriously affect the functioning of the pump; they are:—

1. To keep the contact breaker blade out of contact while obtaining the correct diaphragm setting.

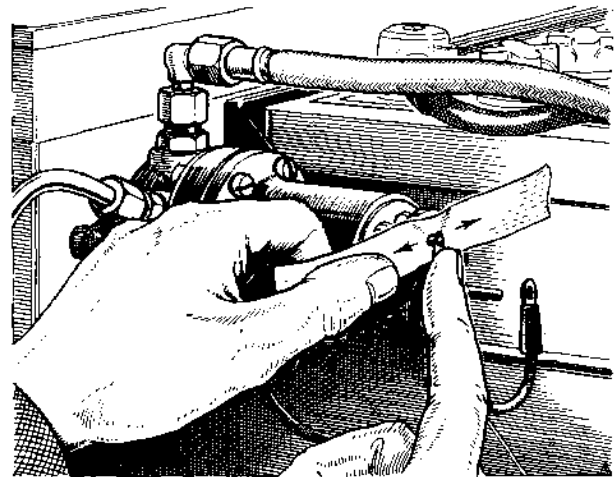


Fig. B.8.

This illustration shows the method of cleaning the fuel pump contact points.

terminals and that the trouble arises with the pump mechanism. If no spark can be detected, then it is an indication that the current supply has failed and that attention should be given to the wiring and battery. If current is present, further investigation should be carried out by removing the bakelite cover which is retained by the terminal nut. Touch the terminal with the lead. If the pump does not operate and the contact points are in contact yet no spark can be struck off the terminal, it is very probable that the contact points are dirty and require cleaning. These may be cleaned by inserting a piece of card between them, pinching them together and sliding the card backwards and forwards.

If, when the wire is connected to the terminal and the tickler of the carburettor is depressed, the points

B THE FUEL SYSTEM

fail to break, it is possible that there is either an obstruction in the suction pipe, which should be cleared by blowing it through with air, or some irregularity in the pump itself is preventing the correct movement. This may be due either to the diaphragm having stiffened, or to foreign matter in the roller assembly which supports the diaphragm, in which case the diaphragm should be removed and the whole assembly cleaned and reassembled in accordance with the instructions in Section B.4.

On the other hand, if the points are not making contact, see that the tips of the inner rocker (25) are in contact with the magnet housing. If they are not it is an indication that the armature has failed to return to the end of its normal travel.

To cure this, loosen the six screws which attach the magnet housing to the pump body, and make sure that the diaphragm is not sticking to the face of the magnet housing by carefully passing a penknife between the two. The hinge pin (19) should then be removed and the six retaining screws tightened up again

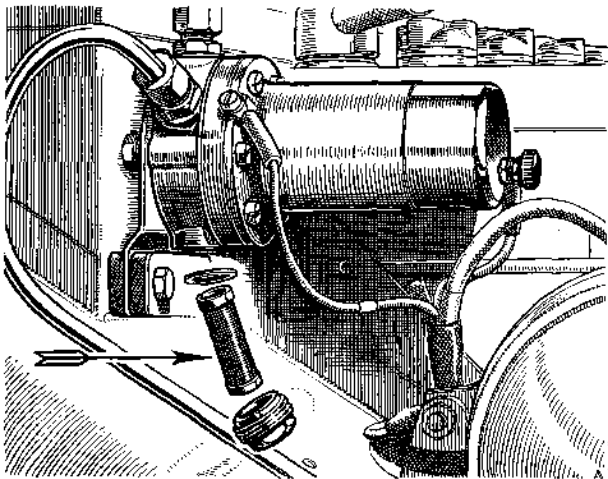


Fig. B.9.

The fuel pump filter removed for inspection.

The tips of the inner rockers will probably now be found to be making contact with the face of the magnet housing, but if they are not it will be necessary to remove and dismantle the whole magnet assembly in order to ascertain if an accumulation of foreign matter has caused a jam. Remember that whenever the magnet housing is removed, care should be taken to see that the guide rollers (10) do not drop out.

Pump noisy

If the pump becomes noisy and works rapidly, it is usually an indication that there is an air leak on the suction side of the pump. Check the level of the fuel in the tank and see that it is not too low.

B.8

The simplest way to test for air leakage is to disconnect the fuel pipe from the carburettor and place its end in a glass jar (approximately 1 pint or half a litre) and allow the pump to deliver petrol into it. If air bubbles appear when the end of the pipe has become submerged in the fuel it is a clear indication of an air leak on the suction side of the pump in the fuel feed pipe between the tank and the pump,

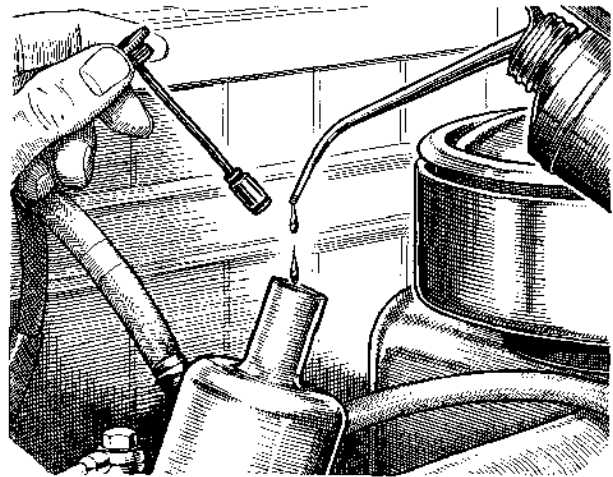


Fig. B.10.

Each carburettor damper assembly should be supplied with light engine oil.

which should be found and cured. Check all the unions and joints, making sure that the filter union and inlet unions are all quite air-tight.

Failure to deliver fuel

Should the pump continue beating without delivering fuel, it is probable that some dirt has become lodged under one of the valves, in which case they should be dismantled by unscrewing the top or delivery union and lifting out the valve cage, when they can be cleaned and reassembled. When replacing it see that the thin hard red fibre washer is below the valve cage and the thick orange one above.

If the pump struggles to pump and becomes very hot, it is probable that the filter has become clogged or there is an obstruction on the suction side. The filter is readily removed for cleaning by unscrewing its retaining plug at the bottom of the pump.

Section B.7

FUEL PUMP MAINTENANCE

Apart from keeping the contacts clean and removing the filter at regular intervals every 6,000 miles (10,000 km.) for cleaning, there is no maintenance required on the fuel pump.

The filter can be removed by unscrewing the hexagon plug at the bottom of the pump, when it can be cleaned in fuel with a stiff brush. Never use rag to clean a filter.

Section B.8

THE CARBURETTERS

Two S.U. carburetters of the controllable jet type, complete with an air cleaner, are fitted.

Each carburetter is provided with a damper, and this consists of a plunger and non-return valve attached to the oil cap nut. The plunger works in the hollow piston rod, which should be partly filled with light engine oil to Ref. F (page P.2). The object of the damper is to provide a slightly enriched mixture on acceleration.

Section B.9

SETTING THE TWIN CARBURETTERS

When setting the carburetters the first thing to do is to remove the air cleaner and intake elbow and then make quite sure the carburetter pistons are free and that the jets are correctly centred (explained under Section B.11). It is also necessary to make sure that the mixture and throttle interconnection adjusting screw is clear of the rocking lever anvil when the mixture control knob on the instrument panel is pushed right home.

Next, one of the clamping bolts on either of the two flexible couplings on the throttle interconnecting spindle should be undone and the jet lever interconnecting rod disconnected at either of the jet levers. This is done by removing the clevis pin attaching the control to one of the jet levers.

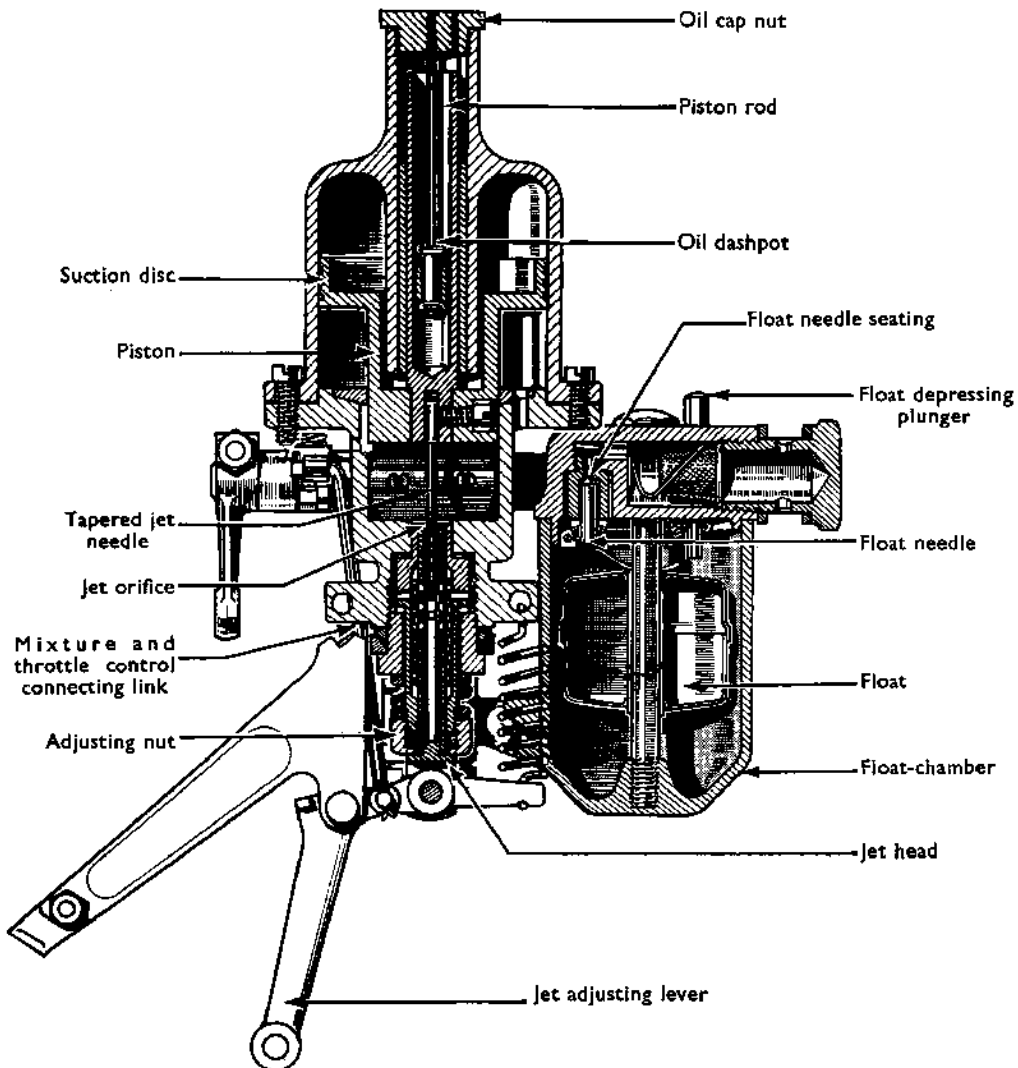


Fig. B.11.
The S.U. carburetter.

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The jet needles should be inspected for correct positioning in the piston. Also see that each jet is the same distance below the bridge on each carburettor choke when the jets are pushed hard up against the adjusting nuts.

Unscrew both throttle adjusting screws until they will just hold a piece of thin paper between their ends and the stops. Then screw each one in exactly one turn.

The engine should now be started, and when really warm the speed should be set by turning each adjusting screw exactly similar amounts. The direction will depend upon whether the engine speed needs increasing or decreasing. Turning the screws clockwise increases the engine speed, and vice versa.

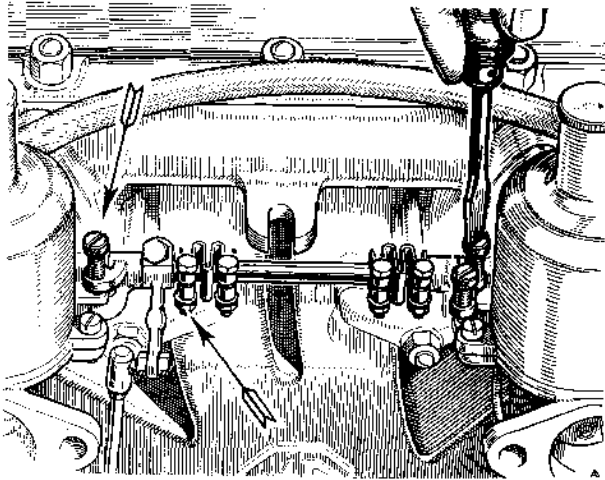


Fig. B.12.

This illustration shows the small universal joints on the throttle spindle and also the two screws for setting the engine speed.

Synchronisation of the carburetters must now be checked, and the best method is to listen to each intake with a piece of rubber tube in the same manner as a stethoscope.

Make sure the tube is held at the same point on each carburettor and set the throttle adjusting screw on each until the hissing noise heard in both is equal.

The next step is to adjust the mixture by screwing the jet adjusting nuts up or down by equal amounts, making quite sure that the jets are hard against the nuts at all times.

The engine speed will vary when this is being done, and the jets should be set so that the engine runs at the best possible speed for this setting of the throttle stop screws. Final corrections to the slow-running should then be made on the throttle adjusting screws, taking care to turn each an exactly equal amount.

When the mixture is correct on both carburetters the engine beat will become irregular if one of the pistons is raised slightly (approximately $\frac{1}{32}$ in. or .8 mm.).

If the piston on one carburettor is raised and the engine stops, and lifting the piston of the other does not stop the engine, then this indicates that the

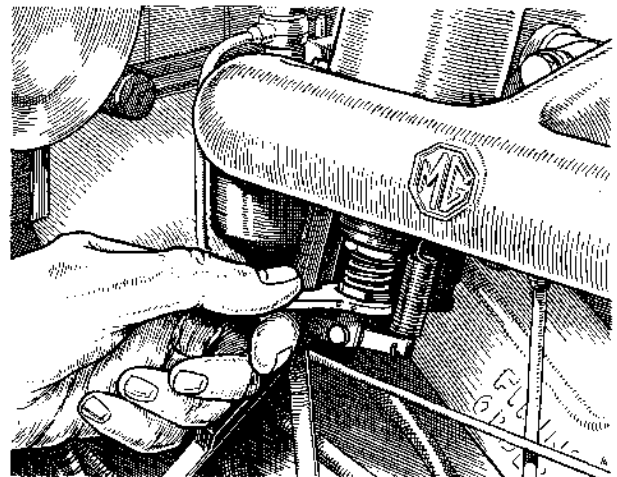


Fig. B.13.
Setting the jet.

mixture on the first carburettor is weaker than the other. Therefore further jet adjustments must take place to balance the delivery from both jets.

Correct mixture is indicated by a regular, even exhaust beat. (An irregular beat with a splashy misfire and colourless exhaust indicates a weak mixture, whilst too rich a mixture produces a rhythmic misfire or "hunting" and a blackish exhaust.)

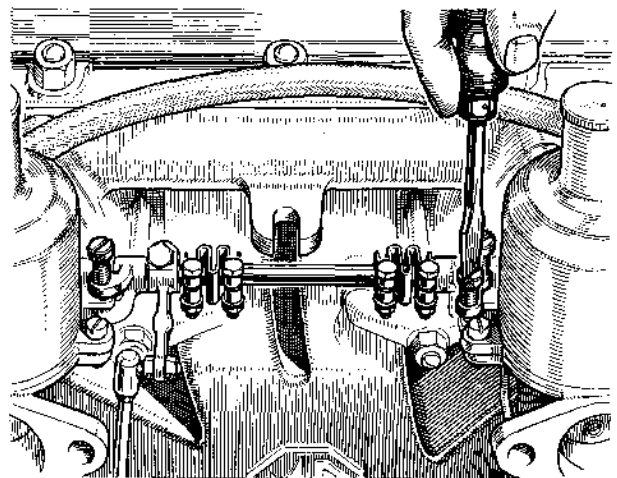


Fig. B.14.

This illustration shows the setting screw for the interconnected rich mixture and throttle control.

With the jets hard up against the adjusting nuts, the mixture control lever interconnecting rod should be adjusted to fit the jet actuating levers exactly without disturbing their position, and the throttle interconnecting spindle clamping bolt should be tightened.

The carburetters are now set correctly.

Section B.10

CARBURETTER DETAILS

Should it be necessary to change a carburetter needle, this can be done by removing the two screws holding the suction chamber in position, and lifting off the suction chamber after marking its position to ensure that it is refitted in its original position. The piston can now be removed. At the side of the piston will be found a set screw. When this is slackened off the needle can be withdrawn and the new needle fitted. **The correct position of the needle is with its shoulder flush with the face of the piston.**

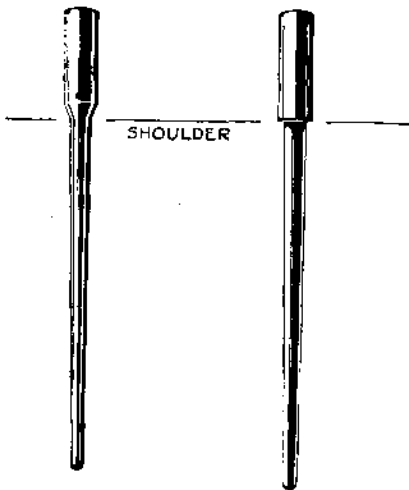


Fig. B.15.

The shoulder of the needle should be flush with the under face of the piston.

When replacing, care should be taken that the keyway at the side of the piston registers with the key in the body and that the return spring is refitted correctly.

Great care should also be taken to see that all machined faces and parts are kept scrupulously clean.

The filter

A filter is fitted in each carburetter behind the fuel pipe banjo union.

Removal of the banjo union bolt releases the filter and its spring.

The carburetter filters should be given attention every 6,000 miles (10,000 km.), when they should be

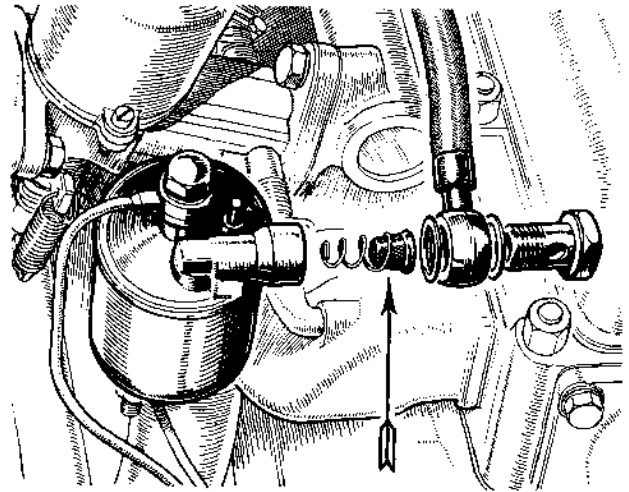


Fig. B.16.

Each carburetter has a small filter fitted in the float-chamber lid. Clean the filters regularly.

withdrawn and cleaned in fuel with a brush. Never use cloth of any description to clean the filters.

When replacing the filters insert them in the float-chamber housing spring first and make sure that the fibre washers on either side of the banjo union are in good condition to ensure a leak-proof joint.

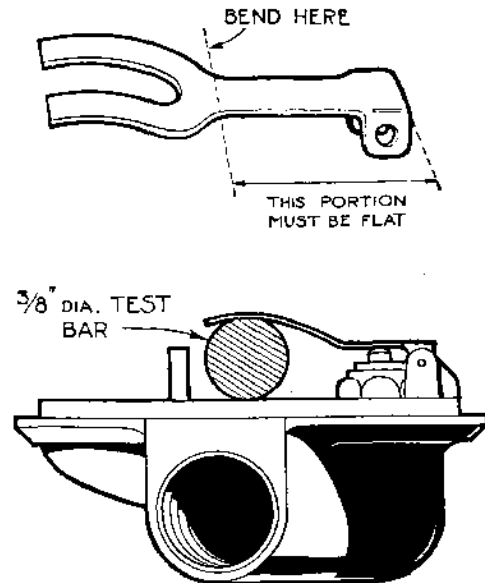


Fig. B.17.

Showing the place where the float lever should be set and, below, the method of checking the correct adjustment of the lever.

The float-chamber

The position of the forked lever in the float-chamber must be such that the level of the float (and therefore the height of the fuel at the jet) is correct.

This is checked by inserting a $\frac{3}{8}$ in. (9.5 mm.) round bar between the forked lever and the machined lip

B THE FUEL SYSTEM

of the float-chamber lid. The prongs of the lever should just rest on the bar (see Fig. B.17) when the needle is on its seating. If this is not so, the lever should be reset at the point where the prongs meet the shank. Care must be taken not to bend the shank, which must be perfectly flat and at right angles to the needle when it is on its seating.

Section B.11

CENTRING THE JET

First remove the clevis pin at base of the jet, which attaches the jet head to the jet operating lever; withdraw the jet completely, and remove the adjusting nut and the adjusting nut spring. Replace the adjusting nut without its spring and screw it up to the highest position. Slide the jet into position until the jet head

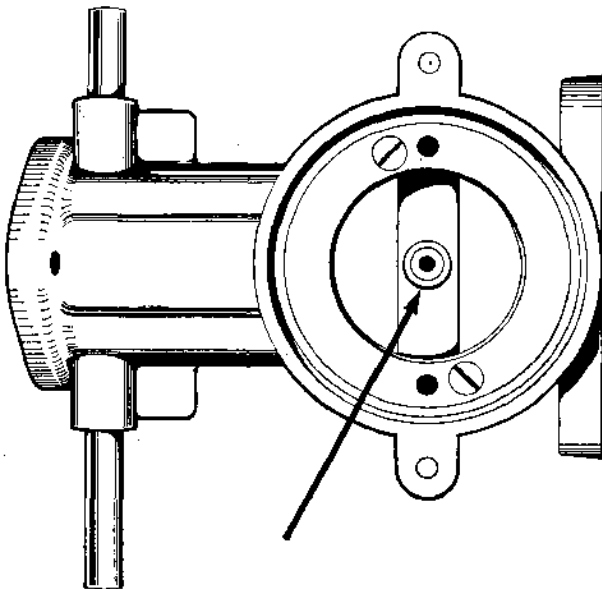


Fig. B.18.

Indicates an incorrectly centred jet which is eccentric to the jet aperture in the carburettor body.

is against the base of the adjusting nut. When this has been done, feel if the piston is perfectly free by lifting it up with the finger with the dashpot piston removed. If it is not, slacken the jet holding screw and manipulate the lower part of the assembly, including the projecting part of the bottom half jet bearing, adjusting nut and jet head. Make sure that this assembly is now slightly loose. The piston should then rise and fall quite freely as the needle is now able to move the jet into the required central position. The jet holding screw should now be tightened and a check made to determine that the piston is still quite free. If it is not found to be so, the jet holding screw should be slackened again and the operation repeated.

B.12

When complete freedom of the piston is achieved the jet adjusting nut should be removed, together with the jet, and the spring replaced. The adjusting nut should now be screwed back to its original position.

Experience shows that a large percentage of carburetters returned for correction have had jets removed and not correctly centred on replacement.

Section B.12

SOURCES OF CARBURETTER TROUBLE

Piston sticking

The piston assembly comprises the suction disc and the piston forming the choke, into which is inserted the hardened and ground piston rod which engages in a bearing in the centre of the suction chamber and in which is, in turn, inserted the jet needle. The piston rod running in the bearing is the only part which is in actual contact with any other part, the suction disc, piston, and needle all having suitable clearances to prevent sticking. If sticking does occur the whole assembly should be cleaned carefully and the piston rod lubricated with a spot of thin oil. No oil must be applied to any other part except the piston rod. A sticking piston can be ascertained by removing the dashpot piston damper, inserting a finger in the air intake and lifting the piston, which should come up quite freely and fall back onto its seating when released.

Water or dirt in the carburettor

When this is suspected, lift the piston with a pencil. The jet can then be seen. Flood the carburettor by depressing the float depressing plunger and watch the jet; if the fuel does not flow through freely there is a blockage. To remedy this, start the engine, open the throttle, and block up the air inlet momentarily without shutting the throttle, keeping the throttle open until the engine starts to race. This trouble seldom arises with the S.U. carburettor owing to the size of the jet and fuel ways. When it does happen the above method will nearly always clear it. Should it not do so, the only alternative is to remove the jet. This, however, should on no account be done unless it is absolutely necessary, as it has to be carefully centred when refitting and it is practically impossible to assemble this part correctly unless it is first thoroughly understood how to carry this out. (See Section B.11.)

Float-chamber flooding

This can be seen by the fuel flowing over the float-chamber and dripping from the air inlet, and is generally caused by grit between the float-chamber

needle and its guide. This can usually be cured by depressing the float depressing plunger to allow the incoming flow of fuel to wash the grit through the guide and into the float-chamber.

Float needle sticking

If the engine stops, apparently through lack of fuel, when there is plenty in the tank and the pump is working properly, the probable cause is a sticking float needle. An easy test for this is to disconnect the pipe from the electric pump to the carburetter and switch on the ignition to check if fuel is delivered ; if

it is, starvation has almost certainly been caused by the float needle sticking to its seating, and the float-chamber lid should therefore be removed, the needle and seating cleaned, and refitted. At the same time it will be advisable to clean out the entire fuel feed system, as this trouble is caused by foreign matter in the fuel, and unless this is removed it is likely to recur. It is of no use whatever renewing any of the component parts of the carburetter, and the only cure is to make sure that the fuel tank and pipe lines are entirely free from any kind of foreign matter or sticky substance capable of causing this trouble.

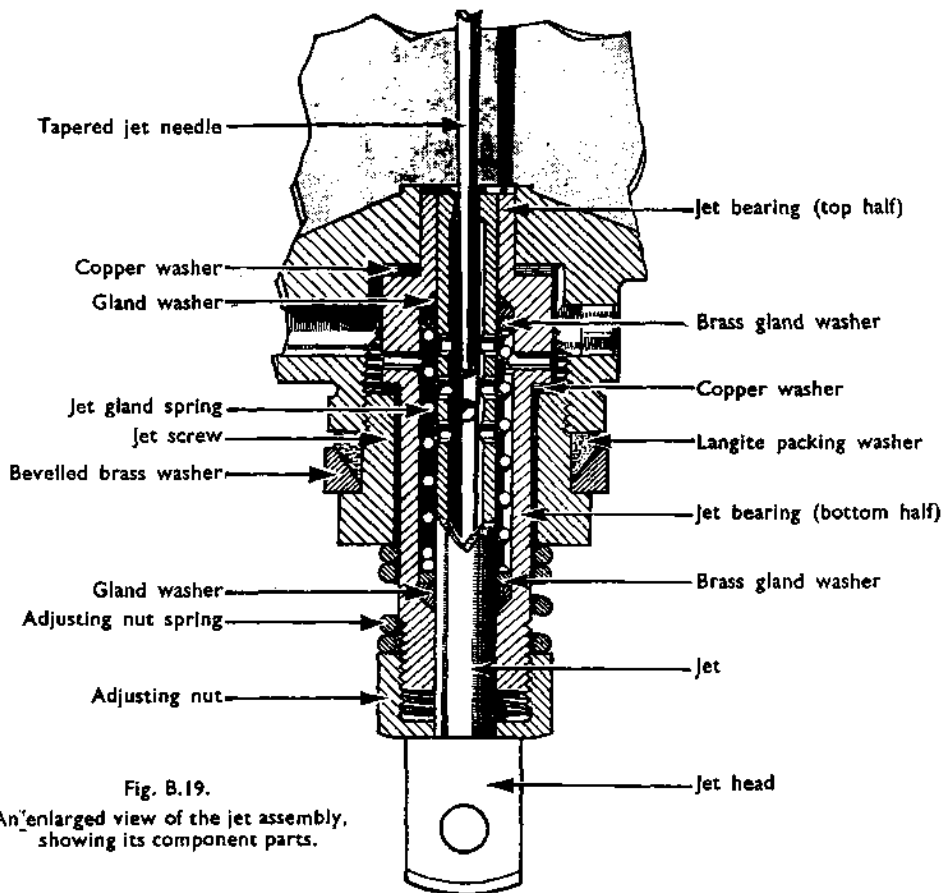
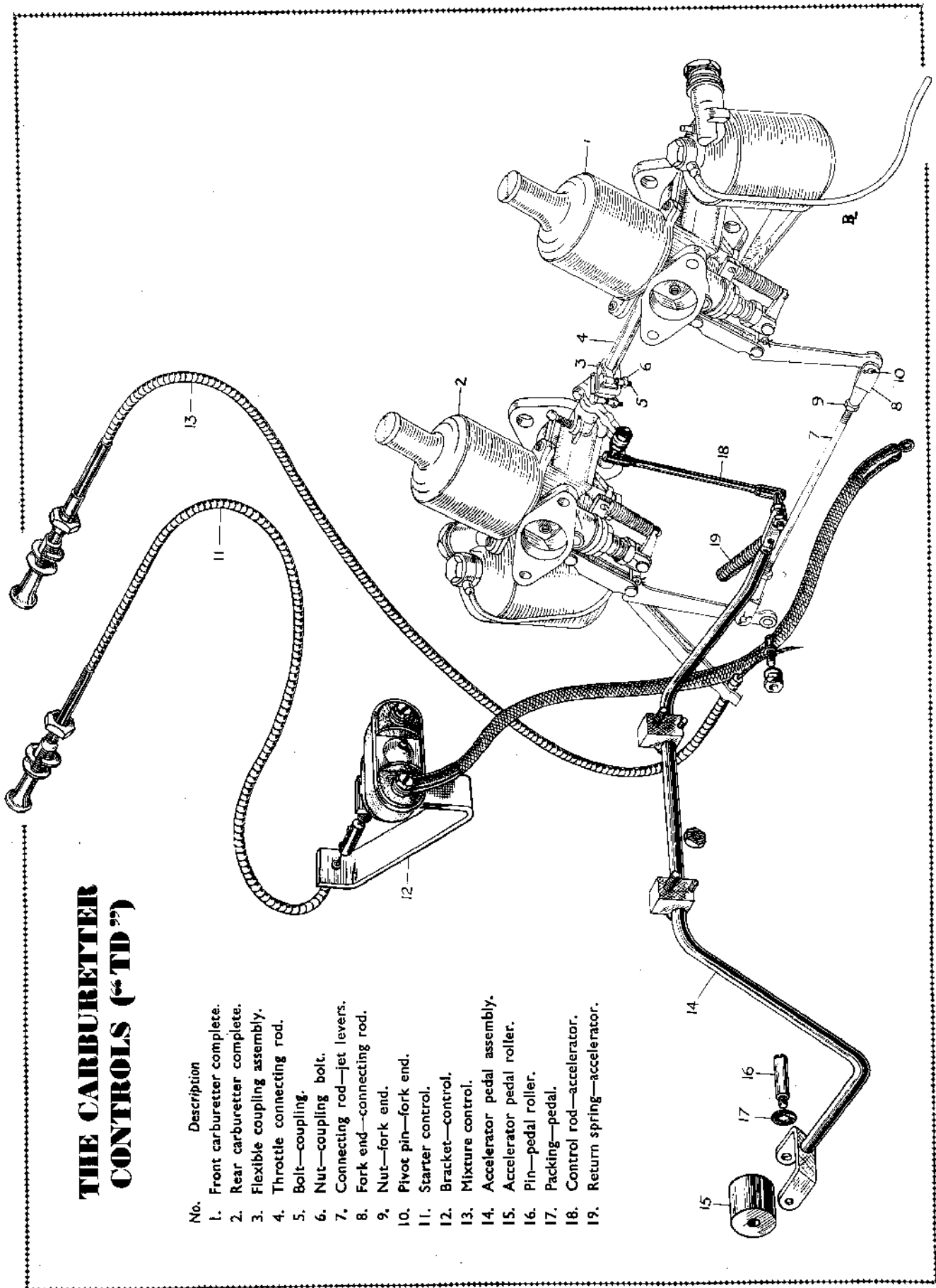


Fig. B.19.
An enlarged view of the jet assembly,
showing its component parts.

THE CARBURETTER CONTROLS ("TD")



- | No. | Description |
|-----|-----------------------------|
| 1. | Front carburetter complete. |
| 2. | Rear carburetter complete. |
| 3. | Flexible coupling assembly. |
| 4. | Throttle connecting rod. |
| 5. | Bolt—coupling. |
| 6. | Nut—coupling bolt. |
| 7. | Connecting rod—jet levers. |
| 8. | Fork end—connecting rod. |
| 9. | Nut—fork end. |
| 10. | Pivot pin—fork end. |
| 11. | Starter control. |
| 12. | Bracket—control. |
| 13. | Mixture control. |
| 14. | Accelerator pedal assembly. |
| 15. | Accelerator pedal roller. |
| 16. | Pin—pedal roller. |
| 17. | Packing—pedal. |
| 18. | Control rod—accelerator. |
| 19. | Return spring—accelerator. |

Section B.13

THE "TF" CARBURETTERS

Two carburetters of the controllable jet type are fitted to the Series "TF." They are similar in operation to those used on the "TD" but differ in detail. Also, each has its own air cleaner.

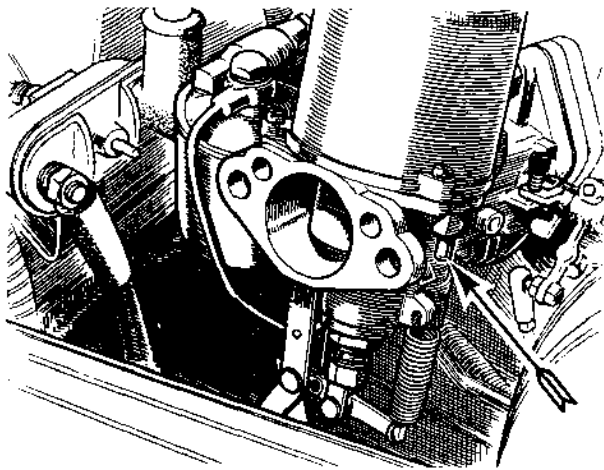


Fig. B.20.

The location of the plunger for raising the piston is here illustrated. The air cleaner has been removed for clarity.

To prevent any dust or dirt from entering the piston assembly, air to the under side of the piston is drawn from the air cleaner through two holes in the carburettor flange and drillings in the body of the carburettor.

No damper is used in earlier units. (See Section P.5.)

A piston raising pin is fitted at the right-hand side of the carburettor body which allows the piston to be raised for tuning or other purpose without removing the air cleaner.

Section B.14

REMOVING THE "TF" FUEL TANK

Take off the spare wheel. Slacken the tank retaining straps at their lower ends and unscrew the four chromium-plated nuts at the top of the spare wheel carrier. Remove the bolts from inside the car.

Drain the tank, detach the fuel line and remove the nuts from the lower ends of the tank retaining straps.

Disconnect the electric cable for the fuel gauge unit and lift out the tank.

Section B.15

LATE TYPE FUEL PUMPS

The later "TF" models are fitted with a high-pressure type S.U. fuel pump which is attached to the rear right-hand chassis frame side, just forward of the wheel arch. These high-pressure S.U. pumps are fitted with a light stainless steel compression spring to press the inlet valve against its seat except during the actual inlet stroke. This is to prevent fuel passing through the pump by gravity or siphoning when the pump is switched off.

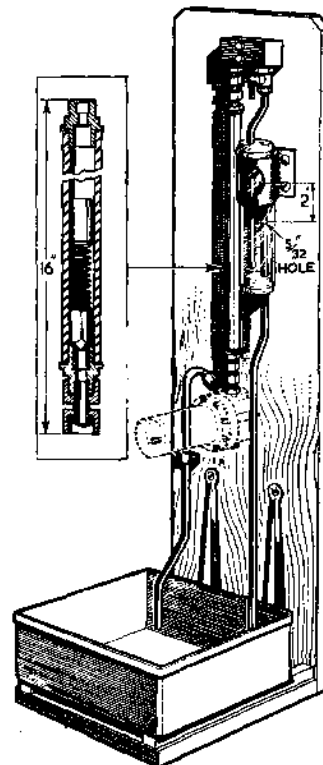


Fig. B.20.

Test rig for high-pressure type S.U. fuel pump.

Fuel pump adjustment on the high-pressure pump is similar to the procedure laid down in Section B.5 but a different test rig is required. Figure B.20 illustrates a rig of the type advised, which can be obtained complete from the Service Parts Department.

The test figures for the high-pressure type S.U. pump are :—

- Flow : 10 gallons per hour.
- Suction lift : 33 inches.
- Output lift : 48 inches

SECTION C

THE IGNITION EQUIPMENT

Description and Specification of Equipment.

- Section No. C.1 Locating the cause of uneven firing.
- Section No. C.2 Testing low-tension circuit.
- Section No. C.3 The high-tension cables.
- Section No. C.4 The sparking plugs.
- Section No. C.5 The contact breaker.
- Section No. C.6 Distributor lubrication.
- Section No. C.7 Removal of the distributor.
- Section No. C.8 Replacing the distributor and timing the ignition.
- Section No. C.9 Dismantling the distributor.
- Section No. C.10 The condenser.
- Section No. C.11 Fitting new distributor bushes.
- Section No. C.12 Reassembling the distributor.
- Section No. C.13 Modified distributor fixing.
- Section No. C.14 Distributors with high-lift cams.

GENERAL DESCRIPTION

The coil ignition equipment is provided with an automatic advance mechanism which relieves the driver of the necessity of adjusting the timing. The advantages are particularly evident when accelerating and during hill climbing, since the danger of knocking or pinking through excessive advance is very much reduced.

The automatic advance device is housed in the distributor unit, and consists of a centrifugally operated mechanism by means of which the ignition is advanced in proportion to the engine speed.

Like the rest of the electrical equipment, it is wired on the "positive earth" system, which results in longer sparking plug life.

Distributor type

The distributor is a Lucas Model D2A4, Service No. 40162 on early models and No. 40367 on later

models with high-lift cams. (See Section C.14.) In "TF" engines the service number is 40367A. These identification marks are stamped on the side of the distributor. When ordering replacements, always quote these numbers.

Ignition coil type

The coil is a Lucas Model Q12, Service No. 45020. These identification marks are stamped on the base of the ignition coil. When ordering, always quote these numbers. On later models a fluid-filled coil, Lucas No. LA12 (Part No. 2A536) is fitted as standard.

Sparking plugs

The standard sparking plugs for the M.G. "TD" Midget on engines prior to No. XPAG/TD2/22735 are Champion L.10S, 14 mm., $\frac{3}{8}$ in. reach.

Engines from No. XPAG/TD2/22735 onwards are fitted with the Champion NA.8, 14 mm., $\frac{3}{8}$ in. reach plug.

C THE IGNITION EQUIPMENT

Section C.1

LOCATING THE CAUSE OF UNEVEN FIRING

To test with sparking plugs in position

- (a) Start the engine and set it to run at a fairly fast idling speed.
- (b) Short-circuit each plug in turn by placing a hammer head or the blade of a screwdriver with a wooden or insulated handle between the terminal and the cylinder head. No difference in the engine performance will be noted when short-circuiting the plug in the defective cylinder. Shorting the other plugs will make uneven running more pronounced.
- (c) Having located the cylinder which is at fault, stop the engine and remove the cable from the terminal of the sparking plug. Restart the engine and hold the end of the cable about $\frac{3}{16}$ in. (4.8 mm.) from the cylinder head.

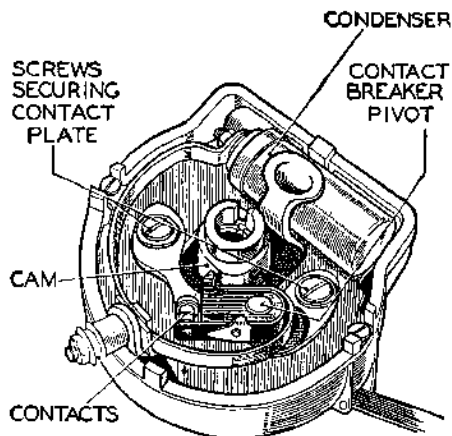


Fig. C.1.

The distributor with the cover and rotor arm removed, showing the contact breaker mechanism.

- (d) If the sparking is strong and regular, the fault probably lies in the sparking plug. Remove the plug, clean, and adjust the gap to the correct setting or alternatively fit a replacement plug. (See Section C.4.)
- (e) If there is no spark or if it is weak and irregular, examine the cable from the sparking plug to the distributor. After a long period of service the rubber insulation may be cracked or perished, in which case the cable should be renewed. Finally, examine the distributor moulded cap, wipe the inside and outside with a clean dry cloth, see that the carbon brush

moves freely in its holder and examine the moulding closely for signs of breakdown. After long service, it may have become tracked, that is, a conducting path may have formed between two or more of the electrodes or between one of the electrodes and some part of the distributor in contact with the cap. Evidence of a tracked cap is shown by the presence of a thin black line in the places affected. A replacement distributor cap must be fitted in place of one that has become tracked.

Section C.2

TESTING LOW-TENSION CIRCUIT

Low-tension circuit. Testing in position

- (a) Spring back the securing clips on the distributor and remove the moulded cap and rotor. If the rotor is a tight fit, it can be levered off carefully with a screwdriver.
- (b) Check that the contacts are clean and free from pits, burns, oil or grease. Turn the engine and check that the contacts are opening and closing correctly and that the clearance when the contacts are fully opened is between .010 in. and .012 in. (.25 mm. and .30 mm.) on distributors No. 40162D and .014 in. and .016 in. (.36 mm. and .41 mm.) on distributors 40162E onwards. Correct the gap if necessary. (See Section C.14.)
- (c) Disconnect the cable at the contact breaker terminal (CB) of the coil and at the low-tension terminal of the distributor, and connect a test lamp between these terminals. If the lamp lights when the contacts close and goes out when the contacts open, the low-tension circuit is in order.

Low-tension circuit—to locate fault

- (a) Having determined, by testing as previously described, that the fault lies in the low-tension circuit, switch on the ignition, and turn the engine until the contact breaker points are fully opened.
- (b) Refer to the wiring diagram and check the circuit with a voltmeter (0—20 volts) as follows:—
Note.—If the circuit is in order the reading on the voltmeter should be approximately 12 volts.
- (c) Battery to starter switch terminal. Connect a voltmeter between the starter switch terminal

- and a good earthing point. No reading indicates a damaged cable or loose connections.
- (d) *Starter switch to ammeter* (brown lead). Connect a voltmeter to ammeter terminal and earth. No reading indicates faulty cable or loose connections.
 - (e) *Ammeter*. Connect voltmeter to other ammeter terminal and earth. No reading indicates fault in ammeter, which must be renewed.
 - (f) *Ammeter to control box terminal "A"* (brown with white lead). Connect voltmeter to control box terminal "A" and earth. No reading indicates faulty cable or loose connections.
 - (g) *Control box terminal "A1."* Connect voltmeter to control box terminal "A1" and earth. No reading indicates fault in series winding of control box.
 - (h) *Control box terminal "A1" to lighting and ignition switch terminal "A"* (brown with blue lead). Connect voltmeter to "A" terminal on switch and earth. No reading indicates faulty cable or loose connections.
 - (j) *Lighting and ignition switch terminal "IG."* Connect voltmeter to "IG" terminal on switch and earth. No reading indicates fault in switch, which must be renewed.
 - (k) *"IG" terminal to control box terminal "A3"* (white lead). Connect voltmeter to "A3" terminal on control box and earth. No reading indicates faulty cable or loose connections.
 - (l) *Control box terminal "A3" to ignition coil terminal "SW"* (white lead). Connect a voltmeter to the ignition coil terminal "SW" and to earth. No reading indicates a damaged cable or loose connections.
 - (m) *Ignition coil*. Disconnect the cable from the "CB" terminal of the ignition coil and connect a voltmeter to this terminal and to earth. No reading indicates a fault in the primary winding of the coil and a replacement coil must be fitted. If the correct reading is given, remake the connection to the coil terminal.
 - (n) *Ignition coil to distributor* (white with black lead). Disconnect the cable from the low-tension terminal on the distributor and connect the voltmeter to the end of this cable and to earth. No reading indicates a damaged cable or loose connections.

- (a) *Contact breaker and condenser*. Connect the voltmeter across the contact breaker points. No reading indicates a fault in the condenser.

Section C.3

HIGH-TENSION CABLES

- (a) The high-tension cables must be examined carefully and any which have the insulation cracked, perished or damaged in any way must be replaced by 7 mm. rubber-covered ignition cable.
- (b) To fit the cables, thread the knurled moulded terminal nut over the lead, bare the end of the cable for about $\frac{1}{4}$ in. (6 mm.), thread the

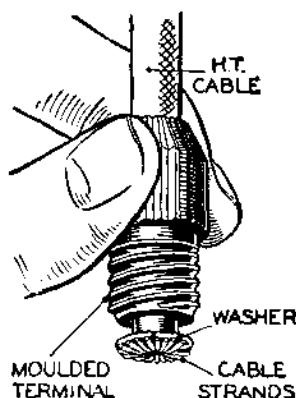


Fig. C.2.
Demonstrates the correct method of fitting the high-tension cable to the moulded terminal nuts of the ignition coil and distributor.

wire through the brass washer removed from the original cable and bend back the strands over the washer. Finally screw the nut into its terminal.

- (c) The cables from the distributor to the sparking plugs must be connected up in the correct firing order, which is 1, 3, 4, 2.

Section C.4

ATTENTION TO SPARKING PLUGS

To obtain the best engine performance and the most economical running, the sparking plugs must be kept clean and correctly adjusted. They should be removed and cleaned after the first 500 miles (800 km.) of use in a new engine. This is advisable since the slower engine speeds and the conditions of the "running in" period have a tendency to cause fouling of the plugs.

Plugs should subsequently be removed for inspection, cleaning and adjustment after each period of 3,000 miles (5000 km.).

C THE IGNITION EQUIPMENT

When sparking plugs are removed from the engine their gaskets should be removed with them and replaced on the plugs, which should be placed in a suitable holder. It is advisable to identify each plug with the number of the cylinder from which it was removed so that any faults can be traced back to the cylinder concerned. The plug stand illustrated in Fig. C.3 is of simple construction, possessing a series of holes to admit the upper ends of the plugs.

When examining plugs place a new plug of the same type beside the others to afford a ready comparison of the relative condition of the used plugs.

When examining plugs note the condition of their gaskets. A large proportion of the heat from the insulator is dissipated to the cylinder head by means of the copper gasket between the plug and cylinder head. Plugs not screwed down tight become over-heated, causing pre-ignition, short plug life and "pinking."



Fig. C.3.

The use of a simple plug stand of the type illustrated is recommended to hold the plugs when they are removed from the engine.

Gaskets in different conditions are illustrated in Fig. C.4. The upper left-hand gasket was obviously not properly compressed, owing to the plug not being tightened down sufficiently.

On the other hand it is unnecessary and unwise to tighten up the plugs too much. What is required is a reasonably good seal between the plug and the cylinder head.

The lower left-hand gasket clearly indicates that the plug was pulled down too tightly or has been in service too long. Note its distorted condition and the evidence of blow-by, which is a prolific cause of plug overheating.

The right-hand upper gasket demonstrates a gasket in good condition, providing an adequate seal and a good path for heat dissipation.

For comparison a new gasket is shown in the lower right-hand corner of Fig. C.4.

If the gaskets are at all questionable they should be replaced by new ones without hesitation.

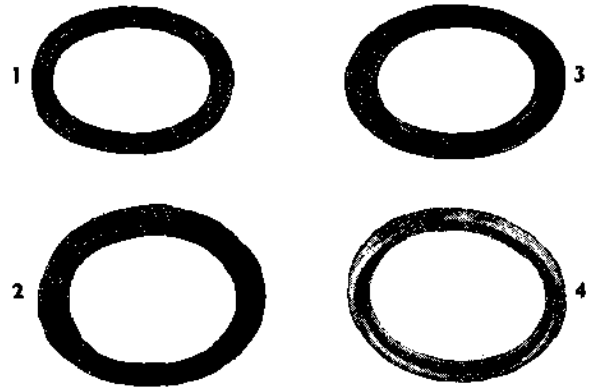


Fig. C.4.

This illustration shows plug gaskets in various conditions — (1) indicating insufficient tightening down of the plug, (2) over-tightening of the plug, (3) correct degree of tightening, (4) new gasket before use.

Plug inspection

After removal of the plug, the condition of the electrodes and deposits on the insulator and plug body should be examined.

1. If the insulator is brown in colour, the electrodes grey and the plug body dry or covered with a thin layer of soot, the engine condition and mixture strength are satisfactory.
2. A dry, greyish-yellow or brown insulator with a thin layer of light fawn powder deposit indicates the use of a leaded fuel or a rich mixture.
3. When the insulator is dry and fawn or white in colour, and the electrodes are corroded and burnt at the tips, the plug temperature is too high. This is caused either through the use of an unsuitable plug; by a weak mixture; or by high combustion temperatures.
4. Soot deposits, forming a black velvety coating on the insulator and plug body, show that the plug does not reach a self-cleansing temperature. This may be due to a mixture which is too rich, but if the deposit is wet it indicates that oil is also reaching the combustion space in excessive quantities. Correct operation may be restored by adjusting the mixture, but an overhaul of the engine is necessary to reduce the amount of oil passing the piston.
5. After cleaning, examine the plugs for cracked insulators and the lower end for wear produced through previous cleaning.

Whenever possible, sparking plugs should be cleaned in a special plug cleaner of the type supplied by the plug manufacturer. Oily plugs should be washed with petrol first. A compressed air jet should then be used to remove any abrasive from the interior of the plug body and the insulator. If a plug cleaner is not available, a wire brush is the best substitute. This should also be used to clean any accumulation of carbon from the threads. The thread portion of the plug body is often neglected when cleaning owing to the fact that it is not generally realised that, like the

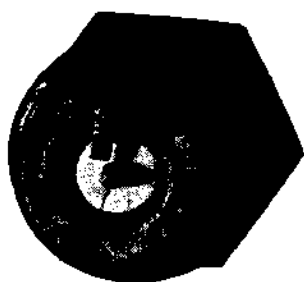


Fig. C.5.
Here is shown a plug with a cracked insulator.

gaskets, the threads are an important means of heat dissipation and that when they are coated with carbon it retards the flow of heat from the plug and leads to overheating.

Cleaning the thread will also facilitate refitting of the plug and avoid the use of unnecessary force on the plug spanner.

Having ensured that the plug is thoroughly clean and still serviceable, the electrodes should be reset. A combination gauge and setting tool produced by the makers of Champion sparking plugs greatly facilitates the correct and easy setting of the sparking plug points, but care should be taken to avoid a false reading through distortion of the points by burning.

When resetting the points, the side electrode only should be adjusted to give the correct clearance. **Never bend the centre electrode.**

Champion L.10S or NA.8 plugs are fitted as standard (see page C.1), and their correct spark gap should be set between .020 in. and .022 in. (.50 mm. and .56 mm.).

Remember that electrode corrosion and the development of oxides at the gap area vitally affects the sparking efficiency. The special plug cleaner can remove oxides and deposits from the insulator, but the cleaner stream does not always reach this area with full effect owing to its location, and cannot necessarily deal with corrosion effectively as this sometimes requires too strong a blast for proper removal.

When plugs appear worthy of further use it is good practice to dress the gap area on both centre and side electrodes with a small file before resetting them to

the correct gap. The intense heat, pressures, explosion shock, and electrical and chemical action to which the plugs are submitted during miles of service are so intense that the molecular structure of the metal of the points is eventually affected. Plugs then reach a worn-out condition where resetting of the points no longer serves a useful purpose and where plug replacement is called for. Every 12,000 miles (20000 km.) new plugs should, therefore, be fitted.

Before replacing a used plug in the engine, test it for correct functioning under air pressure in a plug tester, following out the instructions issued by the makers of the tester. Generally speaking, a plug may be considered satisfactory for further service if it sparks continuously under a pressure of 100 lb./sq. in. (7 kg./cm.²) with the gap between the points set at .022 in. (.56 mm.). It is essential that the plug points then be reset to the smaller gap of .020 in. (.50 mm.) before the plug is refitted to the engine.

While the plug is under pressure in the tester it should be inspected for leakage by applying oil round the terminal and insulator. Leakage is indicated by the production of air bubbles, the intensity of which give an indication of the degree of leakage.

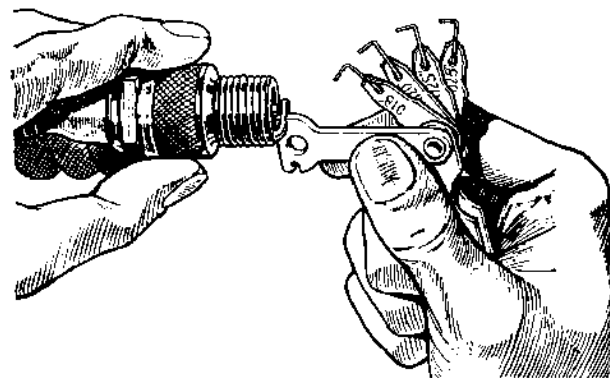


Fig. C.6.
Adjustments to the spark plug gap should be made only by bending the side wire, preferably by using a proper setting tool such as the "Champion" setting tool here illustrated.

The leaking gases have a "blow-torch" effect when the engine is running which rapidly raises the temperature of the plug to above its heat range, thus producing overheating, pre-ignition, and rapid electrode destruction.

The top half of the insulator is also frequently responsible for poor plug performance due to the following faults: splashes, accumulation of dirt or dust, cracked insulators (caused by a slipping spanner), overtightness of the terminals. Examine for a cracked insulator at the shoulder and the terminal post and remove any accumulations of dirt and dust.

C THE IGNITION EQUIPMENT

Since each engine design has its own particular working temperature and pressure inside the cylinder, it is essential that only sparking plugs recommended by The M.G. Car Company Ltd. be used. A plug designed for a hot dry engine will not function satisfactorily in relatively cool oily engines, as it will constantly oil up and cause trouble. On the other hand, a plug suitable for the oily engine will not function in the hot type engine as the points will overheat and cause pre-ignition.

The threaded portion or "reach" of the plug is also important since it determines the position of the points in the combustion chamber and may produce pre-ignition if the threads on the plug body protrude beyond the cylinder head.



Fig. C.7.

The plug threads should be cleaned with a wire brush to remove deposits on the thread.

Section C.5

CONTACT BREAKER MECHANISM

After the first 500 miles (800 km.) and subsequently every 3,000 miles (5000 km.) check the contact breaker as follows :—

- (a) Turn the engine until the contact breaker points are fully opened, and check the gap with a gauge having a thickness of from .010 in. to .012 in. (.25 mm. to .30 mm.) on early models. (See Section C.14 for later models.) If the gap is correct, the gauge should be a sliding fit. Do not alter the setting unless the gap varies considerably from the gauge thickness.

To adjust the setting, keep the engine in the position which gives maximum opening of the contacts and then slacken the two screws securing the fixed contact plate. Adjust the position of the plate until the gap is set to

the thickness of the gauge and then tighten the two locking screws.

Remember that the cam only keeps the contact points fully open over 10° and that care must be taken to ensure that the points are in the fully open position.

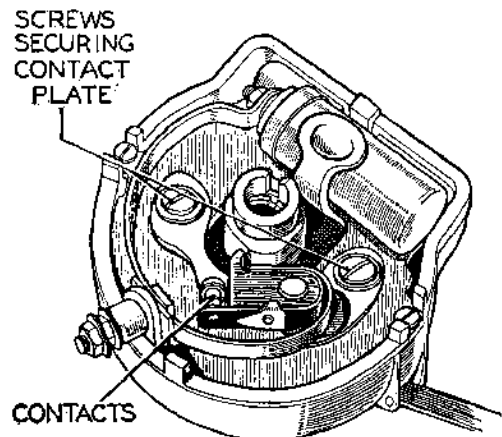


Fig. C.8.

The contact breaker, showing the adjusting screws.

- (b) If the contacts are dirty or pitted, they must be cleaned by polishing them with a fine carborundum stone, and afterwards wiping them with a petrol-moistened cloth. The moving contact can be removed from its mounting in order to assist cleaning (see Fig. C.9). Check and adjust the contact breaker setting after cleaning the contacts.

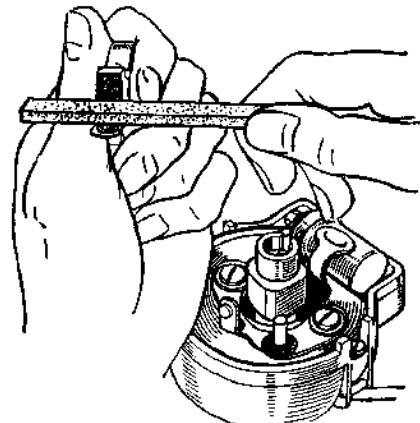


Fig. C.9.

The distributor points are best cleaned by removing the rocker-arm from its pivot and dressing the points with a stick of carborundum as shown.

- (c) Check that the moving arm moves freely on its pivot. If it is sluggish, remove the moving arm and polish the pivot pin with a strip of fine emery cloth. Afterwards clean off all trace of emery dust and apply a spot of clean engine oil to the top of the pivot.

The contact breaker spring tension should be between 20 and 24 oz. (567-680 gm.) measured at the contacts.

Section C.6

DISTRIBUTOR LUBRICATION

To be carried out after servicing the distributor and at intervals of about 3,000 miles (5000 km.).

- (a) Give the cam a light smear of grease to Ref. D (page P.2) and apply a slight trace of oil to the top of the contact breaker lever pivot pin.
- (b) Lift the rotor arm off the top of the spindle and add a few drops of thin machine oil through the lubricating passage provided in the spindle

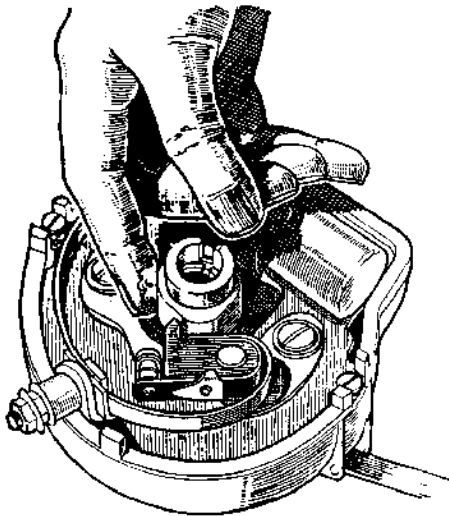


Fig. C.10.

Every 3,000 miles (5000 km.) the cam may be given a slight smear of grease or engine oil in the manner shown.

to lubricate the cam bearing and distributor shaft. (Do not remove the screw in the top of the spindle as an oilway is provided.) Refit the rotor correctly, and push it onto the shaft as far as it will go.

- (c) Add a few drops of thin machine oil through the hole in the contact breaker base through which the cam passes, in order to lubricate the automatic timing control. Do not allow any oil to get on or near the contacts.

Section C.7

REMOVAL OF THE DISTRIBUTOR

Disconnect the low-tension lead from the terminal on the side of the distributor body. Spring back the two retaining clips and lift off the distributor head, which can be lodged on the cylinder block. To facilitate replacement turn the engine over until the rotor arm

is pointing to the segment in the cover for No. 1 cylinder plug lead.

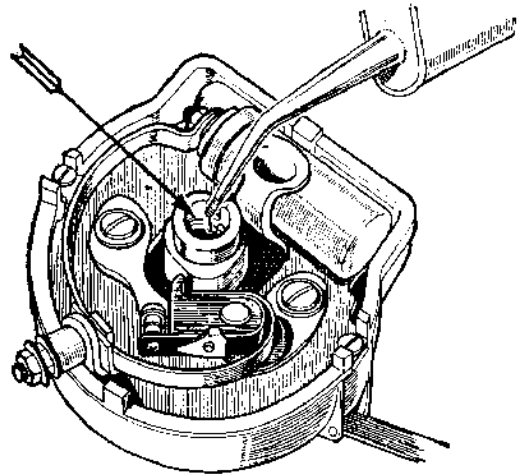


Fig. C.11.

The cam bearing is lubricated through the opening revealed when the distributor rotating arm is withdrawn. Thin machine oil should be used.

Remove the locking wire from the dowel bolt holding the clamp plate to the cylinder block on earlier models and take out the bolt. Disconnect the bonding wire from the cylinder block to the clamp and then the distributor can be lifted straight up. In the case of later models with cotter bolt attachment it is first necessary to mark the base of the distributor body and the face of the housing in the cylinder block to ensure correct replacement before unscrewing the cotter bolt locknut one or two turns and carefully tapping it inwards to release the distributor body stem.

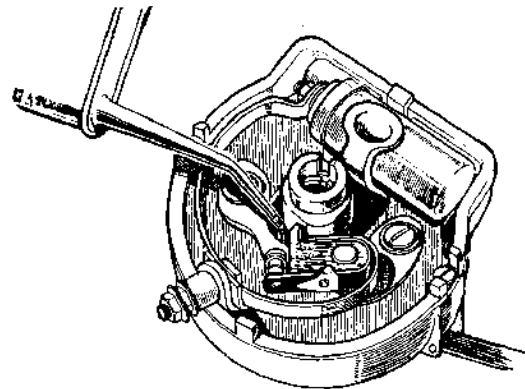


Fig. C.12.

The advance control mechanism is lubricated through the aperture round the cam spindle. Take care no oil finds its way onto the contact points.

Provided the engine is set as indicated and not disturbed subsequently no difficulty will be encountered in correctly timing the spark when the distributor is replaced as indicated in Section C.8.

C THE IGNITION EQUIPMENT

Section C.8

IGNITION TIMING ADJUSTMENT AND REPLACEMENT OF THE DISTRIBUTOR

When the distributor has been removed, it must be retimed on replacement. It should be set with points just breaking at T.D.C. To do this proceed as follows :—

Set the engine with the Nos. 1 and 4 cylinders on top dead centre (see Fig. C.13).

Examine the valves to see which of the previously mentioned cylinders is starting its firing stroke.

Turn the distributor until the rotor is facing the appropriate segment (i.e. the segment connected to the high-tension cable leading to the same cylinder), and insert the distributor in its housing, "feeling" it in so that the nearest tooth is engaged. Turn the body about until the locking screw will enter, and lock it.

Set the contact points to .012 in. (.3 mm.) (see Section C.14), and check that the hole in the crankshaft pulley still coincides with the arrow on the timing

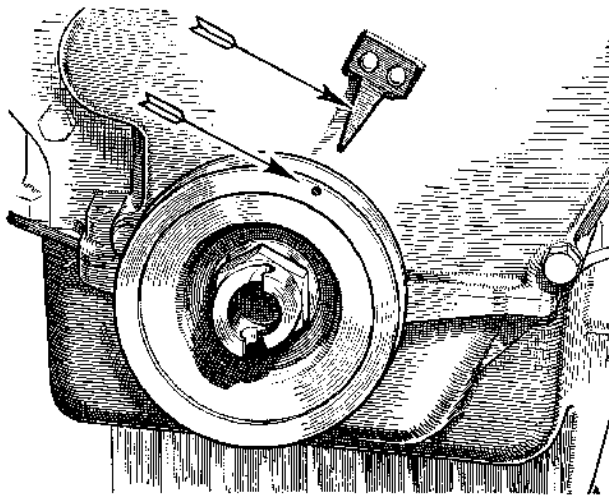


Fig. C.13.

The timing mark on the rim of the crankshaft pulley and the pointer on the chain case which indicate top dead centre for Nos. 1 and 4 pistons when they coincide.

cover. The contact breaker points should now just be commencing to open. Should this not be the case, release the clamping bolt or cotter bolt at the base of the distributor, turn the distributor anti-clockwise until the points are fully closed, and then turn carefully clockwise until the contact points just commence to open.

Securely tighten the clamp bolt on earlier models or the cotter bolt on the later models.

Re-check timing to make sure that tightening the clamp bolt or cotter bolt has not altered the setting.

Note.—Before setting the timing, make sure that the automatic advance and retard mechanism is working properly and is in its fully retarded position while the timing is being set.

Important.—To obtain an accurate setting an electrical method should be used to determine the actual position at which the points break, and the following method can be used :—

With the low-tension lead connected to the distributor, turn on the ignition switch and connect a 12-volt lamp in parallel with the contact breaker

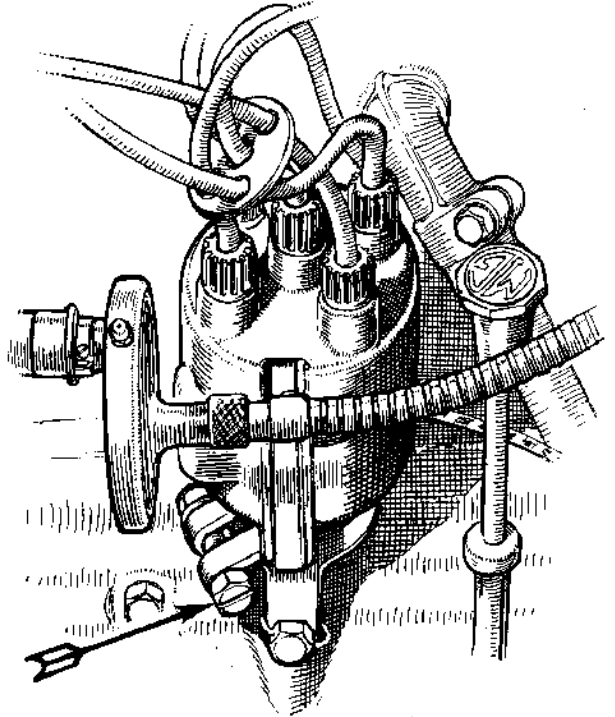


Fig. C.14.

The distributor clamp bolt, indicated by the arrow, permits the distributor body to be rotated independently of the spindle to set the timing of the spark. It should not be disturbed unless it is necessary to alter the spark timing. The bolt with the lock wire passing through the plate lug is the one holding the distributor in position and is the only one which should be released when it is desired to withdraw the distributor without disturbing the setting of the timing. Later models are fitted with a cotter bolt attachment as explained in Section C.13.

point (i.e. one lead from the distributor low-tension terminal and the other to earth) and turn the distributor until the lamp lights, which indicates that the points have just opened.

Or

Get a second operator to watch the ammeter and then turn the distributor body, when it will be observed that the small reading recorded on the ammeter when the points are closed "flicks" back to zero immediately the points open.

Section C.9

DISMANTLING THE DISTRIBUTOR

Before dismantling, carefully note the positions in which the various components are fitted so that they can be replaced correctly, then :—

- (a) Spring back the securing clips and remove the moulded cap.
- (b) Lift the rotor off the top of the spindle. If it is a tight fit it should be levered off carefully with a screwdriver.
- (c) Slacken the nut on the terminal post and lift off the end of the contact breaker spring which is slotted to assist removal. Lift the contact breaker lever off its pivot pin and remove the insulating washer. Take out the two screws, complete with spring washers and flat steel washers, from the plate carrying the fixed contact and remove the plate.

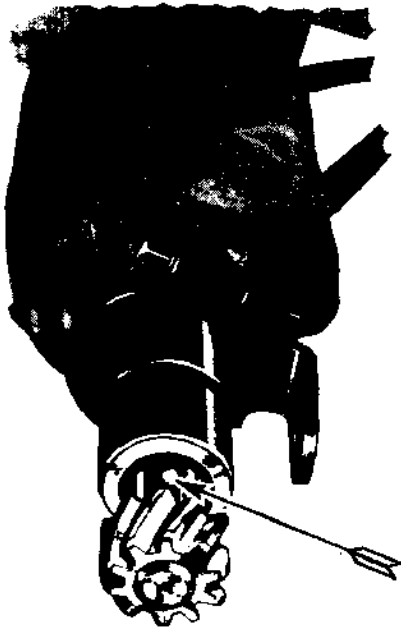


Fig. C.15.

The parallel driving pin locating the driving collar to the contact breaker spindle is here shown.

- (d) Undo the two screws fitted at the edge of the contact breaker base and lift them out together with the spring washers. The contact breaker base can then be removed from the body of the distributor.
- (e) Unscrew the condenser terminal nut, lift off the spring washer and remove the connector strip. Soften the solder securing the condenser in its clip with a hot iron, and remove the condenser by applying pressure at one end.

Note.—The condenser should not be removed unless absolutely necessary.

- (f) Drive out the parallel driving pin passing through the collar of the driving gear at the lower end of the spindle, and withdraw the driving gear from the spindle, taking care of the washer between the gear and the spindle which controls the end float.

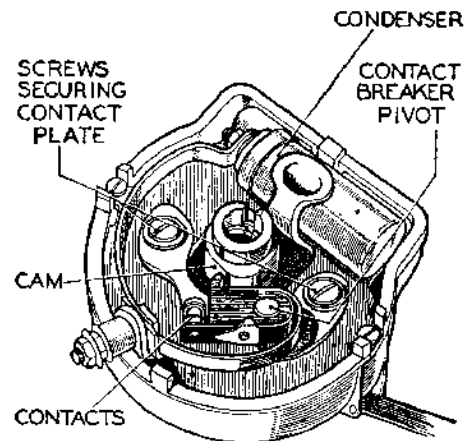


Fig. C.16.

The distributor with the cover and rotor arm removed, showing its components.

- (g) Lift the cam, automatic timing control and shaft assembly from the distributor. Take out the screw from inside the top of the cam spindle and lift the cam off. The automatic timing control is then accessible.

Section C.10

THE CONDENSER

The best method of testing the condenser is by substitution. Disconnect the original condenser and connect a new one between the low-tension terminal of the distributor and earth.

Should a new condenser be necessary, it is advisable to fit a complete condenser and contact breaker plate assembly, but should a condenser only be available, use a hot iron to soften the solder securing the defective condenser in the clip and remove the condenser by applying pressure at one end. Care must be taken not to overheat the new condenser when soldering it in position.

The capacity of the condenser is 0.2 microfarads.

Section C.11

FITTING NEW DISTRIBUTOR BUSHES

In order to ensure easy running of the distributor shaft when the shank has been rebushed, the new bushes must be fitted so that they are in correct alignment.

C THE IGNITION EQUIPMENT

The bushes must be fitted by means of a vertical drilling machine or hand press, using a mandrel and a packing block of the type shown.

- (a) Fit the mandrel in the drilling machine or hand press and place the distributor body in an inverted position on the table below it.
- (b) To remove the bushes, a sleeve must be fitted over the mandrel to build it up to the required size. With this sleeve fitted in position, force the old bushes out of the shank by applying a steady pressure. Before new bushes are fitted they should be allowed to soak for twenty-four hours in thin engine oil to Ref. F (page P.2).
- (c) Take the sleeve off the mandrel. Place one of the longer bushes on the mandrel, then the distributor body in an inverted position and finally one of the smaller bushes.
- (d) Locate the end of the mandrel through the packing piece and press the mandrel downwards, taking care that both bushes enter the distributor shank squarely. Continue forcing the bushes into the shank until the mandrel reaches the end of its travel.
- (e) After fitting, the bushes must not be opened out by reaming or any other means, as this would tend to impair the porosity of the bushes, and so prevent effective lubrication from being obtained.

Section C.12

REASSEMBLING THE DISTRIBUTOR

Note.—Before assembly, the automatic advance mechanism, distributor shaft, and the portion of the shaft on which the cam fits, must be lubricated with thin, clean engine oil to Ref. F (page P.2).

- (a) Assemble the automatic timing control, taking care that the parts are fitted in their original positions and that the control springs are not stretched. Two holes are provided in each toggle; the springs must be fitted to the inner hole in each case. Place the cam on its spindle and secure by tightening the locking screw.
- (b) Fit the shank in its bearings and replace the driving gear, with the special thrust washer between the gear and the distributor body. Fit the driving pin and burr over the gear each side with a suitable punch to retain it in position.

- (c) Place the contact breaker base in position on the distributor body and secure it by replacing the two screws. A spring washer must be fitted under each of the screw heads, and the screws must be fully tightened.
- (d) Place the end of the connector strip over the condenser terminal post, refit the spring washer and secure it by tightening the terminal nut.
- (e) Position the plate carrying the fixed contact on the contact breaker base and secure it by replacing and lightly tightening the two screws, placing a spring washer and flat steel

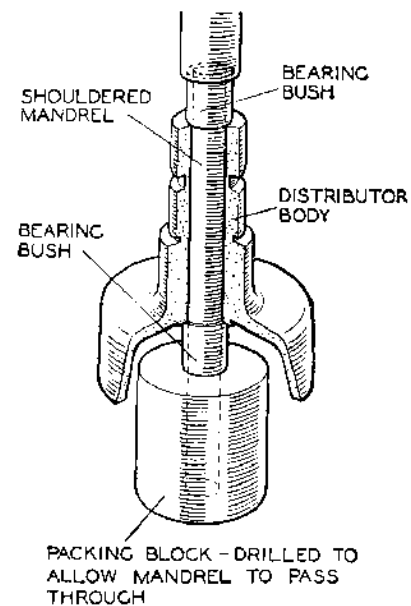


Fig. C.17.
Replacement of bearing bushes.

washer under the head of each of the screws. Place the insulating washer over the contact breaker pivot pin and position the contact breaker lever over the pivot pin. Locate the slotted end of the contact breaker spring under the head of the terminal screw and tighten the nut to lock the spring in position. Adjust the contact breaker setting to give a maximum opening of from $.010$ in. to $.012$ in. ($.25$ mm. to $.30$ mm.).

Note.—If it becomes necessary to renew the contacts a replacement set comprising fixed and moving contacts must be fitted.

- (f) Place the rotor on the top of the spindle, locating the register correctly, and push it fully home.
- (g) Fit the distributor moulding and secure it by means of the spring clips.

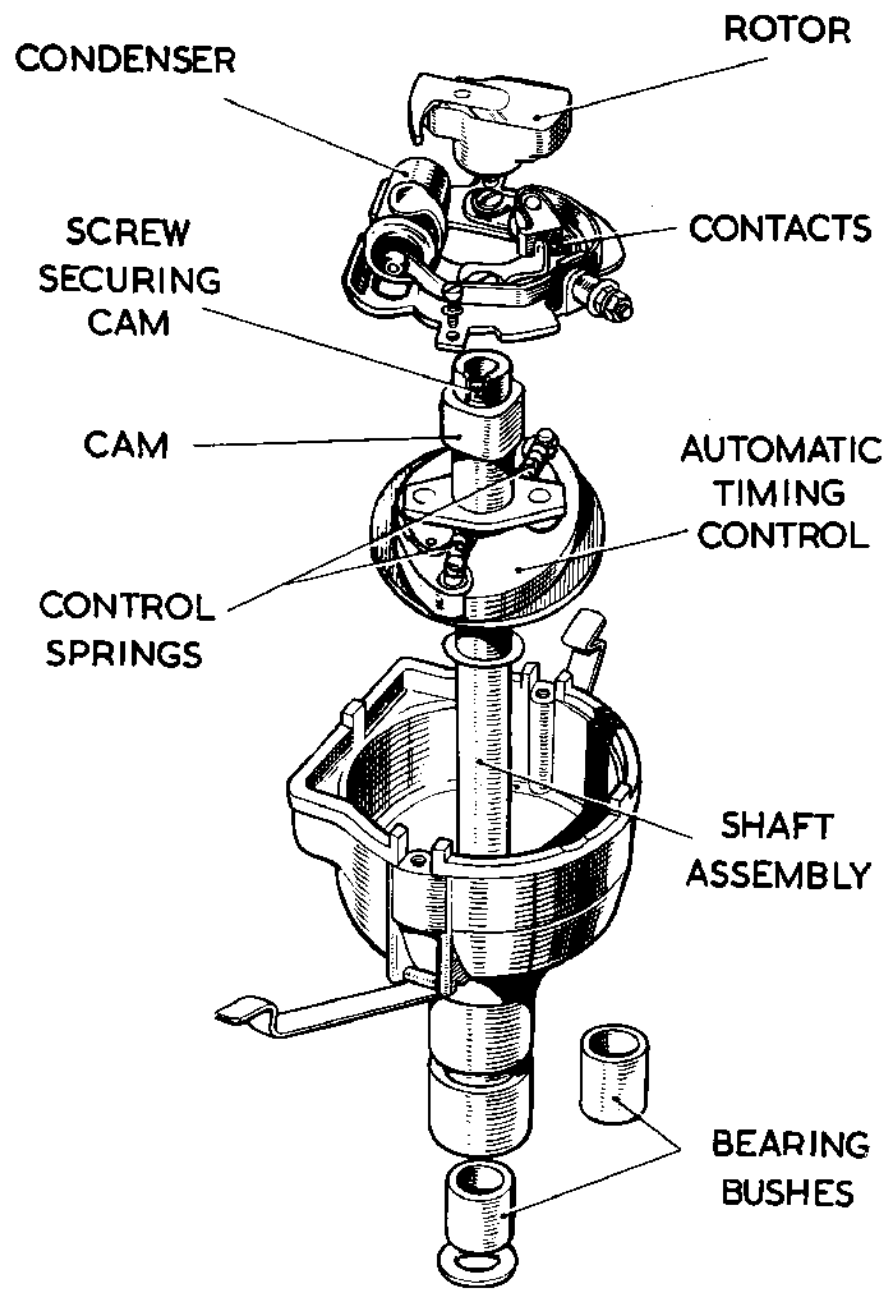


Fig. C.18.
The component parts of the distributor.

C THE IGNITION EQUIPMENT

Section C.13

MODIFIED DISTRIBUTOR FIXING

A new standardised method of distributor fixing has been incorporated in all M.G. Midget (Series "TD") cars, commencing at Engine No. XPAG/TD2/20942, and all Series "TF" cars.

The modified fixing consists of a tapered cotter bolt passing through the distributor housing boss in the cylinder block and contacting the stem of the distributor, and it replaces the split adjusting clip hitherto employed.

Distributors using the cotter pin attachment are released by slackening the cotter bolt inwards to free its tapered surface from the stem of the distributor.

While the location of the distributor rotor will not be disturbed owing to the action of the offset driving tongue, release of the distributor body and stem will affect the ignition point, and it is therefore essential to mark the distributor body and the face of its housing before removal to ensure correct ignition timing on replacement. The distributor housing face is marked with a scale to facilitate this.

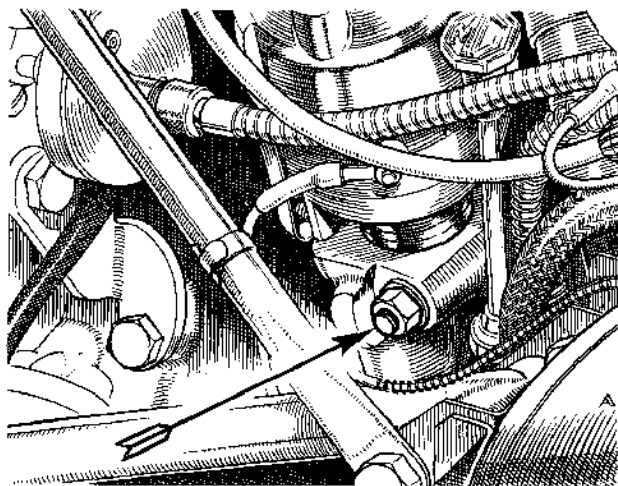


Fig. C.19.

The later type fixing for the distributor, consisting of a cotter bolt engaging the distributor body stem.

Section C.14

DISTRIBUTORS WITH "HIGH LIFT" CAMS

Later models are fitted with a new type of distributor, having high-lift cams. Owing to the shape of these cams the contact breaker gap must be set to .014 in. to .016 in. (.36 mm. to .41 mm.). Previous distributor cams were of two types—symmetric and asymmetric, and both of these types necessitated a contact breaker gap of .010 in. to .012 in. (.25 mm. to .30 mm.).

The wider gap of the high-lift cam, together with the steep angle of the cam face, gives more accurate ignition timing and controls pitting and piling action which limits useful contact life.

When setting contact gaps with the high-lift cam more care is needed when checking that the fibre heel is on the highest point of the cam rise, because maximum separation of the contact points is only obtained over a small angular movement of the distributor shaft.

All three types of cam are illustrated in Fig. C.20. Apart from the appearance of the cams, distributors fitted with high-lift cams can be identified by reference to the suffix letter which follows the Service No. Distributors bearing the suffix "E" or any letter subsequent to "E" after the Service No. 40162 are fitted with high-lift cams, and those with suffix letters previous to "E" are of the symmetric or asymmetric type.



Fig. C.20.

The three types of distributor cam.

The contact breaker setting for the symmetric and asymmetric types is .010 in. to .012 in. (.25 mm. to .30 mm.) gap, and for the high-lift type is .014 in. to .016 in. (.36 mm. to .41 mm.).

SECTION D

THE COOLING SYSTEM

General Description.

- Section No. D.1 Draining and filling the cooling system.
- Section No. D.2 To remove the radiator.
- Section No. D.3 Fan belt adjustment.
- Section No. D.4 The water pump—to dismantle and reassemble.

GENERAL DESCRIPTION

The cooling system is of the thermo-siphon, impeller-assisted type, with thermostatic control. The water is circulated from the base of the radiator by the pump, and after passing round the cylinders and cylinder head it reaches the header tank via the thermostat and top water hose. From the header tank it passes downwards through the cooling ducts to the radiator base tank.

Air is drawn through the radiator by a fan which is mounted on the water pump spindle, and both are driven by a belt from the crankshaft, which also drives the dynamo. Later models are fitted with a combined water temperature and oil pressure gauge.

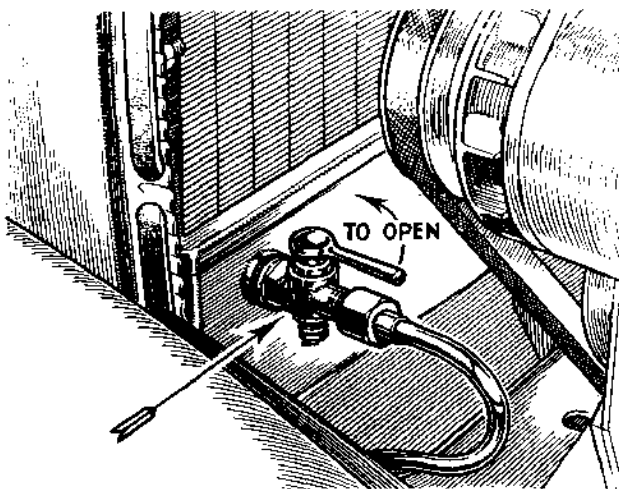


Fig. D.1.

The radiator drain tap. It is fitted with an extension pipe to facilitate delivery of the water into a receptacle.

Section D.1

DRAINING AND FILLING THE COOLING SYSTEM

Remove the header tank filler cap.

Drain the water from the cooling system by means of the drain tap on the left-hand side of the radiator bottom tank and the tap on the right of the engine at the front of the cylinder block. The system cannot be

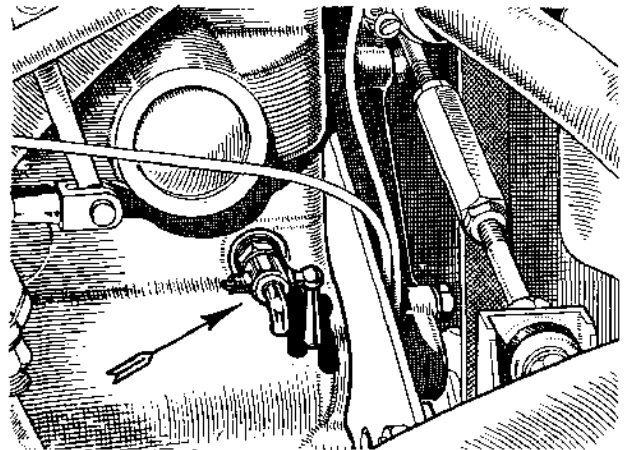


Fig. D.2.

A drain tap which must be opened to drain the cylinder water jacket completely is fitted to the right-hand side of the cylinder block

fully drained from the radiator tap alone owing to the location of the water impeller in the circulating system.

If "Bluecol" or any other anti-freeze mixture is in use the water should be drained into a suitable clean container and kept for future use.

D THE COOLING SYSTEM

To fill the system, close both the drain taps and fill through the header tank filler orifice until the water is approximately 2 in. (5 cm.) from the top of the filler neck. The capacity of the cooling system is 12 pints (6.8 litres). When possible, rain-water should be used for filling the system.

Avoid over-filling when anti-freeze is in use, to prevent unnecessary loss on expansion.

Screw the filler cap firmly into position.

Section D.2

TO REMOVE THE RADIATOR

Take off the bonnet by undoing the rear hinge bracket and withdrawing the bonnet rearwards from the front hinge.

Detach the forward ends of the radiator stays.



Fig. D.3.
Removing the radiator.

Disconnect the by-pass hose at the thermostat, the hose on the elbow at the pump and the main hose at the top of the thermostat.

Take out the two large, shouldered bolts holding the radiator to the headlamp brackets.

Remove the fixing nuts and locknuts from the mounting brackets. Note the position of the rubber buffers, retaining rings and washers.

The shell and radiator block will then come away together.

D.2

Section D.3

FAN BELT ADJUSTMENT

The adjustment of the dynamo, fan and water pump belt tension is effected by slightly slackening the two bolts on which the dynamo pivots, releasing the set screw (at the top front end of the dynamo) securing it to the slotted link and pulling the dynamo bodily

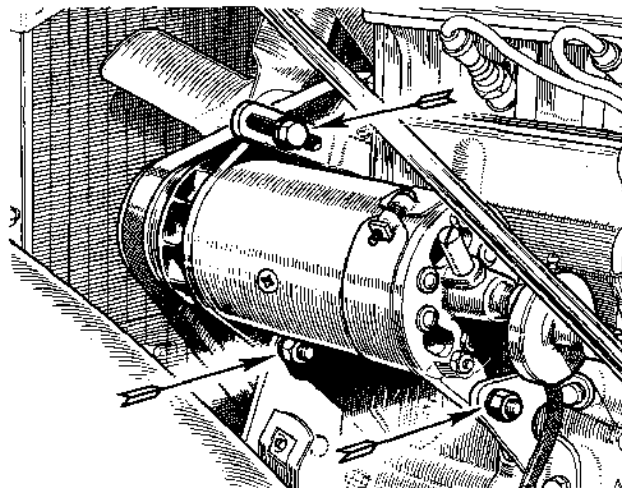


Fig. D.4
The two pivot bolts and the adjusting bolt for the dynamo mounting which provide adjustment for the fan belt tension are clearly shown by the arrows.

outwards until the belt tension is correct. Tighten up the set screws with the dynamo in this position.

Note.—Only gentle hand pressure must be exerted on the dynamo, or the belt tension will be excessive and cause rapid wear.

Section D.4

THE WATER PUMP—TO DISMANTLE AND REASSEMBLE

The water pump is fitted to the front face of the cylinder block, and is driven by a belt from the crankshaft. This belt also drives the dynamo. The pump is fitted with a special carbon gland ring which provides an efficient water seal and needs no lubrication or adjustment. In the early life of the car a slight leak may occur, but this will automatically cease as the carbon ring beds itself down. Should it be necessary to dismantle the unit for any reason, remove the radiator and proceed as follows :—

Remove the fan blades by withdrawing the four set screws securing them to the fan centre, and remove the fan belt.

Take out the set bolts and remove the pump unit by breaking the joint between the impeller housing flange and the cylinder block, moving the inner control link bracket outwards to clear.

Dismantle the pump by removing the impeller from the shaft, tapping out the taper pin attaching it to the shaft and taking care to see that it is knocked out in the right direction. Withdraw the pressure spring and washer, which gives access to the carbon seal and gland washer assembly. Care should be taken not to damage the carbon ring, which is relatively brittle, the working face of the rubber seal, and not to lose

of the spindle on a piece of wood until the outer bearing can be withdrawn. This will release the distance-piece between the bearings, which can be withdrawn, giving access to the inner race.

Remove the inner circlip by contracting the ring and inserting a screwdriver behind it to ease it out of its groove. After removal of the circlip the retaining bearing and the impeller spindle can be withdrawn.

If the felt oil sealing rings are badly worn or the bearings unduly slack, they should be renewed. Carefully examine the carbon sealing ring for cracks or undue wear and renew if necessary. The face of the

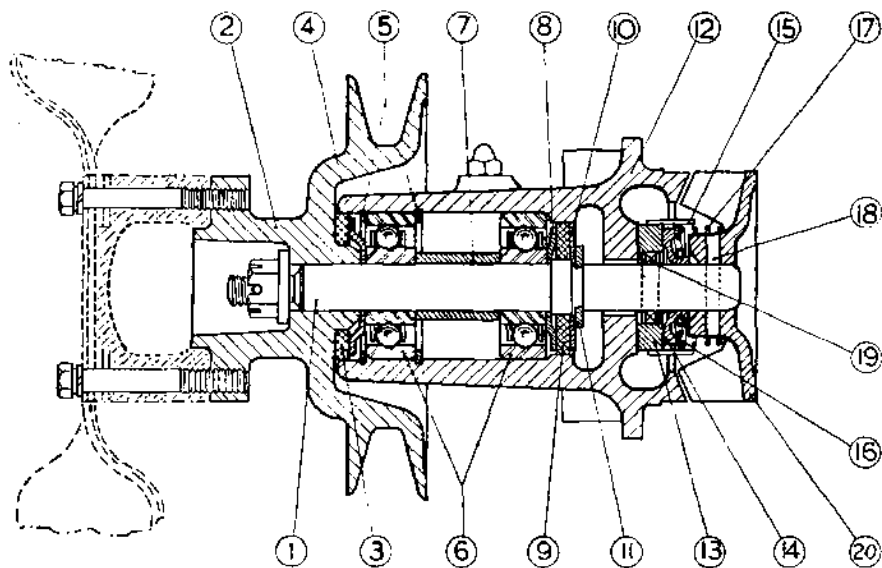


Fig. D.5. The water pump assembly on early models. Later models have a modified sealing gland (see Fig. D.6).

- | | | |
|-----------------------------|------------------------------|--------------------|
| 1. Spindle. | 8. Retaining cover (rear). | 15. Gland ring. |
| 2. Fan pulley. | 9. Felt washer (rear). | 16. Seal washer. |
| 3. Felt washer (front). | 10. Retaining washer (rear). | 17. Seal ring. |
| 4. Retaining cover (front). | 11. Spindle circlip. | 18. Taper pin. |
| 5. Bearing circlips. | 12. Pump body. | 19. Gland peg. |
| 6. Bearings. | 13. Seal washer. | 20. Impeller vane. |
| 7. Distance tube. | 14. Spindle seal. | |

the driving pin for the carbon gland, which is a loose fit in the shaft.

The pump spindle is carried on two ball races, which should give no trouble unless they have been neglected. Access to the races is obtained by releasing the impeller and gland as described above, removing the drive pin for the gland, removing the attachment nut in the centre of the drive pulley, withdrawing the pulley, pulley key, felt sealing ring and retainer. Remove the outer bearing circlip by engaging the end lugs with a pair of long-nosed pliers.

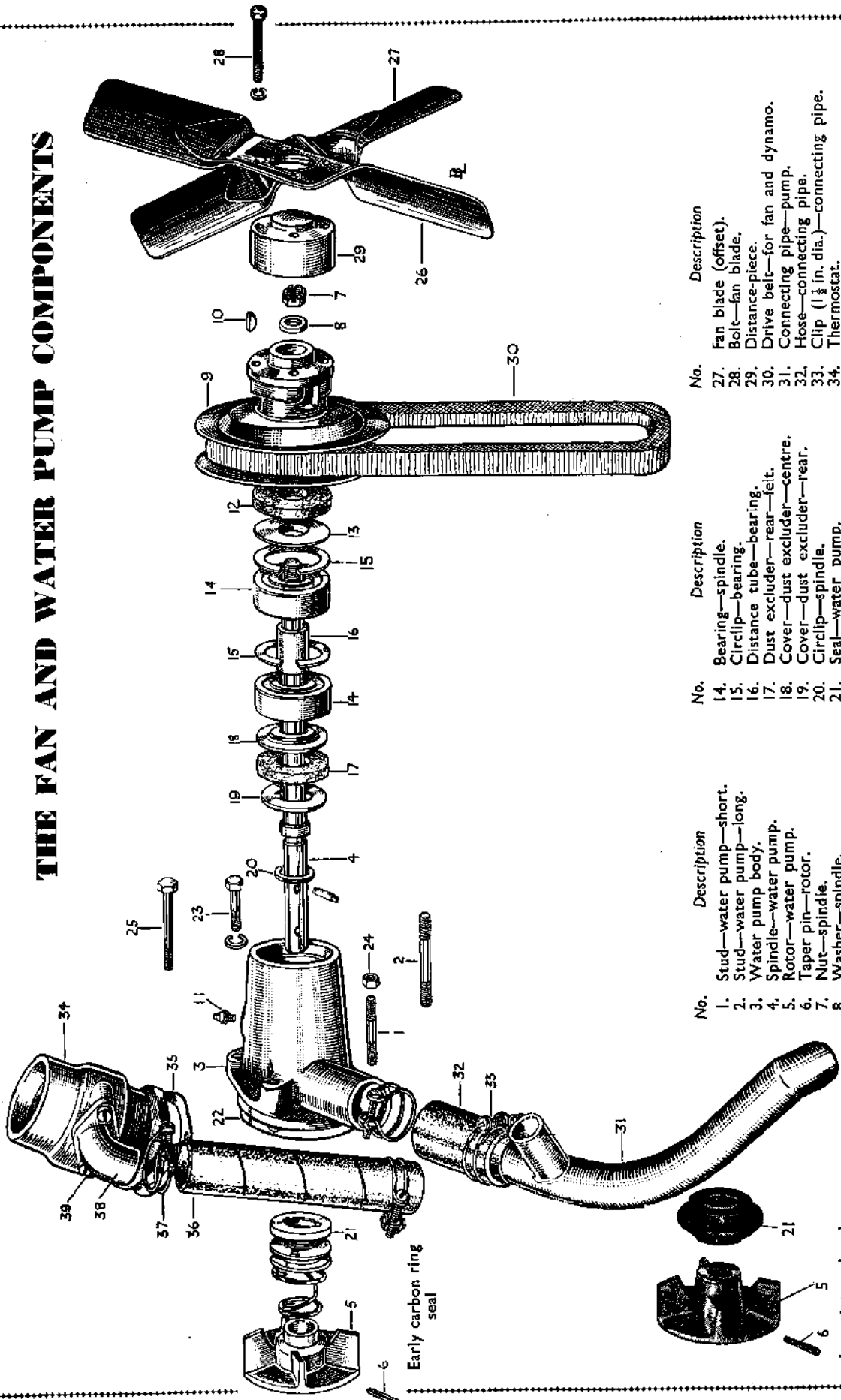
Pour a little paraffin (kerosene) into the impeller body around the outer bearing and tap the inner end

brass sealing washer should be examined for flatness and all edges should be freed from burrs as this may damage the synthetic rubber seal. Fit a new seal if damaged.

Reassembly is carried out in the reverse manner to that detailed for removal, taking care that the flange jointing washer is in good condition.

The space between the two races should be partially filled with grease (for the correct grade, see Section P, page 2) and the felt washers liberally soaked in engine oil or grease before replacement. The slotted nut retaining the pulley should not be over-tightened; as long as it is just firm it will be satisfactory.

THE FAN AND WATER PUMP COMPONENTS



- | No. | Description |
|-----|--|
| 1. | Stud—water pump—short. |
| 2. | Stud—water pump—long. |
| 3. | Water pump body. |
| 4. | Spindle—water pump. |
| 5. | Rotor—water pump. |
| 6. | Taper pin—rotor. |
| 7. | Nut—spindle. |
| 8. | Washer—spindle. |
| 9. | Fan pulley. |
| 10. | Key—pulley. |
| 11. | Grease nipple. |
| 12. | Dust excluder—front. |
| 13. | Cover—front dust excluder. |
| 14. | Bearing—spindle. |
| 15. | Circlip—bearing. |
| 16. | Distance tube—bearing. |
| 17. | Dust excluder—rear—felt. |
| 18. | Cover—dust excluder—centre. |
| 19. | Cover—dust excluder—rear. |
| 20. | Circlip—spindle. |
| 21. | Seal—water pump. |
| 22. | Joint—pump body to block. |
| 23. | Bolt—pump—short. |
| 24. | Nut—water pump stud. |
| 25. | Bolt—pump—long. |
| 26. | Fan blade. |
| 27. | Fan blade (offset). |
| 28. | Bolt—fan blade. |
| 29. | Distance-piece. |
| 30. | Drive belt—for fan and dynamo. |
| 31. | Connecting pipe—pump. |
| 32. | Hose—connecting pipe. |
| 33. | Clip (1 1/2 in. dia.)—connecting pipe. |
| 34. | Thermostat. |
| 35. | Joint—thermostat. |
| 36. | Hose—by-pass pipe. |
| 37. | Clip (1 1/2 in. dia.)—by-pass hose. |
| 38. | Elbow—thermostat. |
| 39. | Screw—elbow. |

Commencing at Engine XPAG/TD/6482, a new water pump with an improved type of water seal has been fitted.

Except for the gland, the new pump is structurally similar, and the method of dismantling and reassembly is the same.

The seating for the new seal is against the boss of the impeller vane instead of the pump body.

The introduction of the new water seal has entailed the deletion of the following parts :—

Part No.	Description	Quantity
MG862/42	Water pump assembly	1
MG862/269	Water pump body	1
MG862/270	Spindle for water pump	1
MG862/271	Impeller vane	1
MG862/77	Water seal kit	1 set

which have been replaced by the following :—

SA2419/2	Water pump assembly	1
X24433	Water pump body	1
X24435	Spindle for water pump	1
X24434	Impeller vane	1
162600	Washer for water pump seal	1
162990	Water pump seal	1

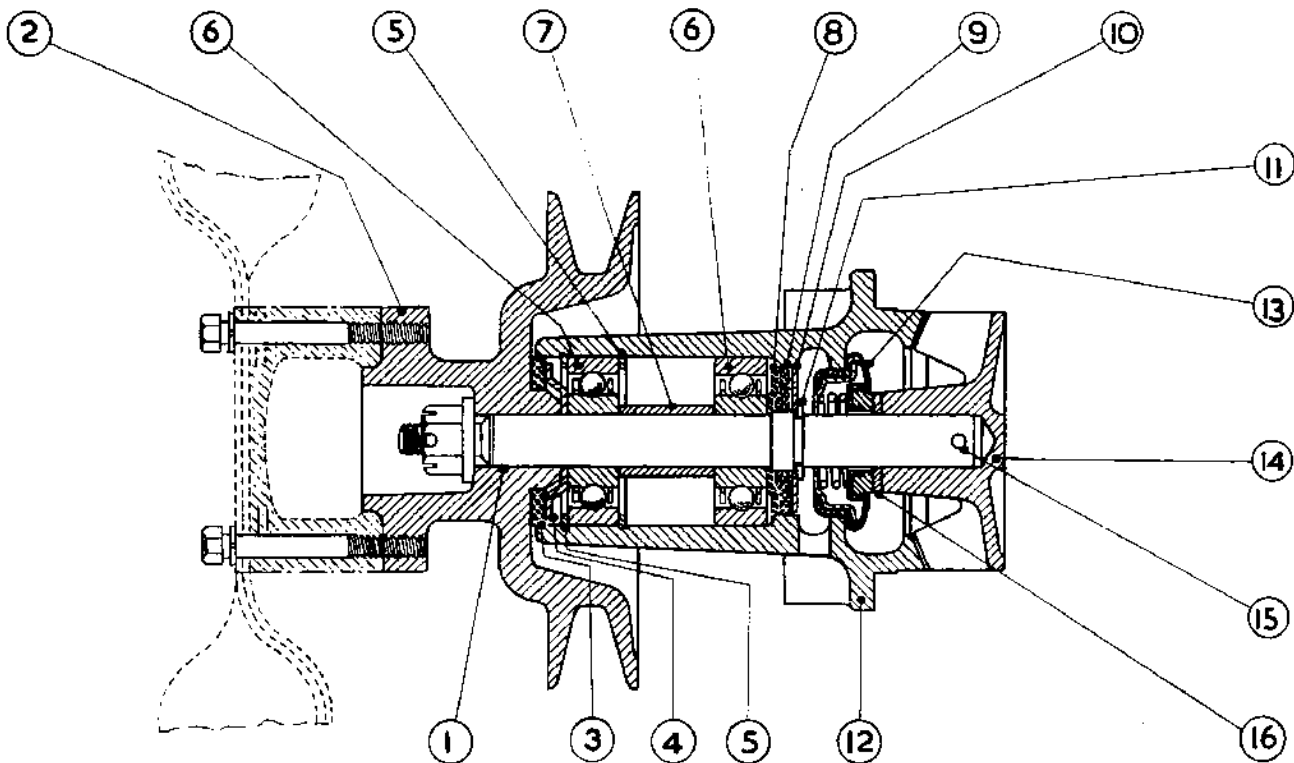
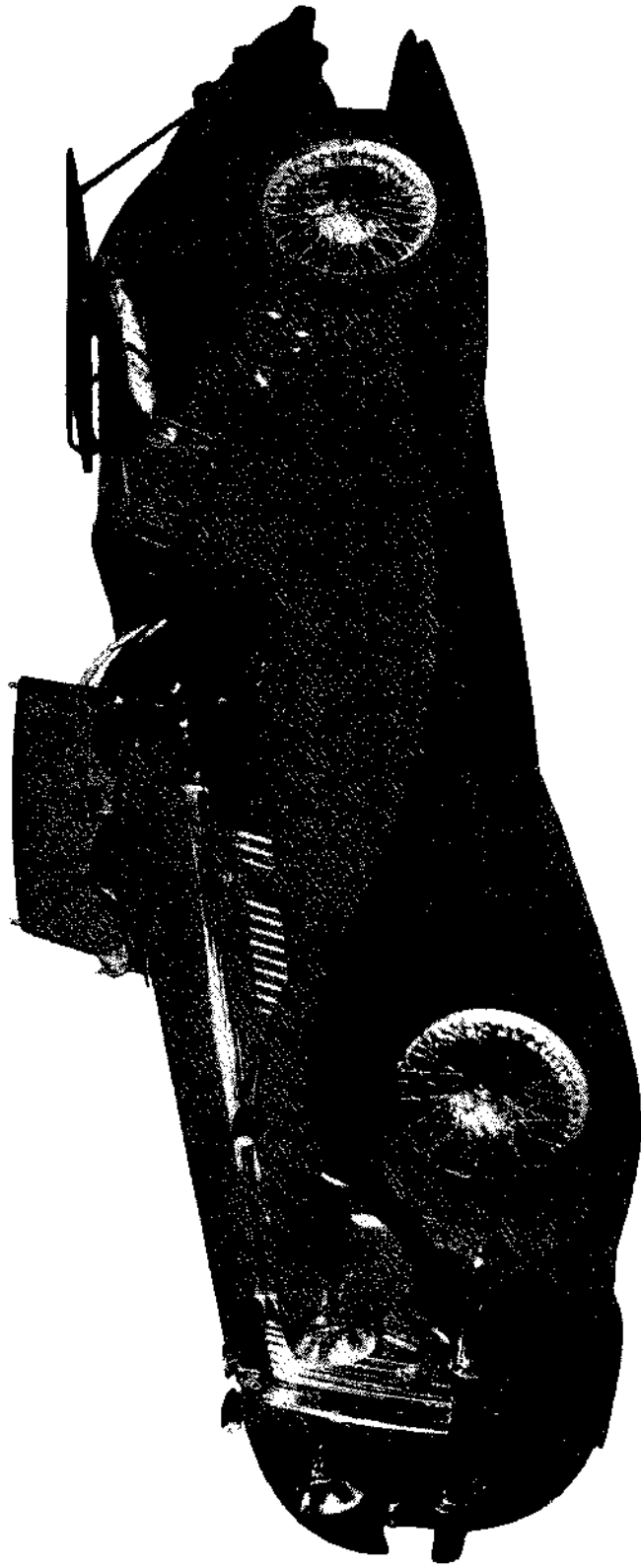


Fig. D.6.

The assembly of the later type water pump.

- | | |
|-----------------------------|------------------------------|
| 1. Spindle. | 9. Felt washer (rear). |
| 2. Fan pulley. | 10. Retaining washer (rear). |
| 3. Felt washer (front). | 11. Pump spindle circlip. |
| 4. Retaining cover (front). | 12. Pump body. |
| 5. Bearing circlips. | 13. Seal. |
| 6. Bearings. | 14. Impeller vane. |
| 7. Distance tube. | 15. Taper pin. |
| 8. Retaining cover (rear). | 16. Gland seating washer. |

THE M.G. MIDGET (Series "TF")



SECTION DD

THE COOLING SYSTEM

General Description.

Section No. DD.1 Draining and filling the cooling system.

Section No. DD.2 To remove the radiator.

Section No. DD.3 The water pump—to dismantle and reassemble.

GENERAL DESCRIPTION

The cooling system of the M.G. Midget (Series "TF") is sealed, and the water circulation is assisted by a pump attached to the front of the cylinder block and driven by a belt from the crankshaft. The water circulates from the base of the radiator and passes around the cylinders and cylinder head, reaching the header tank of the radiator via the thermostat and top water hose. From the header tank it passes down the core to the base tank of the radiator. Air is drawn through the radiator by a fan attached to the water pump pulley.

Section DD.1

DRAINING AND FILLING THE COOLING SYSTEM

The cooling system is under appreciable pressure while the engine is hot after a run and the radiator filler cap must be removed very carefully or left in position until the water has cooled.

If it is necessary to remove the filler cap while the engine is hot, it is absolutely essential to remove it

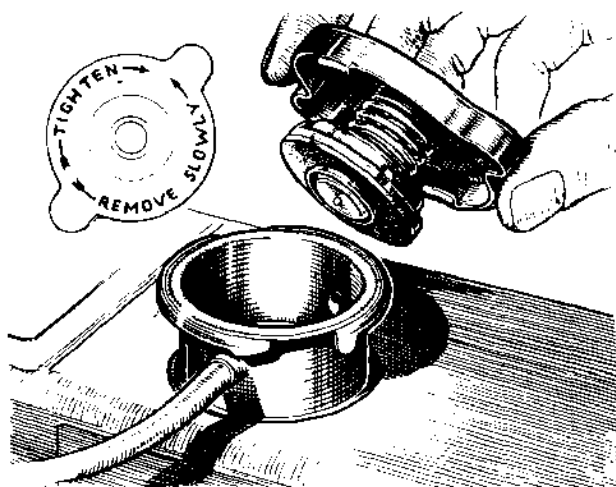


Fig. DD.1.

The filler cap showing the retaining cam on the spout rim and the safety lobes.

gradually, and the filler spout is provided with a specially shaped cam to allow this to be done easily.

Unscrew the cap slowly until the retaining tongues are felt to engage the small lobes on the end of the filler spout cam and wait until the pressure in the radiator is fully released before finally removing the cap.

Drain and refill the system as detailed in Section D.1.

Section DD.2

TO REMOVE THE RADIATOR

Take off the bonnet by undoing the rear hinge bracket and withdrawing the bonnet rearwards from the front hinge.

Detach the forward ends of the radiator stays.

Remove the bolt at each side bracket securing the radiator to the valances at the top.

Remove the two set bolts screwing into captive nuts in the radiator grille at each side, accessible below the wings.

Disconnect the by-pass hose at the thermostat, the hose on the elbow at the pump, the lower hose at the radiator and the main hose at the top of the thermostat.

Unscrew and remove the nuts below the radiator securing it to the front cross-member.

The shell and radiator block will then come away together.

Section DD.3

THE WATER PUMP—TO DISMANTLE AND REASSEMBLE

The water pump used in the Series "TF" is the same as that fitted to the later types of the "TD" and is illustrated in Fig. D.6.

Instructions for its removal, dismantling and reassembly will be found in Section D.4. Disconnect the tie-bar between the valances.

SECTION E

THE FLYWHEEL AND CLUTCH

General Description.

Section No. E.1	Running adjustments.
Section No. E.2	Removal of the clutch.
Section No. E.3	Dismantling the clutch.
Section No. E.4	Assembling the clutch.
Section No. E.5	Refitting the clutch.
Section No. E.6	Adjusting the release levers.
Section No. E.7	Refacing the driven plate.
Section No. E.8	Servicing the clutch.
Section No. E.9	8 in. diameter clutch.
Section No. E.10	Introduction of a clutch control rod.

GENERAL DESCRIPTION

The clutch is a single dry plate Borg & Beck, Type 7A6G up to Engine No. 9407, Type BB.8/70 from Engine No. 9408 and BB.8/70A from Engine No. 30301 onwards, consisting of a driven plate assembly, a cover assembly and a graphite release bearing assembly.

Driven plate assembly

This has a flexible centre in which the splined hub is indirectly attached to the clutch plate and transmits the power and over-run through a number of coil springs held in position by retaining wires. Two friction facings are riveted to the clutch plate, one on each side.

Cover assembly

The cover assembly consists of a pressed-steel cover (4) and a cast-iron pressure plate (18) loaded by six thrust springs (5). Mounted on the pressure plate are three release levers (12) which pivot on floating pins (16) retained by eyebolts (15). Adjusting nuts (14) are screwed onto the eyebolts and secured by lock pins or staking. Struts (17) are interposed between lugs on the pressure plate and the outer ends of the release levers. Anti-rattle springs (13) load the release levers, and retainer springs (11) connect the levers to the release lever plate (10).

Release bearing

The release bearing consists of a graphite bearing (7) shrunk into a bearing cup (8), the cup being located by the operating fork and release bearing retainer springs (9).

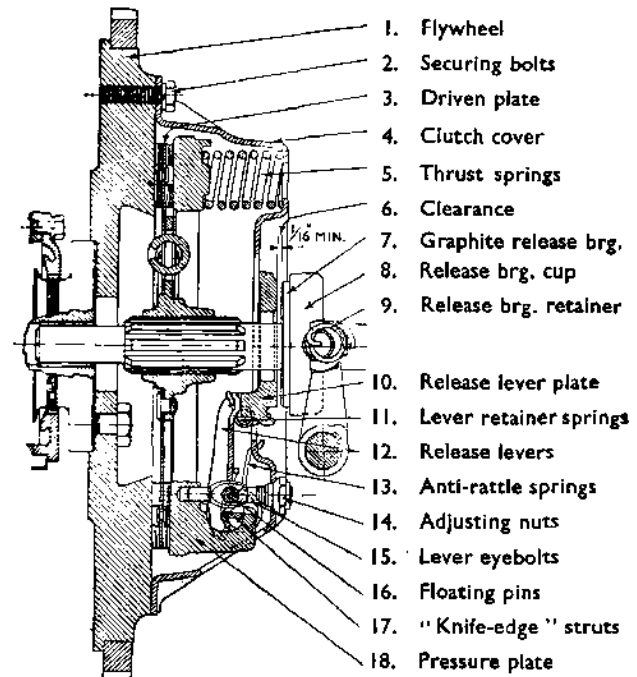
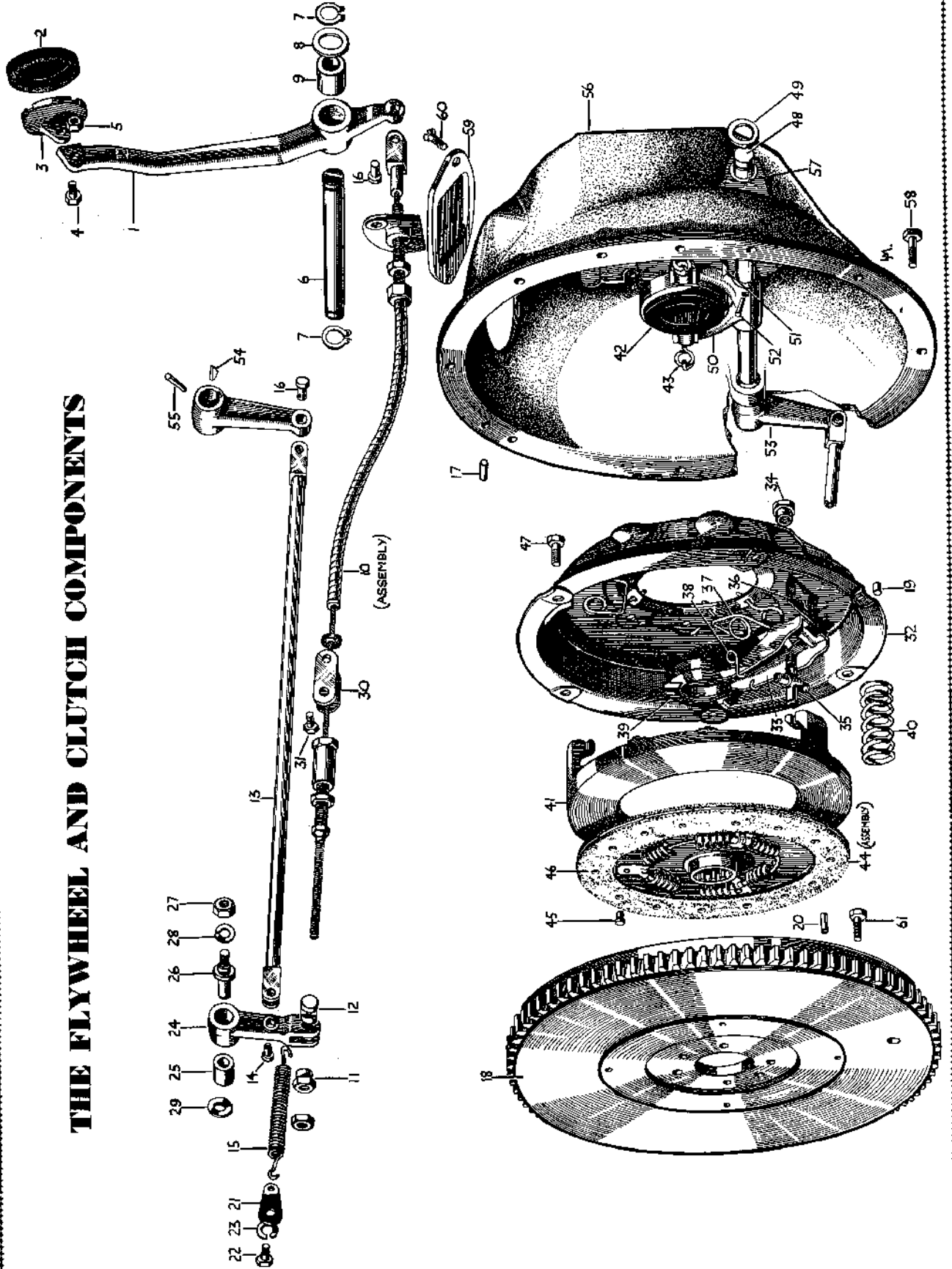


Fig. E.1.

The clutch in section, showing the disposition of its components.

THE FLYWHEEL AND CLUTCH COMPONENTS



KEY TO FLYWHEEL AND CLUTCH COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Clutch pedal and bush.	22.	Bolt—bracket.	42.	Clutch release bearing and cup assembly.
2.	Pad—rubber—clutch pedal.	23.	Spring washer—bolt.	43.	Retainer—clutch release bearing.
3.	Pad—brake pedal.	24.	Lever—cable and connecting rod.	44.	Clutch driven plate assembly.
4.	Bolt—pad—brake pedal.	25.	Bush—lever.	45.	Rivet—clutch driven plate.
5.	Nut—pad bolt.	26.	Fulcrum pin—lever.	46.	Facing.
6.	Shaft—clutch.	27.	Nut—fulcrum pin.	47.	Bolt—clutch cover.
7.	Seager circlip.	28.	Washer—fulcrum pin.	48.	Clutch withdrawal shaft.
8.	Spacing washer—between pedals.	29.	Washer—fulcrum pin—outer.	49.	Circlip—withdrawal shaft.
9.	Bush—brake pedal.	30.	Abutment bracket—clutch cable.	50.	Fork—clutch.
10.	Clutch cable assembly.	31.	Bolt—bracket.	51.	Key—clutch fork.
11.	Nut—clutch adjuster.	32.	Cover—clutch.	52.	Taper pin—clutch fork.
12.	Pin—clutch adjuster.	33.	Release lever—clutch.	53.	Clutch operating lever.
13.	Connecting rod—clutch.	34.	Eyebolt and nut.	54.	Key—clutch lever.
14.	Yoke pin—rod.	35.	Fulcrum pin—release lever.	55.	Taper pin—clutch lever.
15.	Spring—clutch return.	36.	Strut—release lever.	56.	Clutch housing (with bushes).
16.	Pin—clutch lever.	37.	Spring—anti-rattle—release lever.	57.	Bush—clutch housing.
17.	Dowel—clutch housing.	38.	Spring—retaining—release lever.	58.	Bolt—securing clutch housing.
18.	Flywheel (with starter ring and dowels).	39.	Plate—release lever.	59.	Clutch inspection cover.
19.	Dowel—clutch cover.	40.	Spring—pressure plate.	60.	Screw—inspection cover.
20.	Dowel—crankshaft.	41.	Pressure plate—clutch.	61.	Bolt—flywheel securing.
21.	Bracket—clutch return spring.				

E THE FLYWHEEL AND CLUTCH

Section E.1

RUNNING ADJUSTMENTS

The only adjustment necessary throughout the life of the driven plate facings is to restore periodically the free movement of the clutch pedal (i.e. movement of the pedal before the release bearing comes into contact with the release lever plate and commences to withdraw the clutch). As the driven plate facings wear, the free movement of the pedal will gradually decrease, eventually preventing the clutch fully

failure. There should be approximately $1\frac{1}{8}$ in. or 29 mm clearance at "H" between the stop nut "C" and the abutment bracket "D" when the pedal is lightly held with the carbon block in contact with the thrust ring by pushing lightly on the clutch pedal by hand. To

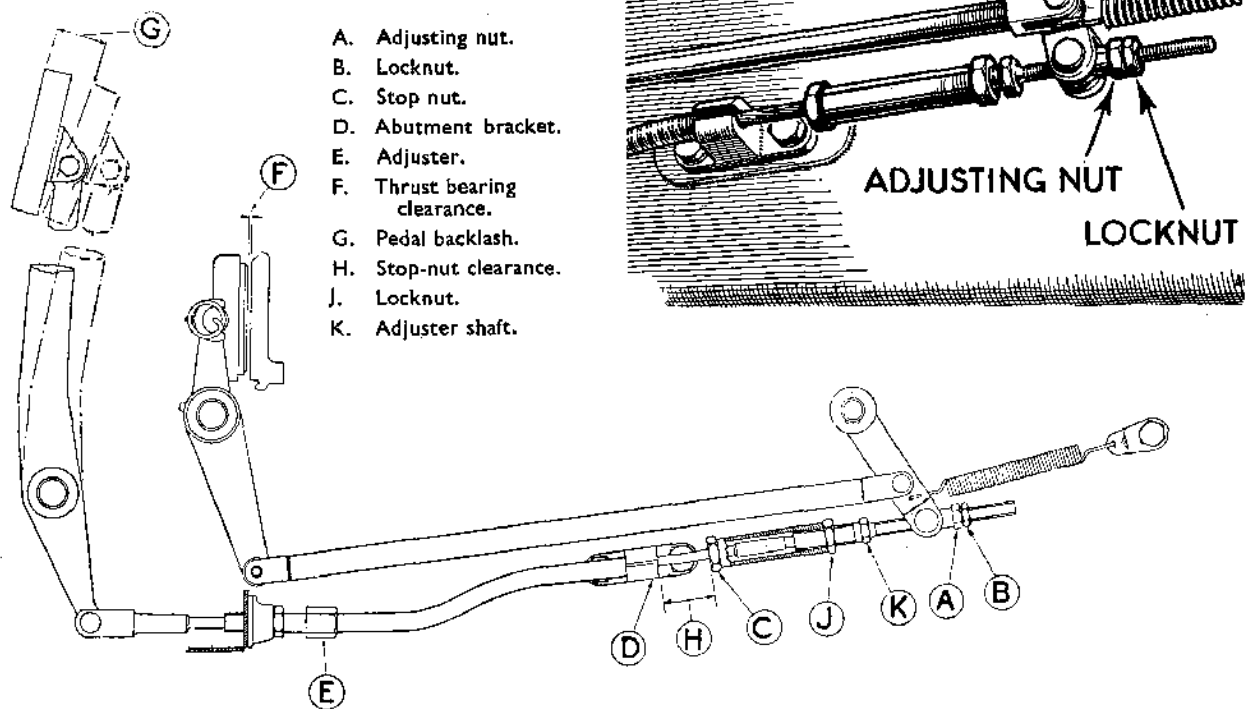


Fig. E.2.

The clutch operating mechanism, showing the pedal adjustment. On later models the clutch cable is replaced by a rod.

engaging and permitting too great a movement on withdrawal.

The minimum clearance at "F" (see Fig. E.2) between the withdrawal lever plate and the face of the thrust bearing is $\frac{1}{16}$ in. (1.59 mm.), which gives a free pedal movement "G" of $\frac{3}{4}$ in. or 19 mm. at the clutch pedal which should always be maintained.

When the clutch pedal free movement becomes less than this, it is essential to make use of the adjustment provided. This consists of an adjusting nut "A" and locknut "B" at the forward end of the clutch operating cable. Care should be taken to tighten up the locknut "B" after adjustment.

In addition, care must be taken to see that the pedal travel is not excessive, as this will apply an excessive load on the carbon thrust block, leading to its early

obtain adjustment, grip the nut "C" and slack off the locknut "J"; grip the adjuster shaft hexagon "K" and adjust the stop nut "C" to the required position. Re-tighten the locknut "J" after adjustment. Need for this adjustment will be indicated when there is a tendency for the clutch not to free when the pedal is fully depressed.

Adjuster "E" is only for the initial adjusting of the outer cable length to give the correct flexibility between the pedal box and floating engine, and should require no subsequent setting.

Note.—The adjustment nuts (Item 14, Fig. E.1) are correctly set and locked when the clutch is assembled and should not be altered unless the clutch has been dismantled and new parts fitted. Interference with this adjustment will throw the pressure plate out of position and cause the clutch to judder.

Section E.2

REMOVAL OF THE CLUTCH

Remove the gearbox as detailed on page F.1. The gearbox should be supported during this operation to prevent strain on the shaft and distortion of the driven plate assembly.

Slacken the securing bolts (2) (see Fig. E.1) a turn at a time by diagonal selection until the spring pressure is completely relieved.

Remove the securing bolts and lift the complete clutch pressure plate and cover assembly away from the flywheel (1).

Remove the driven plate assembly.

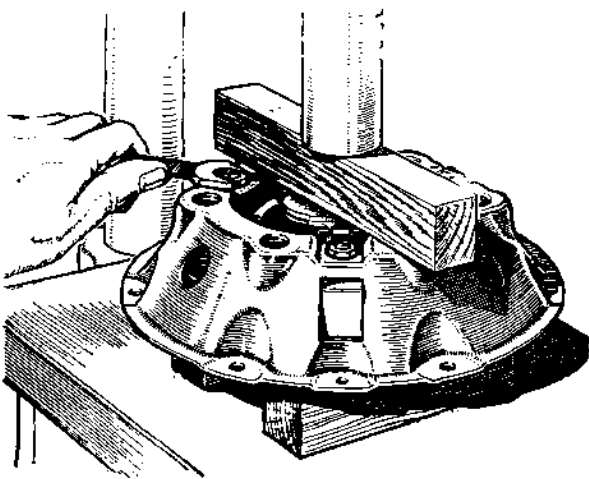


Fig. E.3.

The correct procedure to adopt when dismantling the clutch cover assembly. Note the two wood blocks supporting the pressure plate on the bed of the press. These must not project beyond the pressure plate to ensure that they do not foul the cover-plate when this is depressed by the press.

Section E.3

DISMANTLING THE CLUTCH

Suitably mark the following parts in such a manner that they can be reassembled in the same relative positions to each other in order to preserve the balance and adjustment : cover (4), pressure plate lugs (18) and release levers (12).

Detach the release lever plate (10) from the retainer springs (11) and place the cover assembly under a press with the pressure plate (18) resting on blocks of such a size that the cover is free to move downwards when pressure is applied. (See Fig. E.3.)

Place a block of wood across the top of the cover, resting on the spring bosses.

Compress the cover, by means of the spindle of the press, and, while holding it under compression, remove the adjusting nuts (14) and slowly release the pressure to prevent the thrust springs (5) from flying out.

Lift off the cover to expose all parts for inspection.

Remove each release lever (12) by grasping the lever and eyebolt (15) between finger and thumb so

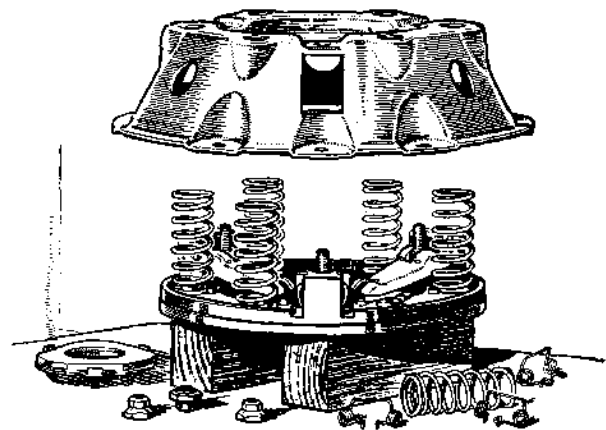


Fig. E.4.

When reassembling the clutch the pressure plate should be supported on the wood blocks used for dismantling and the levers assembled on their shoulder studs. The thrust springs should be placed in position on their seatings, making sure that they remain correctly located when the clutch cover is placed in position. Make sure also that the lever anti-rattle springs are properly located.

that the inner end of the lever and the threaded end of the eyebolt are as near together as possible, keeping the eyebolt pin in position in the lever. (See Fig. E.5.)

Lift the strut (17) over the ridge on the lever and remove the eyebolt (15) from the pressure plate.

Section E.4

ASSEMBLING THE CLUTCH

Before assembly, thoroughly clean all parts and renew those which show appreciable wear.

Place the pressure plate on the blocks under the press and place the thrust springs (5) in a vertical position on the plate, seating them on the bosses provided. (See Fig. E.4.)

Assemble the release levers (12), eyebolts (15) and eyebolt pins (16), holding the threaded end of the eyebolt and inner end of the lever as close together as possible. With the other hand insert the strut (17) in the slots on the pressure plate lug sufficiently

E THE FLYWHEEL AND CLUTCH

to allow the plain end of the eyebolt to be inserted in the hole in the pressure plate. Move the strut upwards into the slot in the pressure plate lug and over the ridge on the short end of the lever, and drop it into the groove formed in the lever. Fit the remaining levers in a similar manner, taking care that they are being refitted into their original positions.

Lay the cover (4) over the assembled parts, ensuring that the anti-rattle springs (13) are in position and that the tops of the clutch springs are directly under

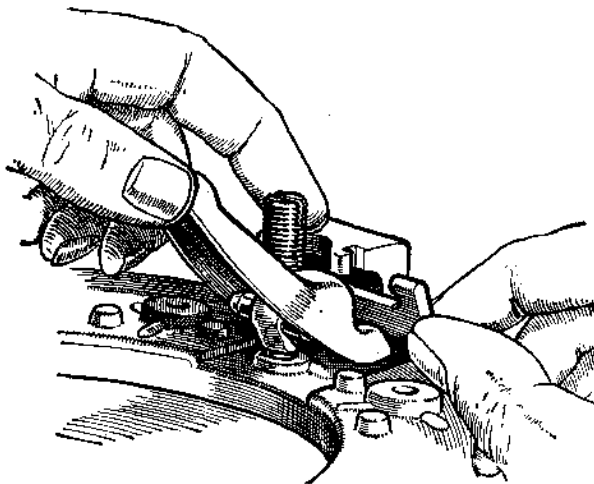


Fig. E.5.

To assemble the levers hold the threaded end of the eyebolt and lever close together as shown and with the other hand insert the strut in the slot of the pressure plate lug sufficiently to permit the plain end of the eyebolt to be inserted in the hole in the pressure plate.

the seats in the cover, also that the machined portions of the pressure plate lugs are directly under the slots in the cover through which they have to pass. Also ensure that the parts marked before dismantling are in their correct relative position to maintain correct balance.

Place the block of wood across the cover as in Fig. E.3, and compress the clutch springs by means of the press spindle, guiding the eyebolts and pressure plate lugs through the holes in the cover.

Screw the adjusting nuts (14) on the eyebolts (15) and secure by staking or split pins in accordance with the system originally used by the makers.

Remove the clutch from the press, and assemble the lever plate (10) on the tips of the levers (12) and retainer springs (11).

Note.—If new parts have been fitted, which may affect the adjustment, the levers should be set, using the gauge plate, Part No. 68885, as indicated in Section E.6.

Section E.5

REFITTING THE CLUTCH

To refit the clutch to the flywheel proceed as follows :—

Assemble the driven plate assembly in the flywheel (1), taking care to place the larger chamfered spline end of the driven plate hub towards the gearbox or the rear of the vehicle.

Centralise the driven plate by means of the special clutch alignment bar T.124, which fits the splined bore of the driven plate hub and the pilot bearing in the flywheel. As an alternative a spare gearbox driving gear and shaft can be used.

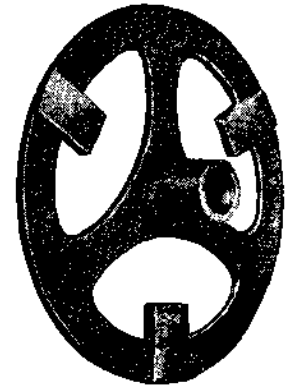


Fig. E.6.

The special Borg & Beck lever adjusting gauge plate for setting the levers correctly.

Fit the cover assembly to the flywheel by means of the securing bolts (2), tightening them a turn at a time by diagonal selection. Do not remove the clutch alignment bar until all the bolts are securely tightened.

Remove the clutch alignment bar and refit the withdrawal bearing and the gearbox. The weight of the gearbox must be supported during refitting in order to avoid strain on the shaft and distortion or displacement of the driven plate assembly.

(Reference numbers apply to Fig. E.1.)

Section E.6

ADJUSTING THE RELEASE LEVERS

Satisfactory operation of the clutch is dependent on accurate adjustment of the release levers (12). This must be carried out before the clutch has been assembled to the flywheel and should only be necessary if new parts have been fitted. The maximum difference allowed in the height of the levers is .015 in. (.38 mm.). To obtain a setting within this limit use the special gauge plate in conjunction with the rest of

the clutch assembly and the flywheel. The latter may be mounted on the engine or lying on the bench, whichever is most convenient. Proceed as follows:—

Place the gauge plate, Part No. 68885 (Fig. E.6), centrally in the flywheel in place of the driven plate.

Fit the cover assembly to the flywheel by tightening the securing bolts (2) a turn at a time by diagonal selection until fully secured.

Place a straight-edge across the gauge plate boss and the tip of one release lever (Fig. E.7).

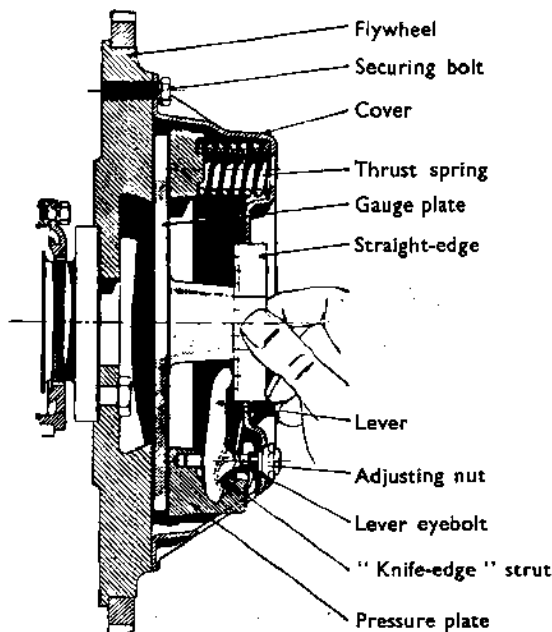


Fig. E.7.

Setting the release levers by means of the special gauge plate, Part No. 68885, and a short straight-edge.

Adjust the release lever, if necessary, by turning the adjusting nut (14) until the tip of the lever is exactly level with the top of the gauge boss.

Adjust the remaining levers in a similar manner. The setting should be within .005 in. (.13 mm.) if carefully carried out.

Re-lock the eyebolt nuts by the same method used by the makers (split pin or staking).

Slacken the securing bolts (2) a turn at a time by diagonal selection, then remove the holding screws and the clutch from the flywheel (1). Remove the gauge plate and reassemble with the actual driven plate.

Section E.7

REFACING THE DRIVEN PLATE

To renew the facings on the driven plate, proceed as follows:—

Do not punch out the rivets.

Using a $\frac{1}{8}$ in. or 4 mm. drill, remove each rivet.

Rivet one new facing in position, using a blunt-ended centre punch if the correct tool is not available to roll the rivet shanks against the plate.

Rivet the second facing onto the opposite side of the plate with the clearance holes over the rivet heads already formed in fitting the first facing.

Mount the plate on a mandrel between centres and check for run-out as near the edge as possible; if error is more than .015 in. (.38 mm.) dress over the high spots until true within this figure.

Section E.8

SERVICING THE CLUTCH

As the clutch facings wear, the pressure plate moves closer to the flywheel face, and the outer or shorter ends of the release levers follow. This causes the inner or longer ends of the levers to travel farther towards the gearbox, and decreases the clearance between the release lever plate and the release bearing. The effect on the clutch pedal is to decrease the clearance or free travel; in other words it reduces the distance the clutch pedal moves forward, away from the back stop, before the release bearing comes into contact with the release lever plate. Some free movement must always be maintained here to prevent the clutch pedal riding against the back stop and thus causing the clutch to slip. This essential free movement is restored by adjusting the clutch pedal position.

Excessive pedal movement causes coil binding of the springs and imposes an undue load on the bearing and on the crankshaft, causing excessive and rapid bearing wear. It therefore follows that the required pedal travel is the sum of the two movements:—

1. *The free movement*, or travel necessary to take up the clearance between the release bearing and the release lever plate, provided to ensure that the clutch is fully engaged when the foot is removed from the pedal.
2. *The effective movement*, or travel necessary to release the clutch, i.e. the amount of effective pedal movement necessary to move the release plate the distance required to free the clutch completely.

The pedal travel should be limited by the front and back stops of the clutch pedal, to the correct amount indicated. It is essential that these clearances be adhered to, to allow the clutch to be completely freed, and at the same time prevent the possibility of damage to the clutch bearing, due to over-travel.

If any difficulty is experienced in freeing the clutch when the correct release movement is provided, on no account should efforts be made to improve matters by attempting to increase the effective pedal travel.

E THE FLYWHEEL AND CLUTCH

The actual cause of the trouble must be ascertained and rectified.

The free pedal movement, measured at the pedal pad, should be $\frac{3}{4}$ in. (19 mm.), and the clearance between the stop on the clutch withdrawal lever and the stop on the flywheel housing should not be more than $\frac{1}{2}$ in. (13 mm.). (See "G," Fig. E.2, page E.4.)

To obtain a clean release, the release lever plate should move a distance of $\frac{5}{16}$ in. (7.9 mm.) towards the flywheel.

Spring pressure

A tolerance of not more than 10 to 15 lb. (4.5 to 6.8 kg.) pressure is allowable on the compression load of the operating springs when at their assembled height, and all clutch springs are tested for this before assembly.

The clutch operation springs are not affected by high clutch temperatures, as the pressure plate absorbs heat rapidly, the springs have only line contact, and a draught is continually passing under them when the engine is running.

Tolerances

Wear on the working faces of the driven plate is about .001 in. (.02 mm.) per 1,000 miles (1600 km.) under normal running conditions. The accuracy of the alignment of the face of the driven plate must be within .015 in. (.38 mm.).

Driven plates

It is important that the clutch facings are not touched with greasy hands, nor any oil or grease allowed to come into contact with them.

Lubrication of the splines of the driven plate is provided at assembly only, when CS881 graphite grease or zinc-based "Keenol" is used.

It is essential to install a complete driven plate assembly when renewal of the friction surfaces is required. If the facings have worn to such an extent as to warrant renewal, then slight wear will have taken place on the splines, and also on the torque reaction springs and their seatings. The question of balance and concentricity is also involved. Under no circumstances is it satisfactory to repair or rectify faults in clutch driven plate centres, and we do not countenance this as manufacturers.

Condition of clutch facings in service

It is natural to assume that a rough surface will give a higher frictional value against slipping than a polished one, but this is not necessarily correct. A roughened surface consists of small hills and dales, only the "high spots" of which make contact. As the amount of useful friction for the purpose of taking up the drive

is dependent upon the area in actual contact, it is obvious that a perfectly smooth face is required to transmit the maximum amount of power for a given surface area.

Since modern facing materials of the asbestos type have been introduced in service the polished surface is common, but it must not be confused with the glazed surface which is sometimes encountered due to conditions to be discussed subsequently. The ideally smooth or polished condition will therefore provide proper surface contact, but a glazed surface entirely alters the frictional value of the facing, and will result in excessive clutch slip. These two conditions might be simply illustrated by comparison between a piece of smoothly finished wood and one with a varnished surface; in the former the contact is made directly by the original material, whereas in the latter instance a film of dry varnish is interposed between the contact surfaces, and actual contact is made by the varnish.

If the clutch has been in use for some little time under satisfactory conditions, the surface of the facings assumes a high polish through which the nature of the material can be seen clearly. This polished facing is of light colour when in perfect condition.

Should oil in small quantities gain access to the clutch and find its way onto the facings, it will be burnt off as a result of the heat generated by the slipping occurring under normal starting conditions. The burning of this small quantity of lubricant has the effect of gradually darkening the facings, but provided the polish of the facing remains such that the nature of the material can be distinguished clearly it has little effect on clutch performance.

Should increased quantities of oil obtain access to the facings, then one of two conditions, or a combination of these, may arise, depending upon the nature of the oil.

1. The oil may burn off and leave a carbon deposit on the surface of the facings, which assume a high glaze, producing further slip. This is a very definite, though very thin, deposit, and in general it hides the grain of the material.
2. The oil may partially burn and leave a resinous deposit on the facings. This has a tendency to produce a fierce clutch, and may also cause excessive "spinning" due to the tendency of the face of the linings to adhere to the surface of the flywheel or pressure plate.
3. There may be a combination of conditions (1) and (2) which produces a tendency to "judder" on clutch engagement.

Still greater quantities of oil produce a dark and soaked appearance of the facings, and the result will be further slip, accompanied by fierceness or "juddering"

on engagement, according to the severity of the conditions.

If the conditions enumerated above are experienced, the clutch driven plate should be replaced by a new one. **The cause of the presence of the oil must be traced and removed.** It is, of course, necessary for the clutch and flywheel to be cleaned out thoroughly before assembly.

Where the graphite release bearing ring is badly worn in service, a complete replacement assembly should be fitted, returning the old assembly for salvage of the metal cup. These graphite rings are inserted into their metal cups by heating the metal cup to a cherry red, then forcing the graphite ring into position. This is a specialised job, but it can be carried out satisfactorily provided the necessary care is exercised. Immediately the ring is forced into

position, the whole should be quenched in oil. Alignment of the thrust pad in relation to its face and the trunnions should be within .005 in. (.12 mm.).

In almost every case of rapid wear on the splines of the clutch driven plate, misalignment is responsible.

Looseness of the driven plate on the splined shaft results in noticeable backlash in the clutch. Misalignment also puts undue stress on the driven member, and may result in the hub breaking loose from the plate, with consequent total failure of the clutch.

It may also be responsible for a fierce chattering or dragging of the clutch which makes gear changing difficult. In cases of persistent difficulty it is advisable to check the flywheel for truth with a dial indicator, to determine any possible misalignment. The dial reading should not vary more than .003 in. (.07 mm.) anywhere on the flywheel face.

Section E.9

INTRODUCTION OF 8 in. DIAMETER CLUTCH

Commencing at Engine No. 9408, an 8 in. diameter clutch has been introduced. This has been done to alleviate the synchro noise condition and to improve the torque carrying capacity.

The engine type description has been altered from XPAG/TD to XPAG/TD/2. This has been done for the reason that while the power unit with gearbox complete is interchangeable, neither the engine unit nor the gearbox unit separately is interchangeable with previous engines, because the clutch thrust race is in a different

position relative to the engine bell housing, and the clutch shaft and thrust face position is also different in the gearbox bell housing. This means that the old type XPAG/TD engine and the corresponding gearbox will have to continue to be serviced.

The XPAG/TD gearbox can be identified by the clutch fork shaft, which has a diameter of $\frac{5}{8}$ in. (15.9 mm.) and the Part No. SA.1906/9, whereas the XPAG/TD/2 has a clutch with a fork shaft having a diameter of $\frac{3}{4}$ in. (19 mm.) and the Part No. SA.1906/10.

Listed below are the parts affected by this change :—

Part No.	Replaced by	Description	No. Off
XPAG/TD	XPAG/TD/2	Engine and Gearbox Unit	1
SA.2445	SA.2445/1	Power Unit with Clutch, less Gearbox, Electrical Equipment, Carburetter and Manifolds	1
SA.1906/9	SA.1906/10	Gearbox complete	1
SA.2252/1	SA.2252/2	Flywheel with Starter Ring and Dowels	1
X.22418	168020	Starter Ring	1
X.24436	168124	Clutch Assembly	1
MG.900/14	SA.2239/4	Clutch Housing with Bush	1
MG.862/335	MG.660/104	Bush for Clutch Housing	2
MG.862/300	MG.795/146	Clutch Fork	1
MG.917/117	168023	Clutch Fork Shaft	1
MG.862/456	MG.795/145	Circlip	1
P.151/185	X.151/8	Key	1
MG.900/146	168021	Clutch Lever	1

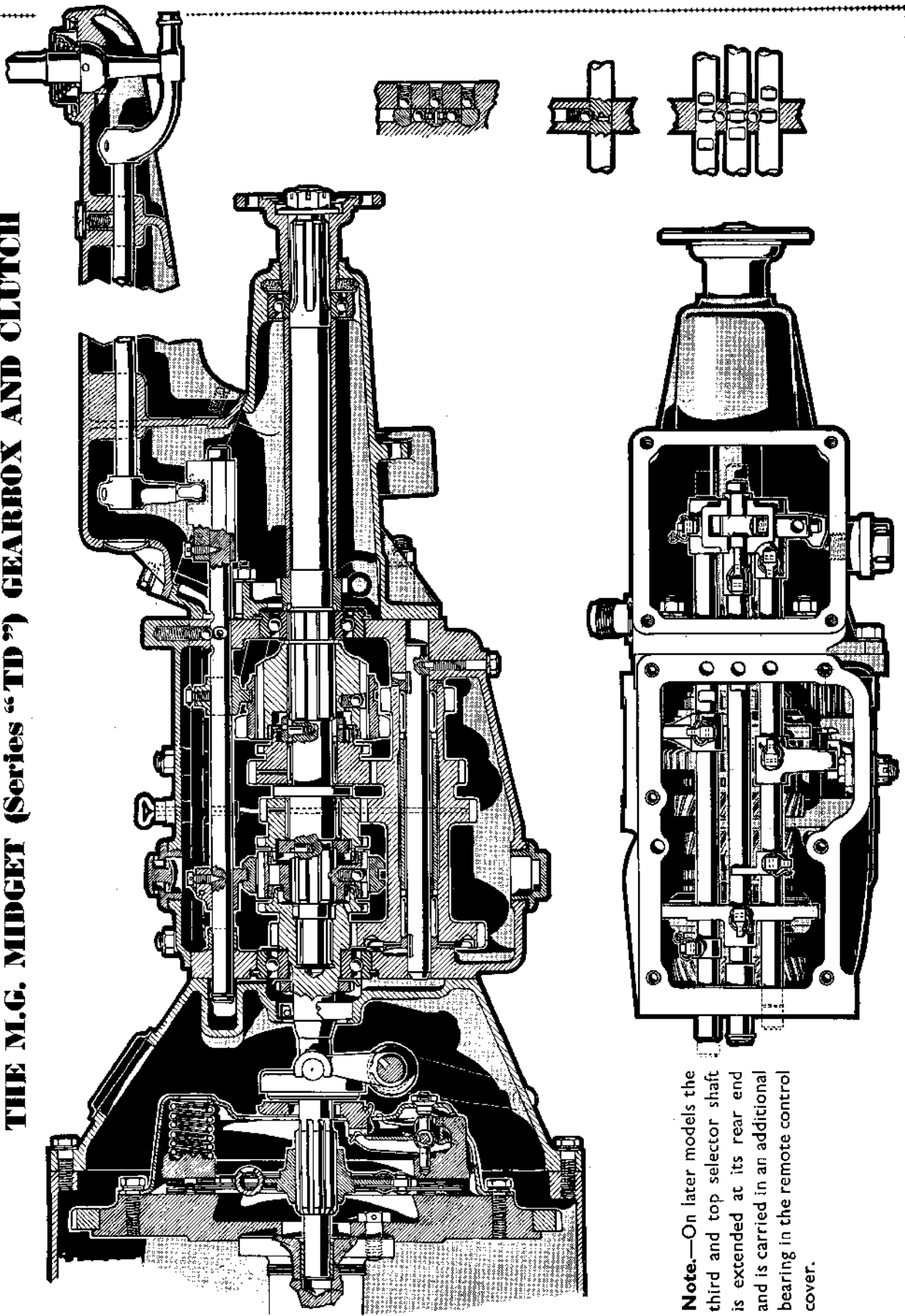
Section E.10

INTRODUCTION OF A CLUTCH CONTROL ROD

Commencing at Chassis No. TD22251, a clutch control rod has been fitted in place of a clutch cable.

On such cars the free pedal movement "G" (see Fig. E.2) must also be maintained at $\frac{3}{4}$ in. (19 mm.).

THE M.G. MIDGET (Series "TD") GEARBOX AND CLUTCH



Note.—On later models the third and top selector shaft is extended at its rear end and is carried in an additional bearing in the remote control cover.

SECTION F

THE GEARBOX

General Description.

Section No. F.1	To remove the gearbox with the engine in the chassis.
Section No. F.2	To dismantle the gearbox.
Section No. F.3	To dismantle the mainshaft.
Section No. F.4	Dismantling the synchromesh mechanism.
Section No. F.5	Reassembly of the synchromesh mechanism.
Section No. F.6	Modified synchromesh hub.
Section No. F.7	Speedometer drive modification.

GENERAL DESCRIPTION

The gearbox has four forward gears and one reverse gear.

Synchromesh is incorporated on second, third and fourth gears.

Top gear is obtained by direct drive, third and second through gears in constant mesh, and first and reverse by sliding gears. Reference to the facing page will show the method of engagement.

Section F.1

TO REMOVE THE GEARBOX WITH THE ENGINE IN THE CHASSIS

Remove the floor mats and take up the floorboards. Remove the gearbox cowl.

Disconnect the propeller shaft at its forward end, marking the flanges so that they can be replaced in the same relative position on reassembly.

Jack up the engine unit under the rear of the sump, using a large piece of wood between the jack and the sump to spread the load, and disconnect the speedometer drive at the gearbox end.

Disconnect the clutch operating lever from its connecting rod.

Release the rear engine unit mounting by removing the two nuts and bolts of the rubber mounting.

Undo all the retaining screws holding the bell housing to the crankcase and lift out the gearbox, taking care not to place any load on the drive gear shaft and clutch centre.

Section F.2

TO DISMANTLE THE GEARBOX

It will be found advantageous to support the gearbox in a vice by means of a piece of steel bar approximately $1\frac{1}{2}$ in. (40 mm.) square by 5 in. (127 mm.) long, this being suitably machined and threaded at



Fig. F.1.
The gearbox ready for removal.

one end to enable it to be screwed into the gearbox drain plug hole (see Fig. F.2).

Remove the dipstick and drain plug from the gearbox and drain off the oil.

Release the clutch housing from the gearbox by removing the fixing bolts and spring washers.

F THE GEARBOX

Extract the split pin from the nut retaining the drive flange at the rear of the gearbox sliding shaft and remove the nut and plain washer.

Remove the six nuts securing the top cover assembly to the gearbox and the four bolts and spring washers securing the remote control cover assembly to the gearbox extension.

Remove the three selector springs.

Using the extractor, Tool No. T.108 (Section Q), withdraw the propeller shaft driving flange. It is advisable to use an extractor of this type to avoid

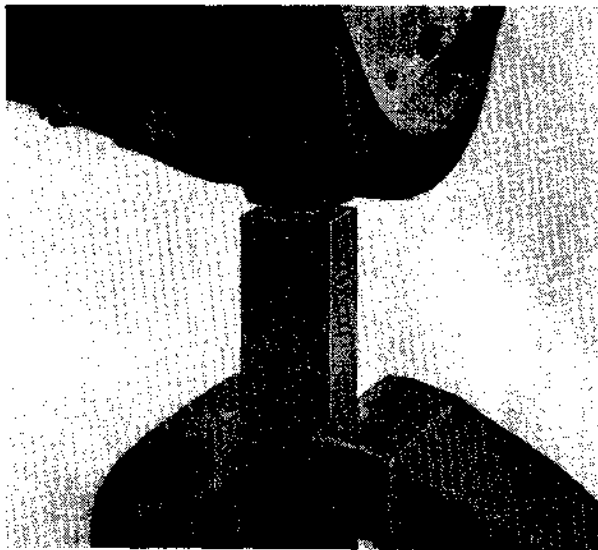


Fig. F.2.

A plug threaded into the drain plug hole is used to hold the gearbox in the vice.

distortion of the flange face. Before doing so, it is advisable to mark both the flange and the shaft so that they can be replaced in exactly the same position.

Detach the speedometer drive housing from the right-hand side of the gearbox. Care should be exercised not to damage the paper gasket on the joint face of the housing.

Extract the lock-wire from the eight square-headed screws locking the gear shifters and stops to the selector shafts and remove the screws.

Slacken the nuts and set bolts securing the gearbox rear casing to the gearbox and withdraw sufficiently to allow the gear shifters to be removed from the ends of the selector shafts.

Remove the nuts and set bolts completely and withdraw the gearbox rear casing from the gearbox.

On early type gearboxes withdraw the selector shafts one at a time, taking care not to lose the selector lock balls in the process. Later models have a third and top selector shaft extended at its front end and fitted with a circlip to prevent its accidental with-

drawal and the loss of the synchromesh balls. In this case the circlip must, of course, be removed before the shaft can be withdrawn. This also makes it imperative to remove the gearbox from the engine before dismantling. Now lift out the selector forks. Reference to page E.10 will show the interlocking mechanism of the shifter balls. Observe the correct position of the gear shifters and stops on the selector spindles as shown in the plan view of the shifters and shafts.

Remove the layshaft spindle locating screw from the rear of the gearbox.

Extract the layshaft spindle by tapping it at the forward end with a suitable copper or brass drift.

Remove the drive gear with its journal bearing by tapping the mainshaft towards the front of the gearbox, using a suitable copper drift.

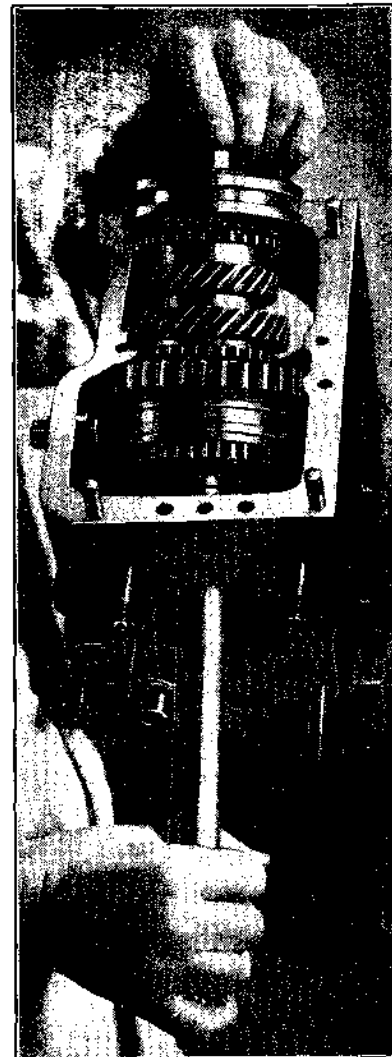


Fig. F.3.

Showing the method of withdrawing the gearbox mainshaft assembly.

Before the mainshaft can be removed it is necessary to extract the journal bearing from its housing, using a suitable drift for this purpose.

The mainshaft assembly can then be withdrawn from the gearbox as shown in Fig. F.3.

Extract the layshaft gear unit, observing that the tabs on the thrust pads line up with the slots cut in the boss at the front and rear walls of the gearbox.

care must be exercised not to lose the spring and plunger or the twenty-eight needle bearings. (See Fig. F.4.) And it must be noted that next to the second gear collar is a thrust washer, which is in two halves, having tongues which engage with slots in the forward face of the collar. It is important that this washer is correctly replaced on reassembly to centralise the collar.

Section F.3

TO DISMANTLE THE MAINSHAFT

Withdraw the top and third gear synchromesh hub from the forward end of the shaft, observing that the plain side of the hub goes to the rear of the gearbox.

Section F.4

DISMANTLING THE SYNCHROMESH MECHANISM

The striking dogs for top, third and second gears are retained on sliding hubs by balls and springs which

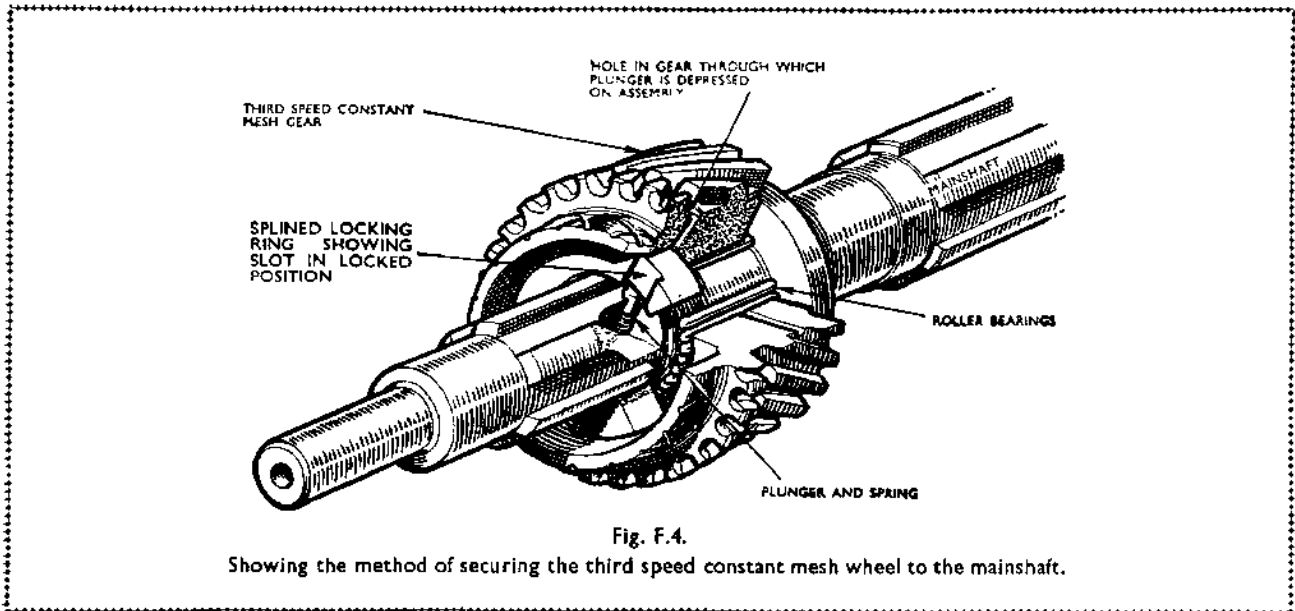


Fig. F.4. Showing the method of securing the third speed constant mesh wheel to the mainshaft.

Remove the third speed gear collar by pressing down the spring-loaded locking plunger and rotating the collar until the female splines register with the male splines on the mainshaft (see Fig. F.4).

The third gear can now be withdrawn.

Care must be exercised to prevent the loss of the plunger and spring or the thirty-two needle bearings on which the third gear is mounted.

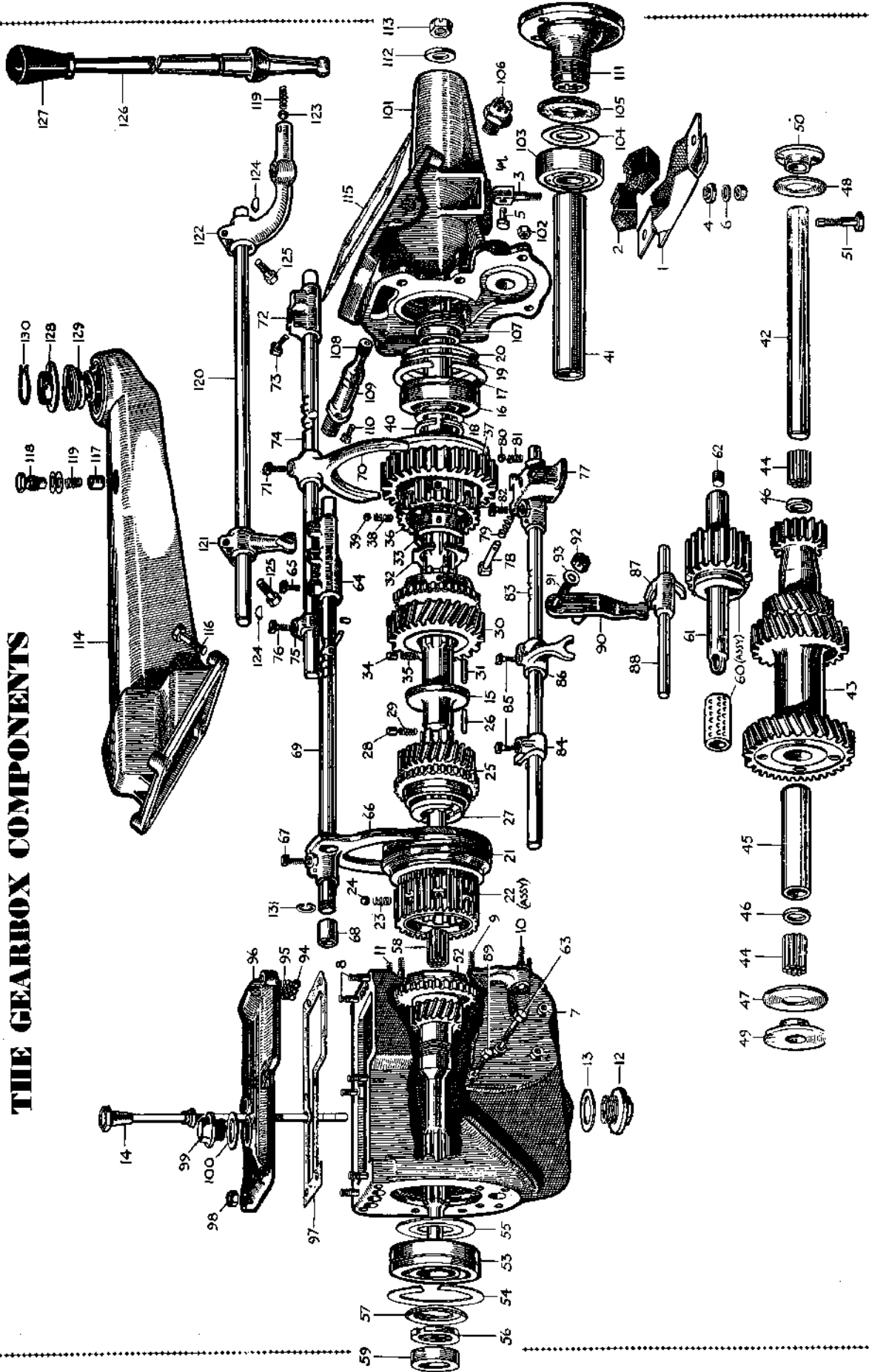
Extract the circlip from the rear end of the mainshaft and remove the first and second gear synchromesh hub ; the conical lining end of the hub faces to the front of the gearbox.

The withdrawal of the second gear from the mainshaft is executed in a similar manner to that for the third gear, namely by pressing down the locking plunger through the hole provided and rotating the collar until the two sets of splines coincide. Again,



Fig. F.5. Showing the spring-loaded locating plunger for the third gear.

THE GEARBOX COMPONENTS



KEY TO THE GEARBOX COMPONENTS

No.	Description	No.	Description
1.	Rear engine bearer bracket.	89.	Locating screw—shaft.
2.	Support rubber.	90.	Reverse link assembly.
3.	Fork end.	91.	Fulcrum pin—link.
4.	Engine rebound rubber.	92.	Nut—fulcrum pin.
5.	Clevis pin—fork end.	93.	Washer—fulcrum pin.
6.	Washer.	94.	Ball—shaft.
7.	Gearbox casing (with studs).	95.	Spring—shifter shaft.
8.	Stud—gearbox top cover.	96.	Gearbox cover.
9.	Stud—speedometer casing (medium).	97.	Gasket—cover.
10.	Stud—speedometer casing (long).	98.	Nut—cover.
11.	Stud—speedometer casing (short).	99.	Filler plug—gearbox.
12.	Plug—oil drain.	100.	Washer for plug.
13.	Washer—drain plug.	101.	Rear casing.
14.	Oil level indicator.	102.	Nut—rear casing.
15.	Mainshaft.	103.	Ball bearing.
16.	Mainshaft bearing.	104.	Guard.
17.	Circlip—mainshaft bearing.	105.	Oil retaining washer.
18.	Guard—bearing—first motion shaft.	106.	Hole plug—reverse light.
19.	Plate—guard.	107.	Speedometer gear.
20.	Spring plate—guard.	108.	Speedometer pinion and shaft.
21.	Striking dog.	109.	Bearing—pinion.
22.	Sliding hub assembly (top and third).	110.	Screw—pinion bearing.
23.	Spring—sliding hub.	111.	Flange—universal joint.
24.	Ball—sliding hub.	112.	Washer—flange nut.
25.	Third speed gear.	113.	Nut—flange to mainshaft.
26.	Rollers—third speed gear.	114.	Remote control cover.
27.	Collar—third speed gear.	115.	Gasket—cover.
28.	Plunger—third speed gear.	116.	Cover bolt—to rear casing.
29.	Spring—plunger.	117.	Housing cover plunger.
30.	Second speed gear.	118.	Plug—operating shaft.
31.	Rollers—second speed gear.	119.	Spring—operating shaft.
32.	Washer—second speed gear.	120.	Remote control shaft.
33.	Collar—second speed gear.	121.	Selector lever (front).
34.	Plunger—second speed gear.	122.	Selector lever (rear).
35.	Spring—plunger.	123.	Ball—lever.
36.	Sliding hub (first and second).	124.	Key—actuating shaft and selector levers.
37.	First speed gear.	125.	Bolt—actuating shaft and selector levers.
38.	Spring—first speed gear.	126.	Change speed lever.
39.	Ball—first speed gear.	127.	Knob—change speed lever.
40.	Circlip.	128.	Cover—lever.
41.	Distance-piece.	129.	Spring—anti-rattle change speed lever.
42.	Layshaft.	130.	Circlip—cover.
43.	Gear unit—layshaft.	131.	Circlip—shaft—third and top.
44.	Rollers—layshaft gear unit.		
45.	Spacer—layshaft gear unit.		
46.	Washer—layshaft.		
47.	Thrust washer—front.		
48.	Thrust washer—rear.		
49.	Bearing plate—front.		
50.	Bearing plate—rear.		
51.	Screw—layshaft.		
52.	First motion shaft.		
53.	Bearing—first motion shaft.		
54.	Circlip—first motion shaft.		
55.	Guard—bearing (first motion shaft).		
56.	Nut—first motion shaft bearing.		
57.	Lock washer—bearing.		
58.	Spigot bearing rollers.		
59.	Oil seal—first motion shaft.		
60.	Reverse gear (with bush).		
61.	Shaft—reverse gear.		
62.	Plug—reverse shaft.		
63.	Screw—reverse shaft.		
64.	Top and third gear selector.		
65.	Locating screw—selector.		
66.	Top and third gear shifter.		
67.	Locating screw—shifter.		
68.	Distance tube—top and third.		
69.	Shaft—top and third shifter.		
70.	First and second gear shifter.		
71.	Locating screw.		
72.	First and second gear selector.		
73.	Locating screw.		
74.	Shaft—first and second shifter.		
75.	Stop—shaft.		
76.	Locating screw—stop.		
77.	Reverse gear selector.		
78.	Plunger—reverse gear selector.		
79.	Spring—plunger.		
80.	Ball—reverse plunger.		
81.	Spring—ball.		
82.	Locating screw.		
83.	Shaft—reverse selector.		
84.	Steady—reverse selector shaft.		
85.	Locating screw—steady.		
86.	Gear shifter—reverse selector shaft.		
87.	Gear shifter—reverse gear.		
88.	Shaft—reverse gear shifter.		

F THE GEARBOX

are housed within the sliding hubs and register with a central groove in the internally cut teeth of the striking dogs. Each sliding hub, therefore, can be pushed out from its striking dog when sufficient effort is applied to overcome the springs.

The ball housing openings are peened over to retain the balls in position and prevent their loss.

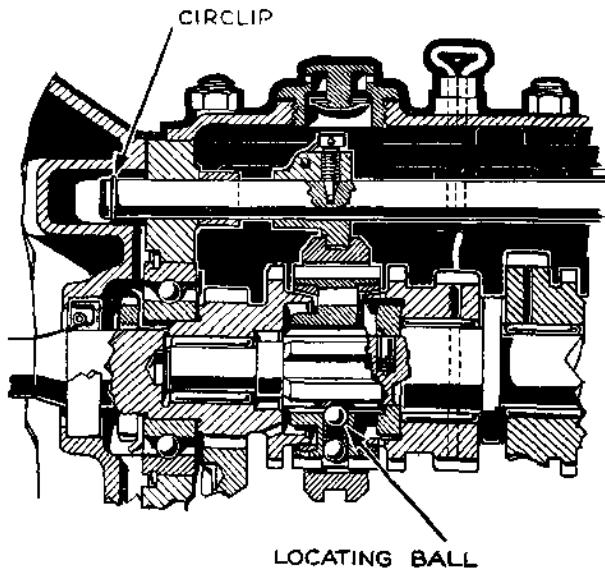


Fig. F.6.

This part section of the gearbox indicates the lengthened third speed shifter shaft and its retaining circlip and the location of the additional locating ball in the synchromesh sliding hub.

Section F.5

REASSEMBLY OF THE SYNCHROMESH MECHANISM

The striking dog is placed against the end of the sliding hub and pushed through into engagement with it, when the balls will spring into an indentation ground in the centre of the teeth and the assembly is completed.

Reassembly of gearbox

The reassembly of the gearbox, mainshaft, etc., is carried out in the reverse manner to that detailed for dismantling, but care must be taken when fitting the layshaft to see that the tags on the thrust washers at each end fit into the grooves in the bosses in the gearbox.

Note.—For easy assembly of the layshaft with its bearings, it is recommended that a dummy shaft $\frac{1}{16}$ in. diameter by $6\frac{1}{8}$ in. long (14.29 mm. diameter by 161.13 mm. long) be used.

Care must also be taken in the case of the later boxes to replace the circlip on the forward end of the third and top selector shaft.

Cases have been found of the balls and springs being ejected from the top and third synchro hub due to discrepancies in the position of the third speed shifter shaft stop on the gear change cover. To overcome this (and also the possibility of the third gear being inadvertently moved beyond its position when the gear change extension cover is removed) a new shifter shaft is being fitted with a circlip which gives a positive stop for third gear under all conditions.

Section F.6

MODIFIED SYNCHROMESH HUB

To further ensure that the synchro balls and springs do not become released, each ball is now being peened into the synchro hub (each with two square-ended depressions at the end of each ball hole around the hub); also a modified top and third striking dog, which is tapered internally each end, is now fitted to maintain the synchro hub in the correct position.

The following parts (for Service purposes) are deleted:—

		No. Off
24245	Striking Dog (Top and 3rd)	1
SA.2435	Sliding Hub (Top and 3rd), with Sliding Cones	1
	Comprising:—	
24246	Sliding Hub	1
24247	Cone for Sliding Hub	2
SA.2402/2	Shifter Shaft Assembly (Top and 3rd)	1
	Comprising:—	
24367	Shaft	1
3648	Pin for Shaft	1
3649	Rivet for Shaft	1

and replaced (for Service modification only) by:—

SA.2435/1	Sliding Hub (Top and 3rd), with Sliding Cones	1
	Comprising:—	
24246	Sliding Hub	1
24247	Cone for Sliding Hub	2
24248	Spring for Sliding Hub	6
1279	Ball for Sliding Hub	6
SA.2402/3	Shifter Shaft Assembly (Top and 3rd)	1
	Comprising:—	
24457	Shaft	1
24377	Circlip	1
3648	Pin for Shaft	1
3649	Rivet for Shaft	1
24465	Striking Dog (Top and 3rd)	1

Gearbox (Production Modifications)

Commencing Gearbox No. TF.939 for Series "TD" Midget.

The new shifter shaft is being fitted with a circlip which gives a positive stop for third gear under all conditions.

The following parts are deleted:—

		No. Off
SA.2402/2	Shifter Shaft Assembly (Top and 3rd)	1
	Comprising:—	
24367	Shaft	1
3648	Pin for Shaft	1
3649	Rivet for Shaft	1

and replaced by :—

	No. Off
SA.2402/3 Shifter Shaft Assembly (Top and 3rd)	1
Comprising :—	
24457 Shaft	1
24377 Circlip	1
3648 Pin for Shaft	1
3649 Rivet for Shaft	1

Commencing at Engine No. 3114 and Gearbox No. TF.513 for Series "TD" Midget. The existing arrangement of synchro balls were peened into the synchro hub to prevent ejection.

The following parts are deleted :—

	No. Off
SA.2435 Sliding Hub (Top and 3rd), with Sliding Cones	1
Comprising :—	
24246 Sliding Hub	1
24247 Cone for Sliding Hub	2

and replaced by :—

SA.2435/1 Sliding Hub (Top and 3rd), with Sliding Cones	1
Comprising :—	
24246 Sliding Hub	1
24247 Cone for Sliding Hub	2
24248 Spring for Sliding Hub	6
1279 Ball for Sliding Hub	6

Commencing Gearbox No. TJ.800 and Engine No. XPAG/TD/6533 for Series "TD" Midget and Gearbox No. SH.335, Engine No. XPAG/SC/16431 for Series "Y" 1½ Litre.

To positively maintain the top and third synchro hub in the correct position one of the spring holes has been bored right through and an additional ball added. This ball locates in an indent in the gearbox mainshaft.

The following parts are deleted :—

	No. Off
SA.2435/1 Sliding Hub (Top and 3rd), with Sliding Cones	1
Comprising :—	
24246 Sliding Hub	1
24247 Cone for Sliding Hub	2

24248 Spring for Sliding Hub	6
1279 Ball for Sliding Hub	6
24151 Gearbox Mainshaft	1

and replaced by :—

SA.2435/2 Sliding Hub (Top and 3rd), with Sliding Cones	1
Comprising :—	
24466 Sliding Hub	1
24247 Cone for Sliding Hub	2
24248 Spring for Sliding Hub	6
1279 Ball for Sliding Hub	7
24467 Gearbox Mainshaft	1

Section F.7

SPEEDOMETER DRIVE MODIFICATION

Starting at Gearbox No. TW396 the speedometer gear is keyed to the gearbox mainshaft to provide a more positive drive.

Care must therefore be taken when dismantling not to lose the key and to make sure that it is in position on reassembly.

New Part Nos. have been allocated to the modified parts as follows :—

Mainshaft (Part No. 168209).

Speedometer gear (Part No. 168210).

Speedometer gear key (Part No. X20139).

Part No. 168209 can be used to service the earlier mainshafts to Part No. X24467, and the speedometer gear (Part No. 168210) can be used to service gears to Part No. MG900/231 by omitting the key.

SECTION G

THE PROPELLER SHAFT

General Description.

Section No. G.1	Attention to the universal joints.
Section No. G.2	Testing for wear. (In position.)
Section No. G.3	Removal of the propeller shaft.
Section No. G.4	Dismantling the propeller shaft.
Section No. G.5	To examine and check for wear.
Section No. G.6	Reassembling the propeller shaft.
Section No. G.7	Replacement of the propeller shaft.

GENERAL DESCRIPTION

The propeller shaft and universal joints are of the Hardy Spicer type with needle roller bearings.

A single shaft connects the rear axle and the gearbox.

To accommodate fore and aft movement of the axle, the shaft is provided with a splined sliding joint at the front end. Each universal joint consists of a centre spider, four needle roller bearing assemblies, and two yokes.

Section G.1

ATTENTION TO UNIVERSAL JOINTS

The propeller shaft has a lubricator fitted to the front and rear spiders which should be given three or four strokes with the grease gun every 1,000 miles (1600 km.). The correct lubricant is grease to Ref. D (page P.2).

If a large amount of grease exudes from the oil seal the joint should be dismantled and new oil seals fitted.

A lubricator is also provided on the sleeve yoke for the lubrication of the splines of the sliding joint. Lubrication in service is with grease to Ref. D (page P.2) every 1,000 miles (1600 km.). After dismantling, and before reassembling, the inside splines of the sleeve yoke should be smeared liberally with grease.

There are, therefore, three lubricators in all on the propeller shaft, one on each universal joint and one on the sliding joint.

Section G.2

TESTING FOR WEAR

(In Position)

Wear on the thrust faces is ascertained by testing the lift in the joint, either by hand or with the aid of a length of wood, suitably pivoted.

Any circumferential movement of the shaft relative to the flange yokes indicates wear in the needle roller bearings or in the splined shaft.

Section G.3

REMOVAL OF THE PROPELLER SHAFT

Before removing the bolts and nuts securing the propeller shaft universal joint flanges to the gearbox flange and the rear axle flange, carefully mark the flanges to assist in refitting them in their original positions. **This is important.**

Remove the bolts and nuts securing the propeller shaft to the gearbox flange and carefully support it while removing the bolts and nuts securing the shaft to the rear axle flange. The shaft can now be removed from the car downwards and rearwards. Note that the flange bolt nuts are of the self-locking type.

G THE PROPELLER SHAFT

Section G.4

DISMANTLING THE PROPELLER SHAFT

Unscrew the dust cap at the rear end of the sliding joint and pull the joint off the splined shaft. Remove the enamel and dirt from the snap rings and bearing races. Remove all the snap rings by pinching their ears together with a pair of thin-nosed pliers and prising them out with a screwdriver.

If a ring does not slide out of its groove readily, tap the end of the bearing race slightly to relieve the pressure against the ring. Holding the joint in one hand with the splined sleeve yoke on the top, tap the radius of the yoke lightly with a copper hammer. The bearing should begin to emerge; turn the joint over

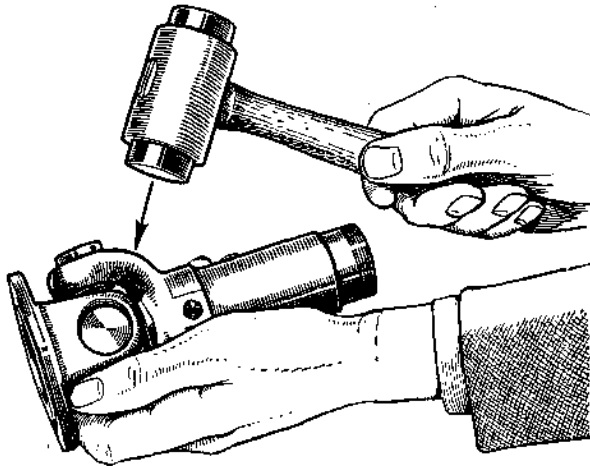


Fig. G.1.

Where to apply light blows to the yoke in the first stage of dismantling the universal joint after removing the retaining circlip.

and finally remove the bearing with the fingers. If necessary, tap the bearing race from inside with a small-diameter bar, taking care not to damage the bearing face, or grip the needle bearing race in a vice and tap the flange yoke clear.

Be sure to hold the bearing in a vertical position, and when free remove the race from the bottom side to avoid dropping the needle rollers.

Repeat this operation for the opposite bearing.

The splined sleeve yoke can now be removed. Rest the two exposed trunnions on wood or lead blocks to protect their ground surfaces, and tap the top lug of the flange yoke to remove the bearing race.

Turn the yoke over and repeat the operation.

G.2

Section G.5

TO EXAMINE AND CHECK FOR WEAR

The parts most likely to show signs of wear after long usage are the bearing races and the spider journals. Should looseness, load markings, or distortion

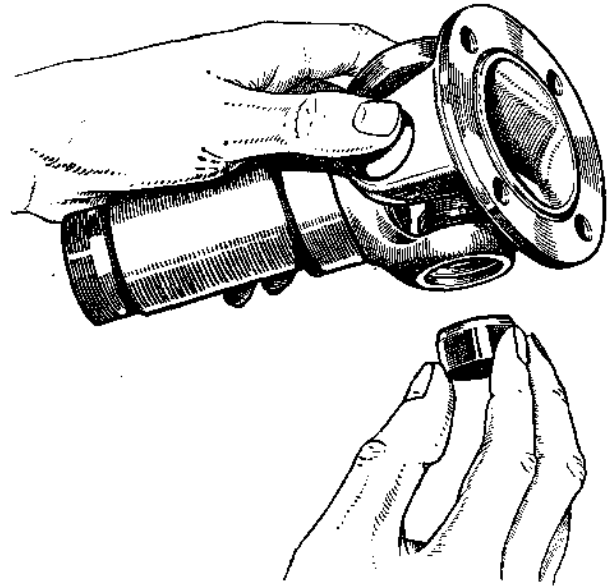


Fig. G.2.

Showing the manner of withdrawing the needle bearing after it has been partly withdrawn. When bearings are removed or replaced they should be held vertically to prevent the needle bearings from being displaced.

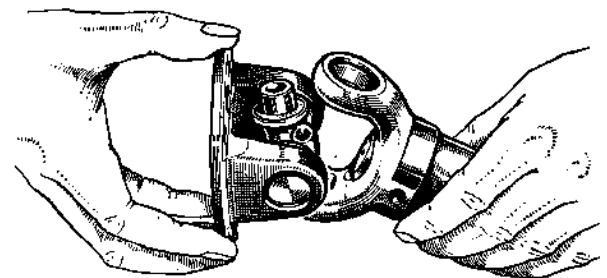


Fig. G.3.

When the needle roller bearings have been withdrawn from opposite sides of the spider the joint can be separated as shown.

be observed, the affected part must be renewed complete, since no oversized journals or bearing races are provided.

It is essential that the bearing races are a light drive fit in the yoke trunnions. In the event of wear taking

place in the yoke cross-holes, rendering them oval, the yokes must be renewed. In case of wear in the cross-holes in the fixed yoke, which is part of the tubular shaft assembly, it should normally be replaced by a complete tubular shaft assembly. Only in the case of emergency should any attempt be made to renew this yoke.

Section G.6

REASSEMBLING THE PROPELLER SHAFT

See that all the drilled holes in the journals are thoroughly cleaned out and free from grease. Assemble the needle rollers in the bearing races and

in diameter than the hole in the yoke, tap the bearing into position. It is essential that the bearing races are a light drive fit in the yoke trunnions. Repeat this operation for the other three bearings. Replace the circlips and be sure that these are firmly located in their grooves. If the joint appears to bind, tap lightly

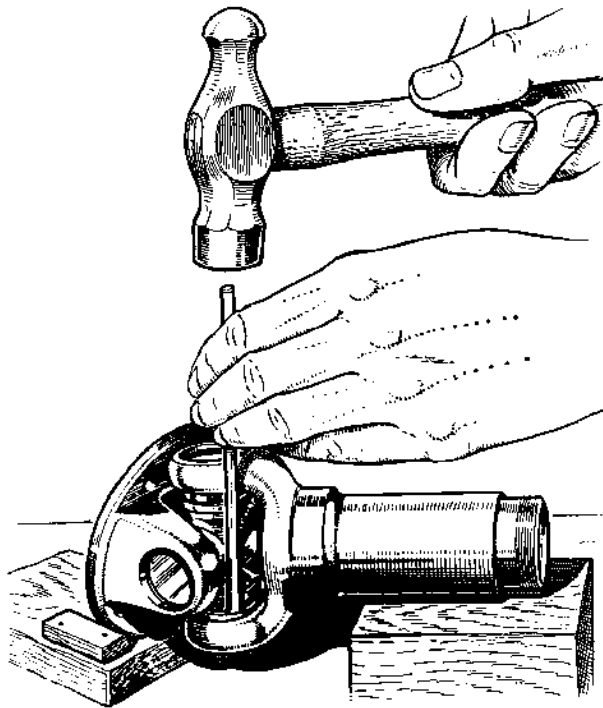


Fig. G.4.

When dismantling the universal joint it is permissible to tap out the bearings with a small-diameter rod from the inside as shown, provided care is taken not to damage the roller race.

fill with grease. Should difficulty be experienced in retaining the rollers under control, smear the walls of the races with petroleum jelly to retain the needle rollers in position while assembling.

Insert the spider in the flange yoke, ensuring that **the lubricator boss is fitted away from the yoke.** Using a soft-nosed drift, about $\frac{1}{32}$ in. (.8 mm.) smaller

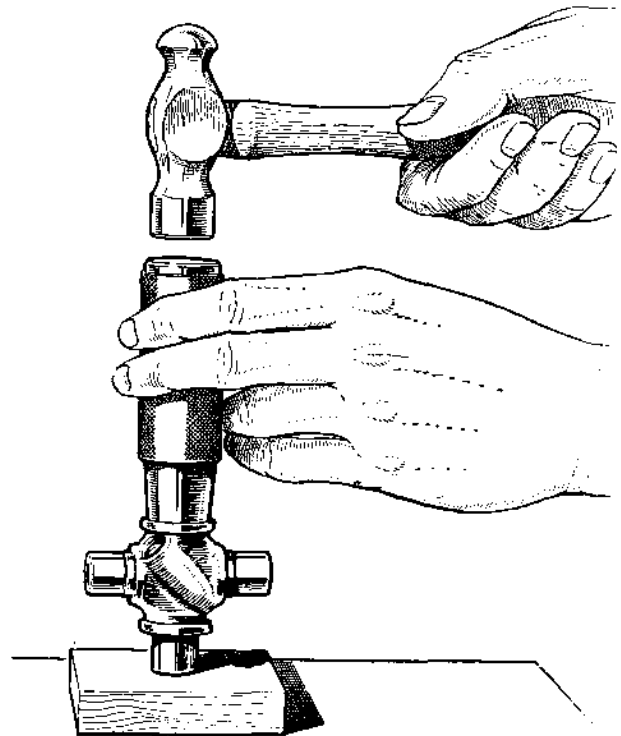


Fig. G.5.

When replacing the gasket retainer, use should be made of a hollow drift to tap it into place without damage.

with a wooden mallet; this will relieve any pressure of the bearings on the end of the journals. Before replacing the sliding joint on the shaft, thread onto the splined shaft the dust cover, the steel washer and the felt washer. When assembling the sliding joint be sure that the trunnions in the sliding and fixed joints are in line. That is to say, the axis of the forked yoke "A" must be parallel to that of the forked yoke "B" and the axis of forked yoke "C" must be parallel to the axis of forked yoke "D" as shown in Fig. G.6. This can be checked by observing that the arrows marked on the splined sleeve yoke and the splined shaft are in line.

It is always advisable to replace the cork gasket and the gasket retainers on the spider journals by means of the tubular drift shown in Fig. G.5. The spider journal shoulders should be shellacked prior to fitting the retainers, to ensure a good oil seal.

G THE PROPELLER SHAFT

Section G.7

REPLACEMENT OF THE PROPELLER SHAFT

Wipe the faces of the flanges clean, and place the propeller shaft in position on the car. Ensure that

the flange registers engage correctly and that the joint faces bed down evenly all round, also that the markings, made on the flanges on removal, coincide. Insert the bolts and see that all the nuts, which are of the self-locking type, are evenly and securely tightened. The sliding joint is always placed at the gearbox end.

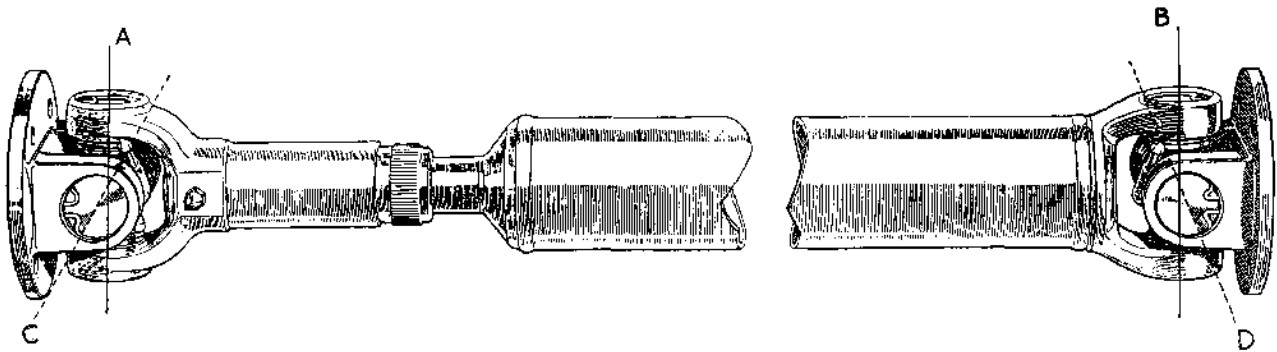


Fig. G.6.

The correct method of assembling the universal joints.

When the splined shaft is assembled to the drive shaft it is essential to see that the forked yokes on both shafts have their axes parallel to each other. In other words, the yoke (A) must be in alignment with the yoke (B), and the flange yoke (C) must be in alignment with the flange yoke (D).

Note.—On later models the thread of the grease nipples has been changed from $\frac{1}{8}$ in. B.S.P. to $\frac{1}{4}$ in. A.N.F. Care must therefore be taken to ensure that correct replacement nipples are fitted if the occasion for their renewal arises.

SECTION H

THE REAR AXLE

General Description.

Lubrication.

- Section No. H.1 Removing and replacing brake-drum and hub.
- Section No. H.2 Removal and replacement of brake plate assembly.
- Section No. H.3 Removing and replacing rear axle half-shafts.
- Section No. H.4 Removing the rear axle from car.
- Section No. H.5 Important points concerning axle attention.
- Section No. H.6 Dismantling the axle and removing the differential assembly.
- Section No. H.7 Dismantling the differential and crown wheel assembly.
- Section No. H.8 Examining parts for wear.
- Section No. H.9 To replace a differential cage.
- Section No. H.10 Assembling the differential and crown wheel.
- Section No. H.11 To replace a pinion.
- Section No. H.12 To fit a new axle casing.
- Section No. H.13 To fit a new axle housing cover.
- Section No. H.14 To replace a crown wheel and pinion having markings different from the original.
- Section No. H.15 Reassembling the axle.
- Section No. H.16 Refitting the rear axle.
- Section No. H.17 Identification of "Unified" screw threads.

GENERAL DESCRIPTION

The rear axle is of the semi-floating type. It is of unit construction, and no repairs or adjustments apart from those connected with the half-shafts and rear wheel bearings, brake-drums and shoe mechanism can be carried out without removing the complete axle unit from the car.

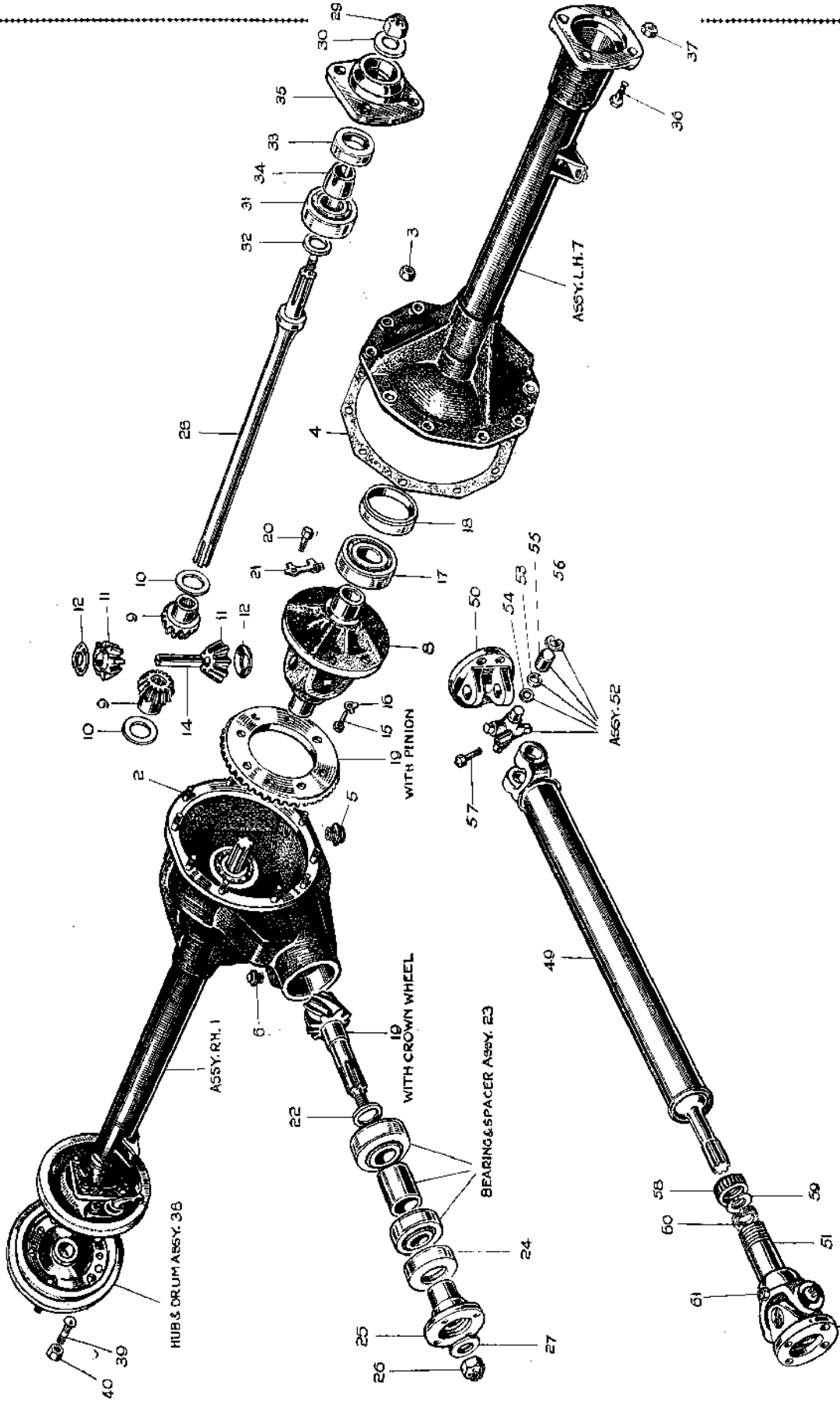
The rear wheel bearing outer races are carried in an extension of the rear axle casing and the inner races bear directly on the axle half-shafts. The wheel hubs are attached to the axle shafts by splines and a tapered split collar.

Contrary to previous M.G. practice, the axle half-shafts can only be withdrawn after removing the wheel, wheel hub and brake-drum, brake back plate assembly and the wheel bearing housing.

The brake-drums are of cast iron integral with the hub or permanently attached to the wheel hub flanges by countersunk-headed screws, **which must not be disturbed.**

Hypoid-type final reduction gears are used and the axle housing is divided close to its centre for assembly purposes, the pinion assembly being mounted in the right-hand half or axle casing.

THE REAR AXLE AND PROPELLER SHAFT COMPONENTS (Series "TD")



KEY TO THE REAR AXLE AND PROPELLER SHAFT COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Axle tube assembly—R/H.	20.	Bolt—crown wheel.	37.	Nut— $\frac{3}{8}$ in. B.S.F. (Phillidas).
2.	Stud—cover.	21.	Locking tab—crown wheel bolt.	38.	Hub and brake-drum assembly.
3.	Nut—axle cover stud.	22.	Distance washer—pinion—rear.	39.	Wheel stud.
4.	Joint.	23.	Bearing and spacer assembly.	40.	Nut—wheel stud.
5.	Drain plug.	24.	Oil seal—pinion—front.	49.	Tubular shaft assembly.
6.	Oil filler plug.	25.	Flange—universal joint.	50.	Flange yoke.
7.	Axle tube assembly—L/H.	26.	Castle nut—pinion.	51.	Sleeve yoke assembly.
8.	Cage—differential.	27.	Washer—castle nut.	52.	Journal assembly less greaser.
9.	Gear—differential.	28.	Rear axle shaft.	53.	Gasket—journal.
10.	Washer—gear.	29.	Nut—axle shaft.	54.	Retainer—gasket.
11.	Pinion—differential.	30.	Washer—axle shaft nut.	55.	Needle bearing assembly.
12.	Washer—pinion.	31.	Bearing—rear hub.	56.	Snap ring.
14.	Pin—pinion.	32.	Distance washer—hub bearing.	57.	Grease nipple.
15.	Locking bolt—pinion pin.	33.	Oil seal—hub.	58.	Dust cap.
16.	Tab washer—locking bolt.	34.	Collar—oil seal.	59.	Steel washer.
17.	Bearing—differential.	35.	Support—brake plate.	60.	Cork washer.
18.	Distance collar—bearing.	36.	Bolt for support.	61.	Grease nipple.
19.	Crown wheel and pinion.				

H THE REAR AXLE

The bearings of the differential and crown wheel assembly are carried in recesses machined in the axle casing and cover, which are bolted together, and, since no inspection apertures are provided, all adjustments have to be carried out by pre-measurement in conjunction with special gauges.

Adjustment of the position of both the crown wheel and the pinion in the axle is effected by distance-pieces, which are selected on initial assembly, and there is no other provision for adjustments. The crown wheel and pinions are only supplied in pairs as heretofore.

The use of Hypoid gears enables a much larger pinion to be used, providing more silent running and a greatly increased life.

The rear brake gear is of the normal two-shoe type, operated hydraulically from the brake pedal and also mechanically by hand-operated mechanism actuating

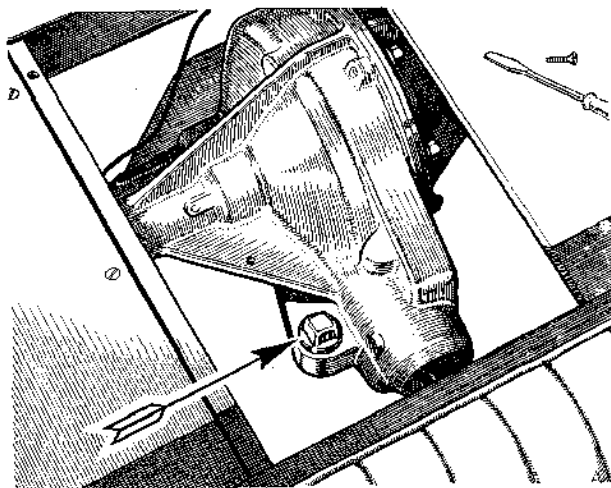


Fig. H.1.

Access to the rear axle oil filler is achieved through the opening behind the rear seat exposed when the floor is lifted.

the same shoes. The operating cylinder for the shoes is mounted vertically on the brake plates and acts directly on the brake-shoes.

Adjustment is by means of a serrated snail cam with screwdriver operation through holes in the brake-drum disc.

Suspension is by means of semi-elliptic leaf springs with rubber interleaving and rubber mounting. The shackles and the spring anchorage are both fitted with flexing rubber bushes needing no lubrication.

LUBRICATION

Oil is introduced to the axle through a filler plug on the right-hand side of the pinion housing. When replenishing or refilling, the level of the oil should not be raised above the lip of the filling aperture.

H.4

It is of the utmost importance that only **HYPOID** oils of the approved grades and manufacture be employed if satisfactory service is to be obtained from the Hypoid gears.

Inspect the oil level every 1,000 miles (1600 km.) and replenish if necessary to the level of the filler opening with one of the Hypoid oils recommended on page P.2.

After the first 500 miles (800 km.) and subsequently every 6,000 miles (10000 km.) drain off the old oil and refill with new.

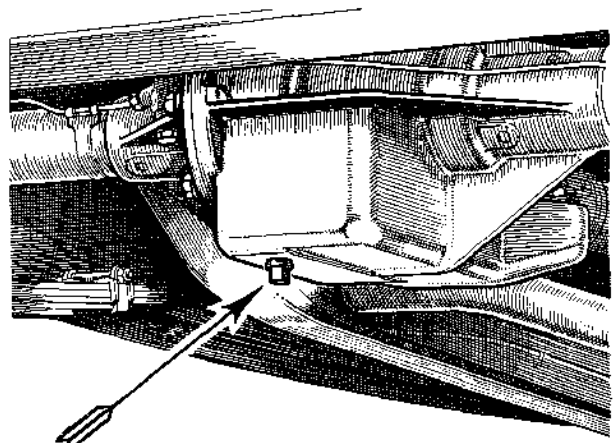


Fig. H.2.

The rear axle drain plug is situated in the base of the axle casing.

The drain plug is underneath the rear end of the axle casing. The capacity of the axle is $2\frac{1}{4}$ pints (1.3 litres).

Lubrication of the rear hub bearings is achieved automatically from the main oil supply and no provision is made for any other attention.

Section H.1

REMOVING AND REPLACING THE BRAKE-DRUM AND HUB

The brake-drums are permanently attached to the wheel hubs by countersunk-headed screws, the inner ends of which are riveted over. **These screws should not be disturbed, and if it is necessary to fit a new drum or hub a complete assembly should be used as the hubs and brake-drums are machined after assembly.** On some models the hub and drum are made in one piece.

Jack up the axle so that the wheel to be operated on is clear of the ground and place chocks on either side of the wheels remaining on the ground. **Release the hand brake fully—THIS IS IMPORTANT.**

Remove the road wheel by prising off the hub cover with the flat on the end of the wheel nut spanner, giving the spanner a sideways motion and **not** a radial one. The spanner end should be inserted in the depressions provided adjacent to the studs holding the cover.

Unscrew the wheel stud nuts and withdraw wheel.

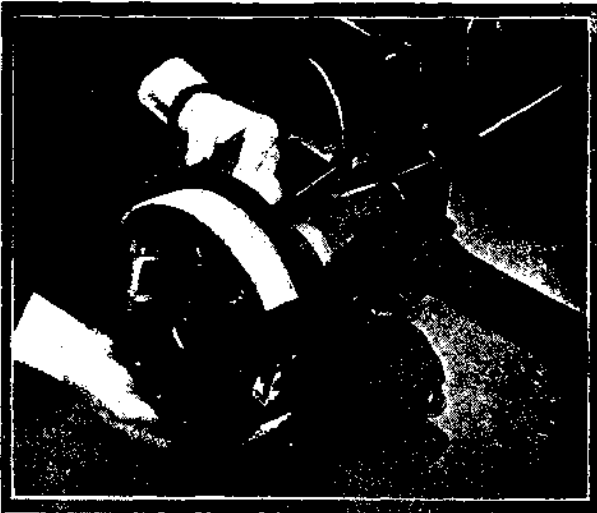
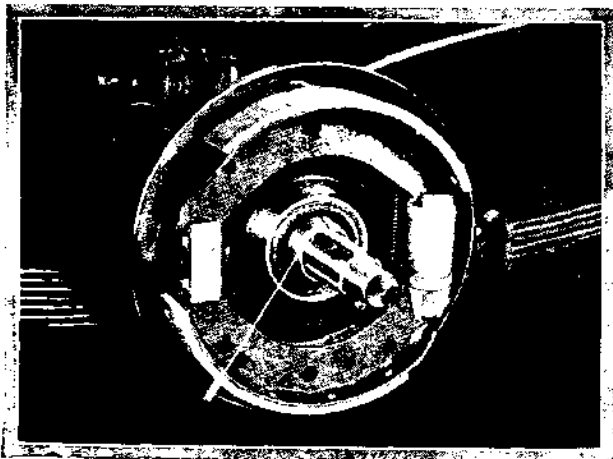


Fig. H.3.

Removing the brake plate assembly from the axle casing flange.

Remove the split pin from the axle nut and unscrew the nut with a set spanner. The axle half-shafts are threaded right-handed on both sides of the car and are therefore interchangeable.



The wheel hub is locked to the axle half-shaft by means of a tapered split collar in addition to the driving splines. It is therefore to be expected that some resistance will be evident when the extractor is used to free the hub from the taper.

When replacing the rear hub it is essential to make quite sure that the tapered split collar is right home against the inner race of the wheel bearing before any attempt is made to offer up the hub. It is, in fact, advisable to tap the collar lightly into position with a hide hammer, taking the utmost care not to damage it in any way. It is also essential to see that the parallel portion of the collar engaging the oil seal is absolutely free from blemishes before it is replaced and that the oil seal is not damaged in any way.

Section H.2

REMOVAL AND REPLACEMENT OF THE BRAKE PLATE ASSEMBLY

Jack up the axle and remove the wheel as in Section H.1.

See that the hand brake is fully released.

Remove the hub as in Section H.1.

If it is required to remove the brake plate assembly to the bench for attention, the Lockheed pipe should be disconnected, but this is not recommended unless absolutely necessary as it entails bleeding the brakes.

The brake plate assembly is attached to the axle flange by four bolts with the nuts fitted on the inner side of the flange. Removal of the nuts enables the bolts to be withdrawn and the brake plate assembly to be removed.

Fig. H.4.

When refitting the rear hubs it is absolutely essential to make sure that the split tapered collar is right home against the ball race.

Reassembly takes place in the reverse order to dismantling, and it is essential to make sure that the retaining nuts are screwed up tight.

Do not forget to bleed the brakes if the pipeline has been disconnected.

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Section H.3

REMOVING AND REPLACING A REAR AXLE HALF-SHAFT

Jack up the axle as outlined in Section H.1, or raise the rear of the car with a sling attached to the bumper supports.

Remove the wheel as in Section H.1.

See that the hand brake is fully released.

Remove the hub and brake-drum assembly as in Section H.1.

Remove the brake plate and shoe assembly as in Section H.2.

Withdraw the split collar from the axle half-shaft.

Fit the special tool (Part No. 68823) to the end of the axle shaft and, using the sliding impact weight, release the shaft complete with bearing, housing and oil seal.

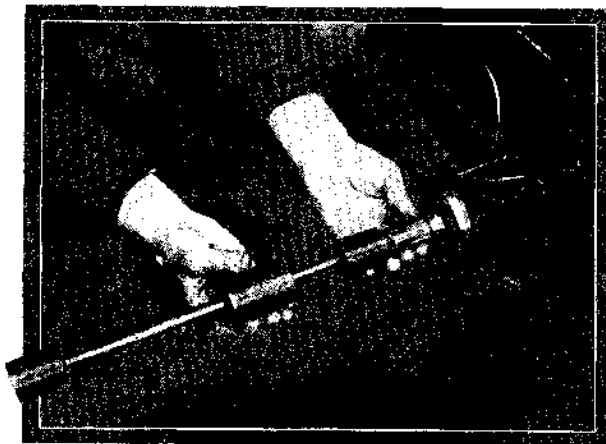


Fig. H.5.

The special impact extractor (Part No. 68823) in use to withdraw the axle shaft and bearing.

The half-shaft can then be pressed out of the bearing. Reassembling is a reversal of the foregoing.

When replacing an oil seal in the wheel bearing housing see that the sealing edge of the bore is towards the bearing. It should be a good press fit in the axle end cap.

Do not forget to see that the split collar is perfectly clean and free from blemish, particularly on its parallel portion, and pushed well home against the bearing inner race before replacing the wheel hub. It is advisable to tap it lightly into contact with the axle bearing with a hide hammer, taking the utmost care not to damage it in any way in the process.

H.6

Section H.4

REMOVING REAR AXLE FROM CAR

Raise rear of car by means of a suitable sling and block up under the chassis just forward of the rear spring front mountings.

Remove both road wheels and release the hand brake.

Disconnect the Lockheed flexible pipe at its junction to the bracket on the chassis.

Disconnect the brake cable casings from their anchorage to the spring brackets by removing the retaining nut and spring washer.

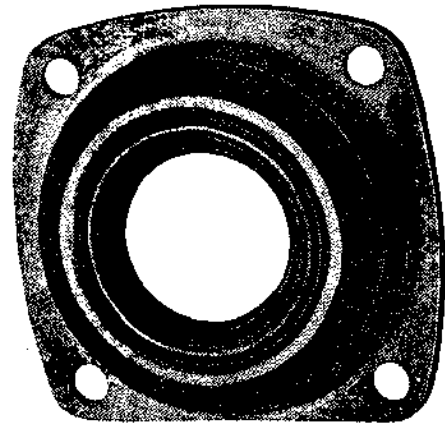


Fig. H.6.

The correct way round for the axle hub oil seal is with its sealing edge facing towards the bearing.

Disconnect the brake cables by removing the clevis pin attaching the forked yoke to the brake-shoe actuating lever on the brake plate.

Disconnect the shock absorber arms at their lower ends.

Mark the propeller shaft coupling flanges so that they are replaced in the same relative positions.

Uncouple the propeller shaft at the rear flange by unscrewing the four coupling nuts and bolts. Support the tail end of the propeller shaft through the aperture in the rear seat giving access to the rear axle oil filler.

Undo all the spring "U" bolt nuts so that the axle rests on the rebound straps. Take the weight of the axle by means of jacks or a suitable axle stand.

Remove the rebound straps, lower the exhaust pipe and the axle can now be withdrawn sideways.

Reassembly is a reversal of the dismantling procedure, but do not forget to bleed the hydraulic brake system after coupling up the flexible hose.

Section H.5

IMPORTANT POINTS CONCERNING AXLE ATTENTION

Attention requiring the dismantling of the axle and the replacement of parts is not advised unless this is absolutely necessary and unless you are equipped with the necessary checking gauges and a full range of distance-pieces and spacers from which to select the required new sizes. The fitting of a replacement axle, when possible, is advised.

Dismantling for examination and cleaning is permissible provided care is taken to refit the distance-pieces and spacers in exactly the same locations.

No adjustment is provided in the accepted sense. The crown wheel and pinion are set in their correct relation to each other by means of distance-pieces and spacers selected to provide the correct location

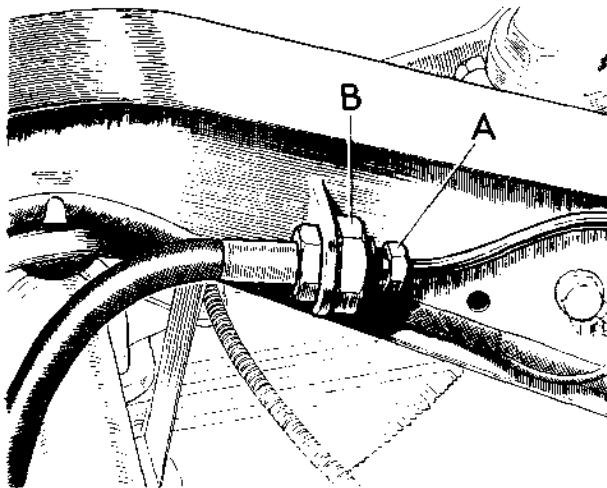


Fig. H.7.

When uncoupling the flexible hose the union nut "A" must first be unscrewed and then the attachment nut "B." On no account must the hexagon on the flexible pipe be turned in an attempt to disengage the flexible coupling.

of the components on initial assembly. Should the components be dismantled, their relative positions should carefully be observed and each part marked suitably so that it can be reassembled correctly in its original position.

Various components can be replaced by correctly combining the markings on the original components against those on the new parts in the manner detailed in subsequent sections.

It is important that the repairer be quite clear on this point before he undertakes the dismantling of the axle.

Spacers between the outer races of the differential bearings and faces of the recesses machined in the axle casing and cover control the position of the crown wheel in relation to the centre line of the pinion.

Adjustment of the pinion position is made by varying the thickness of the pinion washer, and that of the crown wheel by the varying thickness of the differential bearings spacers.

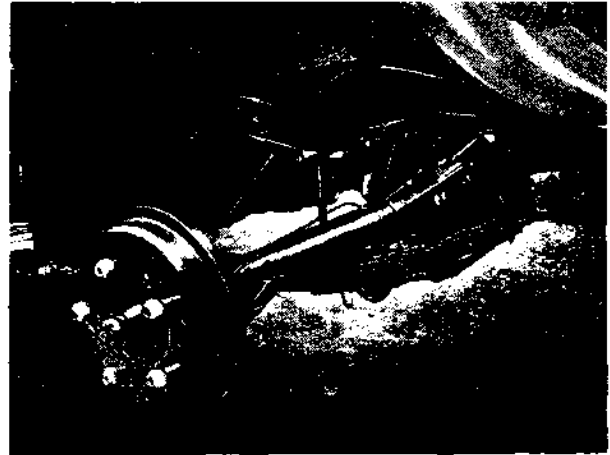


Fig. H.8.

The axle, complete with springs, disconnected from the car and ready for removal.

The following operations are possible without the use of special tools :—

- (a) To replace a crown wheel and pinion with a pair carrying markings which are identical to the originals.
- (b) To replace a crown wheel bearing alone, since these are of the controlled width type, provided genuine M.G. replacements are used.
- (c) To replace an axle cover which carries markings identical to the original.

The following replacements are possible by calculations alone :—

- (d) To replace the differential cage by one carrying a different marking to the original.
- (e) To replace an axle cover carrying different markings to the original.

The following replacements can be carried out by calculation and the use of special tools :—

- (f) To replace an axle case carrying different markings to the original.
- (g) To replace a crown wheel and pinion carrying different markings to the originals.
- (h) To replace bearings to the pinion shaft.

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Operations (a), (b) and (c) merely call for the fitting of the new parts in the positions occupied by the old. The remaining operations entail special precautions and are detailed subsequently.

The axle or half-shafts, rear hub bearings, brake-drums and shoe mechanism can all be dismantled and replaced with the axle in position on the car.

Section H.6

DISMANTLING THE AXLE AND REMOVING THE DIFFERENTIAL ASSEMBLY

Remove the axle from the car as detailed in Section H.4.

To dismantle the axle, first remove the hub and brake-drum assemblies as in Section H.1, and the brake plates as in Section H.2.

Remove the axle half-shafts as detailed in Section H.3.

Remove the series of bolts joining the axle casing and cover together and carefully part them, taking care to see that both halves of the axle are suitably supported to avoid damage to the differential assembly.

The withdrawal of the axle cover from the casing releases the differential and crown wheel assembly, which can now be withdrawn.

Note that spacers are fitted between the differential bearings and the bearing housings and that they are important as they control the position of the differential assembly in the axle.

It is essential that they be replaced in their original locations on assembly, so make a note of the positions from which they are removed.

Note.—All original spacers are marked o/s and n/s.

It must also be noted that the axle casing and cover are marked on the surface of one of the outside webs or tubes with one of the following figures :—Zero, 1, 2, 3, 4, 5, 6, all being positive.

Section H.7

DISMANTLING THE DIFFERENTIAL AND CROWN WHEEL ASSEMBLY

When the differential assembly has been removed from the axle casing, as detailed in Section H.6, it is dismantled by bending back the tab of the locking plate of the bolt locating the differential pinion shaft, withdrawing the bolt and removing the shaft.

The differential pinions can now be removed from the differential cage by swinging them round with

their dished thrust plates until they register with the openings in the differential cage, through which they can be removed.

The differential cage gears can then be withdrawn from inside the differential through the openings, together with their thrust washers.

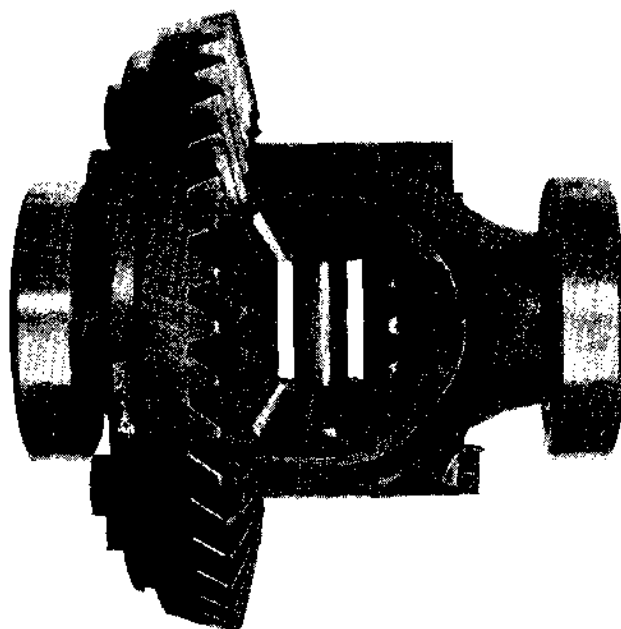


Fig. H.9.

The differential and crown wheel assembly with the ball races in position on the differential cage. The bolt locking the shaft for the differential pinions is clearly seen at the lower right-hand corner of the cage.

The crown wheel is attached to the differential cage by bolts locked by lock plates. Bending back the tabs of the lock plates and removing the bolts releases the crown wheel from the differential cage.

Note.—The crown wheels are marked on their back faces with one of the following figures : +2, +1, Zero (or no marking), -1, -2.

Section H.8

EXAMINING PARTS FOR WEAR

Before examination all parts should be cleaned thoroughly.

The crown wheel bearings are of the ball type and should be renewed if necessary. They are controlled dimensionally and must only be replaced by **genuine M.G. replacements**. Failure to observe this instruction will only lead to complications later.

The pinion shaft bearings are of the taper roller type and should be renewed, as a set, complete with distance-piece, if they do not run smoothly on their rollers.

The crown wheel and pinion are lapped in pairs.

It is essential, therefore, that crown wheels and pinions be stored and used in pairs as originally supplied, otherwise satisfactory results cannot be obtained.

If the inner races of the roller bearings are loose on the pinion, check with a new set of bearings, and if these are also loose on the pinion shaft it is an indication that the shaft has worn; a new crown wheel and pinion should be fitted.

Fractures in the teeth, hollows or any roughness on the surface of the teeth will render both crown wheels and pinions unserviceable.

The axle casing or axle cover (or both) should be renewed if new replacement bearings are not a light drive fit in the bores machined in their housings.



Fig. H.10.

The marking of the differential cage to indicate its assembly dimensions is clearly shown in this illustration, which bears a "C" dimension of .008 and a "D" dimension of .004.

Any looseness of the bearings should be overcome by renewing the bearing, the axle cover or axle casing.

The cage should be renewed if there is excessive wear in the bores in which the differential gears revolve.

The oil seals should be renewed if they are not a press fit in the pinion housing or wheel bearing housing, or if their central portion is loose in the outer metal casing, or if the spring is fractured or broken.

The differential gears, pinions and pins should be renewed if there is any doubt about their condition.

although more latitude in wear is permissible in these parts without detrimental effects than is the case with the crown wheel and pinion.

Section H.9

TO REPLACE A DIFFERENTIAL CAGE

Selecting an axle casing spacer

All differential cages are stamped with two letters—"C" and "D"—together with a figure. The prefix "C" indicates the dimension over the differential bearings and the dimensional range is from 0 in. to

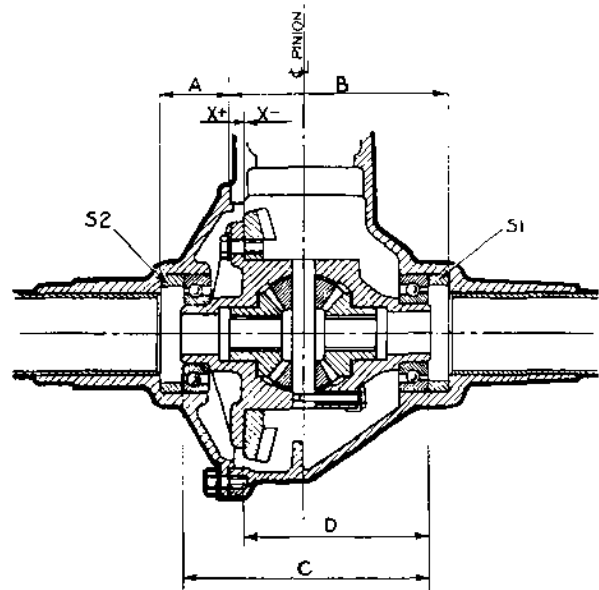


Fig. H.11.

This diagram indicates the significance of the "A," "B," "C" and "D" dimensions.

.012 in. "D" indicates the dimension from the crown wheel back face to the outside face of the right-hand bearing outer race and the range is from 0 in. to +.006 in.

Differential cages can be interchanged by applying the following procedure:—

Balance the "D" dimensions of the two cages and from the result select differential bearing spacers which will produce the same final location of the crown wheel on assembly.

Example (1) If the "D" dimension of the old cage was .005 in. and the "D" dimension on the new cage is .002 in., giving a difference of +.003 in., then this difference must be **added** to the old spacer thickness.

That is to say, if the old spacer is marked .503 in. the new spacer must be .506 in. thick.

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Example (2) If the "D" dimension of the old cage was .001 in. and the "D" dimension on the new cage is .005 in., giving a difference of $-.004$ in., then this difference must be **subtracted** from the original spacer thickness. That is to say, if the old spacer was .509 in. thick, then the new spacer must be .505 in. thick.

Selecting an axle cover spacer

In this case subtract the "D" dimension from the "C" dimension on both the old and the new differential cages.

If the resultant of the dimensions on the new cage is greater than that on the old cage, the new spacer for the axle cover is less than the old one by the difference and vice versa.

Example (1) Old : "C" .006 in. — "D" .005 in.
= .001 in.
New : "C" .007 in. — "D" .002 in.
= .005 in.

The resultant with the new cage is the greater by .004 in., therefore the new spacer should be .004 in. less in thickness than the old one.

Example (2) Old : "C" .002 in. — "D" .001 in.
= .001 in.
New : "C" .001 in. — "D" .005 in.
= $-.004$ in.

The old resultant is here the greater by .005 in., therefore the new spacer must be .005 in. thicker than the old one.

Section H.10

ASSEMBLING THE DIFFERENTIAL AND CROWN WHEEL

The differential is assembled by first inserting the differential gears inside the differential cage with their thrust washers in position.

Note.—When new washers are fitted it is necessary to see that they are properly bedded in or it may be difficult to insert the pinions.

The differential pinions are next inserted through the opening of the cage with their distance-pieces and thrust washers. The pinions are then rotated in the cage until they register with the holes in the cage for the shaft.

The pinion spindle, which should be a light push fit

in the cage, is then inserted, taking care to line up the locking bolt holes.

Note.—The slot in the shaft can be used as a guide.

Fit the locking bolt and turn up the tab of its locking washer.

Fit the crown wheel to the differential cage after making sure that the mating surfaces are perfectly clean and the edges free from burrs.

Check the crown wheel for truth by spinning the assembly on a roller fixture with a dial gauge registering against the outer edge of the crown wheel. The maximum permissible error of alignment is .001 in. (.025 mm.), and if the figure registered is in excess of this the crown wheel should be removed from the differential cage and the flange of the cage checked for truth. If necessary, fit a replacement cage.

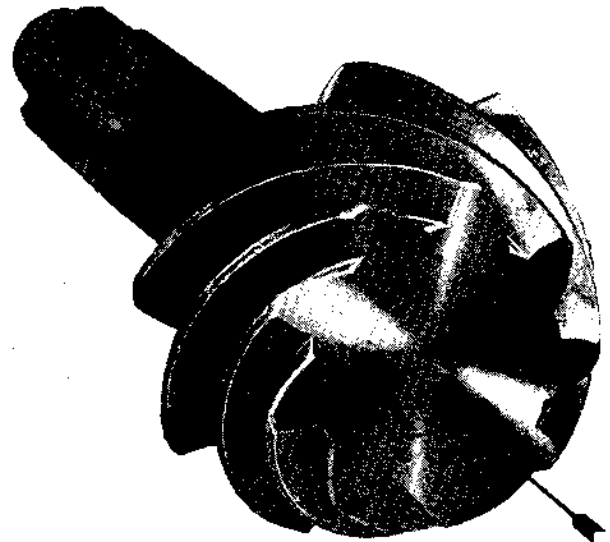


Fig. H.12.

The marking of the pinion to show its dimension for fitting is indicated by the arrow.

Provided the flange is true within the permissible error, clean all parts carefully and reassemble the crown wheel to the cage in a different position to that in which it was first assembled and checked, then re-check. This process should be repeated several times before finally deciding to discard the crown wheel and pinion.

The differential ball races can now be pressed on.

If a new crown wheel or differential cage has been fitted it is essential to measure the "C" dimension over the differential ball races, and the "D" dimension from the crown wheel back face to the right-hand bearing outer race outside face.

Section H.II

TO REPLACE A PINION

- (a) The old pinion in a new axle casing.
- (b) New pinion and new matched set of bearings and distance-piece in an old casing.
- (c) New pinion and old bearings and distance-piece in an old casing.
- (d) Old pinion and new matched set of bearings and distance-piece in an old casing.

it is fitted between the head of the pinion and its rear bearing.

Adjustment of the pinion position is made by varying the thickness of the pinion washer. These are available in a range of thickness varying by .001 in. (.025 mm.) and are marked on spares replacements only.

The pinion is fitted to the axle in the following way :—

Fit the pinion bearing outer races in the pinion housing, then assemble the rear pinion bearing inner race to the special dummy pinion spindle (Special Tool

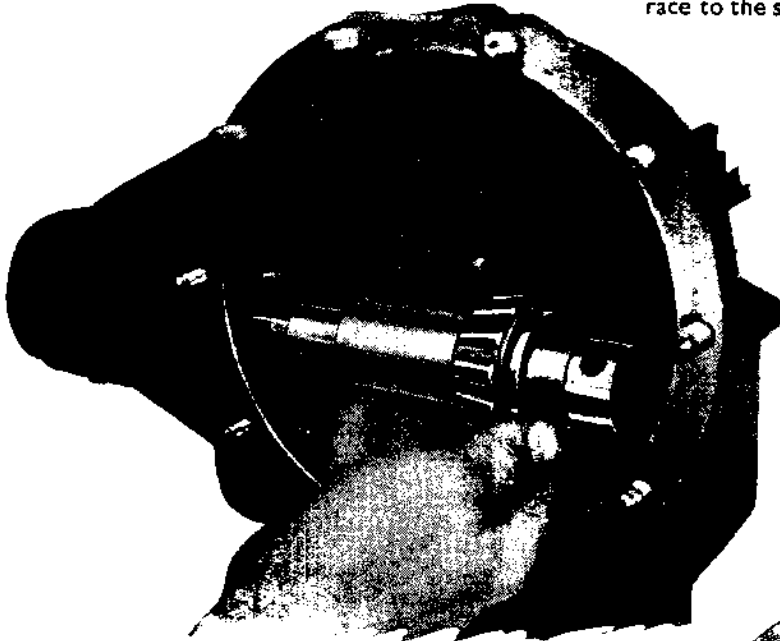


Fig. H.13.
Inserting the special dummy pinion shaft into the axle casing pinion housing.

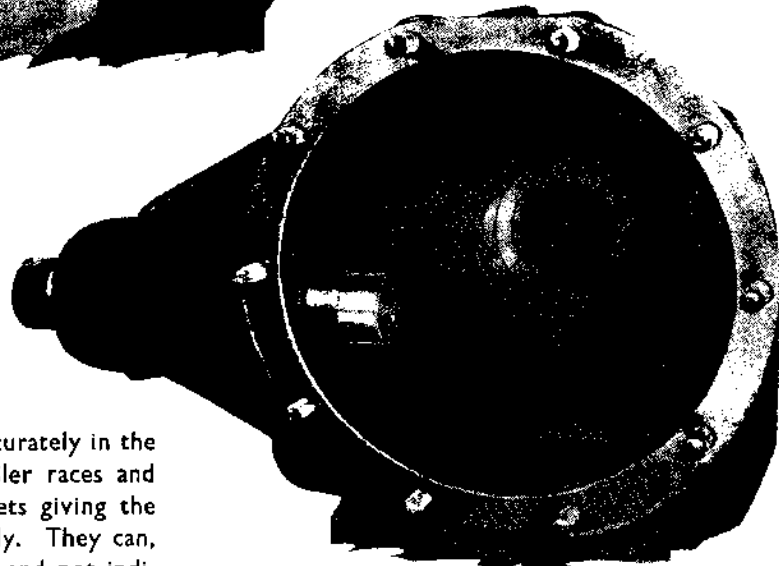


Fig. H.14.
The dummy pinion shaft in position in the housing. The ground head of the dummy shaft forms the datum for establishing the correct thickness for the spacing washer.

In all cases the pinion must be set accurately in the axle casing, remembering that the roller races and their distance-pieces are supplied in sets giving the correct amount of pre-load on assembly. They can, therefore, only be replaced as "sets" and not individually.

The pinions may be marked on their heads with one of the following figures :—

A ringed figure +2, +1, Zero (or no marking), -1, -2, and possibly an unringed figure -2 or -1.

The pinion washer controls the position of the pinion in relation to the axis of the crown wheel, and

No. 68829), and place in position in the housing, inserting it through the cover opening in the axle casing.

Fit the front bearing inner race.*

Fit the spindle nut and tighten it up to give the correct pre-load of 11 to 13 in./lb. (.126 to .149 m./kg.)

*NOTE.—The bearing spacer is omitted, because the correct pre-load can only be obtained with the bearing in position when the universal joint flange is locked up tight. This is due to the calculated compression of the bearing spacer under this locking load.

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to the bearings. This can be checked by applying the special tool, Part No. 68839. (See Section Q.)

Rotate the spindle eight or ten times to seat the bearings.

Fit the checking fixture (Part No. 68829) in the axle cover opening and make sure that the locating arm makes firm contact with the side of the dummy spindle head. (See Fig. H.15.)

This leaves a gap between the dummy pinion head and the checking anvil of the fixture, and this is the

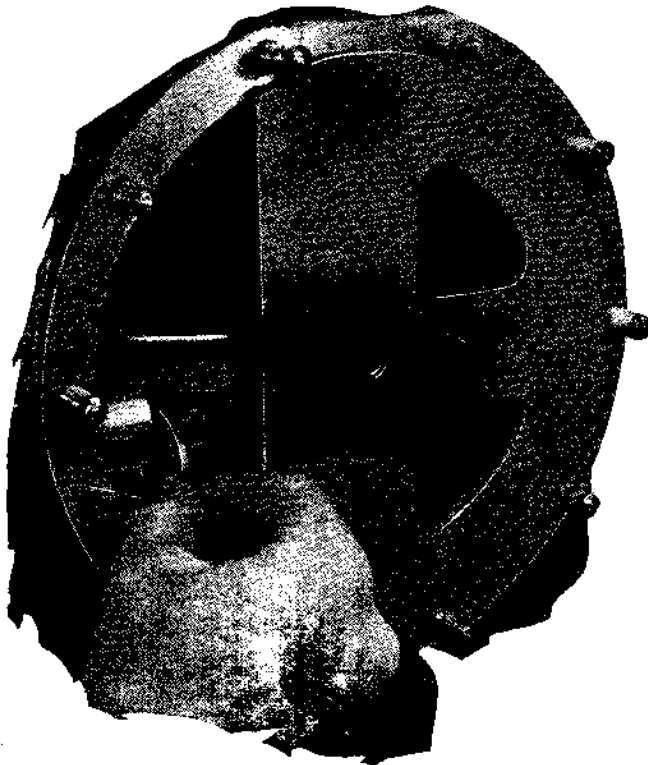
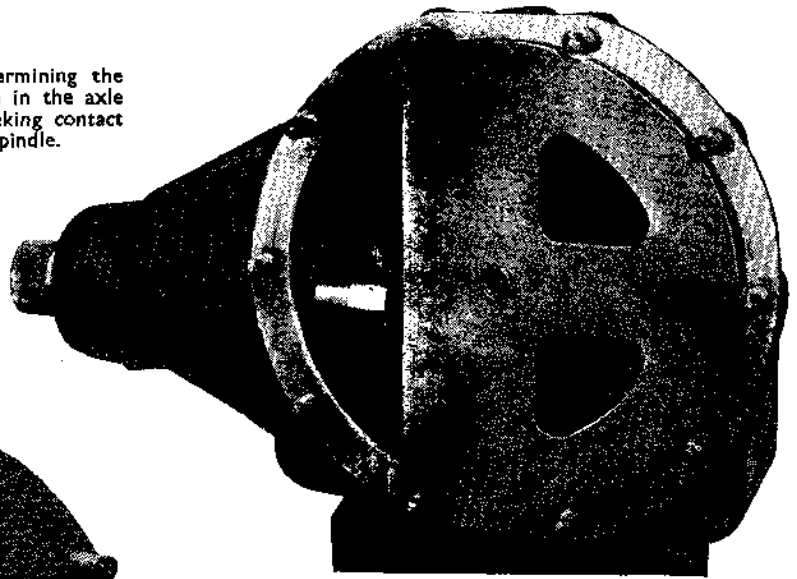
To assist manufacturing conditions it is occasionally necessary that a pinion be assembled away from the standard position. If this is so the variation is marked on the pinion head in a ring such as (+2), the sign + meaning that the centres are increased by .002 in. Correction has to be made for this, and when the figure is + (plus) the amount must be **taken from** the washer thickness, and if the figure is - (minus) then the amount has to be **added** to the washer thickness.

Fig. H.15.

(Right) The special checking fixture for determining the correct spacing washer thickness in position in the axle casing. Note that its locating tongue is making contact with the head of the dummy pinion spindle.

Fig. H.16.

(Below) When the locating tongue of the special checking fixture is in contact with the head of the dummy pinion spindle the space between the head of the spindle and the anvil of the checking fixture determines the thickness of the pinion spacing washer.



actual thickness of the pinion washer required for a standard pinion or one that has no marking.

Select a washer which will just slide between these faces and fit it behind the pinion head when re-assembling.

Example (a) A washer fitting the gap of the dummy pinion with a marking of .127 must be replaced by a washer having the marking .129 when refitting a pinion with the marking -2 or -.002.

Example (b) A washer fitting the gap of the dummy pinion and bearing the marking .127 must be replaced by a washer marked .125 when the pinion is marked +2 or +.002 on its head.

A plain or unringed figure may be marked on the pinion head in addition to a ringed figure, but this is only an indication of the variation of the pinion head thickness from standard and is always minus. It has no bearing on the pinion setting.

When the correct spacing washer has been decided upon the actual pinion assembly can take place, but the importance of making the measurements correctly must be appreciated, since it is impossible to check the adjustment when the axle is assembled.

The actual pinion assembly is carried out by threading the special pinion washer just selected on the pinion shaft, bevelled side against the pinion, and pressing on the rear roller bearing inner race with its projecting side against the washer. This sub-assembly is then inserted into the casing through the axle cover opening and located in position in the pinion housing of the axle casing.

The distance-piece and forward roller bearing inner race are next passed on to the pinion shaft, with the projecting side of the inner race facing forward. These components are followed by the pinion flange with its retaining washer and nut. Tighten up the nut firmly.

Rotate the pinion, using special tool, Part No. 68839, to ascertain that the correct degree of pre-load is

distance collar, i.e. if the old distance collar is $\cdot509$ in., the required new distance collar is $\cdot505$ in.

The distance collars are manufactured in steps of $\cdot001$ in. and measurements should therefore be made to the nearest thousandth of an inch.

Section H.13

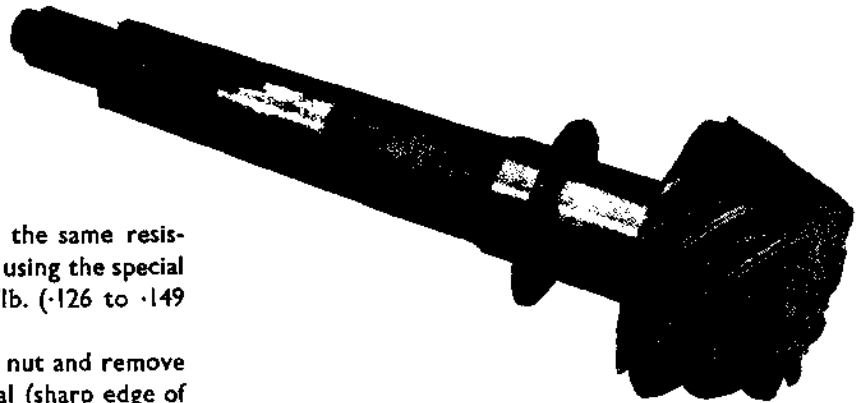
TO FIT A NEW AXLE HOUSING COVER

When a new axle cover is being fitted it is not necessary to make any adjustment to the pinion.

Compensation must, however, be made for variations in the depth of the differential bearing housing

Fig. H.17.

The pinion and pinion spacing washer. Note that the bevelled side of the washer bore should be against the pinion.



present. The pinion should present the same resistance to rotation as was evident when using the special dummy spindle, namely 11 to 13 in./lb. ($\cdot126$ to $\cdot149$ m./kg.).

If the pre-load is correct, undo the nut and remove the washer and flange; fit the oil seal (sharp edge of the bore towards bearing), replace the pinion flange, retaining washer and nut.

If the pre-load is not correct the distance-piece and bearing assembly will have to be replaced by the selection process until the correct pre-load is obtained.

Finally tighten up the nut and fit the split pin.

Section H.12

TO FIT A NEW AXLE CASING

When a new axle case is being fitted it is necessary to refit the pinion as detailed in Section H.11, and select a new distance collar for the differential bearing in the manner here indicated.

Compensation for variations in the depth of the differential bearing bores is made by taking note of the markings on the old and new axle casings. For example:—

If the old casing is $+\cdot002$ in. and the new one $+\cdot004$ in., the positive difference $\cdot002$ in. is added to the existing differential bearing distance collar. That is to say, if the old distance collar is marked $\cdot505$ in., then the required new distance collar is $\cdot507$ in.

Similarly, if the old casing is $+\cdot005$ in. and the new one $+\cdot001$ in., the resulting difference is negative, $-\cdot004$ in., and must be subtracted from the bearing

in the same manner as that outlined for the axle casing in Section H.12, and the same calculations for the selection of the required new distance collar for the differential bearings are involved.

Section H.14

TO REPLACE A CROWN WHEEL AND PINION HAVING MARKINGS DIFFERENT FROM THE ORIGINAL

Note.—The crown wheels and pinions are manufactured in matched pairs and are not replaceable individually but only in pairs. The necessity for replacing either a pinion or crown wheel therefore necessitates the fitting of a new pair of components and the operations of fitting a new pinion and a new crown wheel are involved.

The crown wheels are marked on their back faces with one of the following markings: $+2$, $+1$, Zero (or no marking), -1 or -2 .

Read off the markings from the back face of the old crown wheel and note the difference between this and the marking on the new crown wheel.

H THE REAR AXLE

For example: If the old one is marked -1 ($-.001$ in.) and the new one $+2$ ($+.002$ in.), the dimension difference is $+.003$ in. To reassemble correctly it is thus necessary to fit a new distance collar in the axle casing which is $.003$ in. **thicker** than the old one, and a new one $.003$ in. **thinner** than the old one in the axle cover.

Note that the **combined** thicknesses of these distance collars must remain the same.

The setting of the pinion is carried out as indicated in Section H.11.

Section H.15

REASSEMBLING THE AXLE

Provided that no replacement parts are fitted, the assembly of the axle is quite straightforward if proper note is taken of the positions of various distance-pieces, washers and spacers on dismantling, and they are replaced in exactly their original locations.

Assembly of the differential and crown wheel is described in detail in Section H.10.

Assembly of the pinion housing is given in detail in Section H.11.

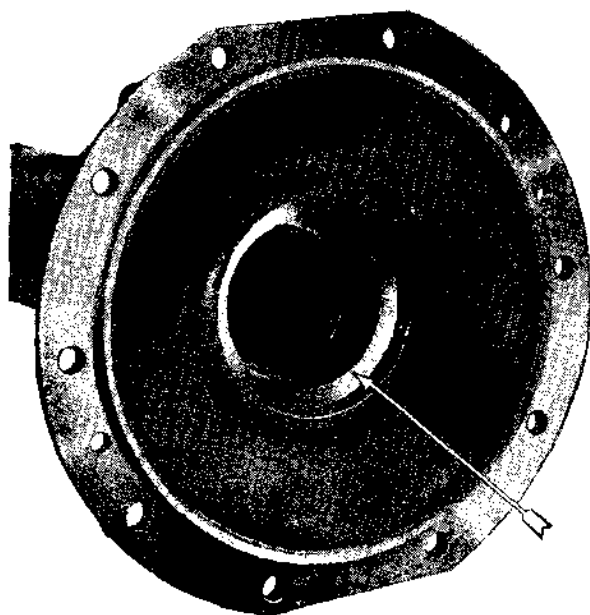


Fig. H.18.

The location of the differential bearing spacer in the axle casing is indicated by the arrow.

The assembly of the axle cover to the axle casing is carried out with a gasket between their joint surfaces. The calculations made for adjustment provide for the thickness of the gasket, but it is important that a genuine M.G. replacement is used. (Thick-

ness of gasket $.005$ in. ($.125$ mm.) when compressed.)

The differential assembly should be assembled in the axle casing, making sure that its bearing in the axle casing is right home in its housing and that a gasket is in position on the joint surface. The axle cover is then placed in position over the axle casing and carefully pushed home till the joint faces are in contact.

The ten nuts fastening the halves of the axle housing together are then screwed lightly in position and

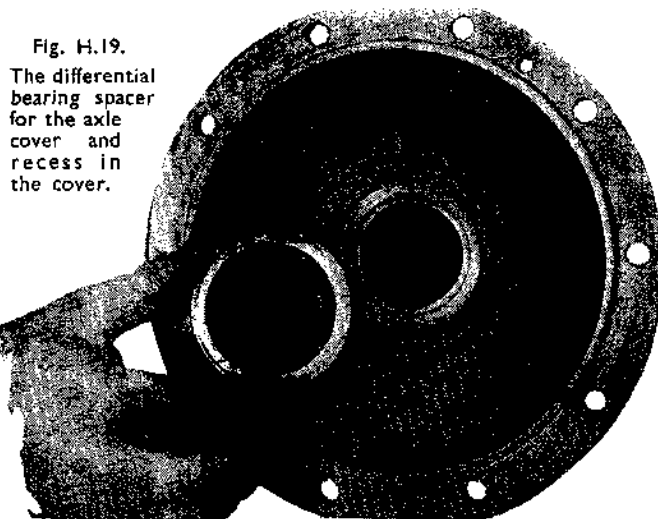


Fig. H.19.
The differential bearing spacer for the axle cover and recess in the cover.

finally tightened up a quarter of a turn at a time in a diagonal sequence to ensure even tightening and absence of distortion.

The brake plates are refitted in the manner described in Section H.2. The axle half-shafts are refitted in the manner described in Section H.3. The hub and brake-drum assemblies are refitted as in Section H.1.

Make sure that the pinion, differential and axle half-shafts are free from undue restriction before replacing the axle in the car.

Section H.16

REFITTING THE REAR AXLE

This is largely a reversal of the removal process, and once the axle has been lifted over the springs it must be carefully positioned before the "U" bolts are tightened.

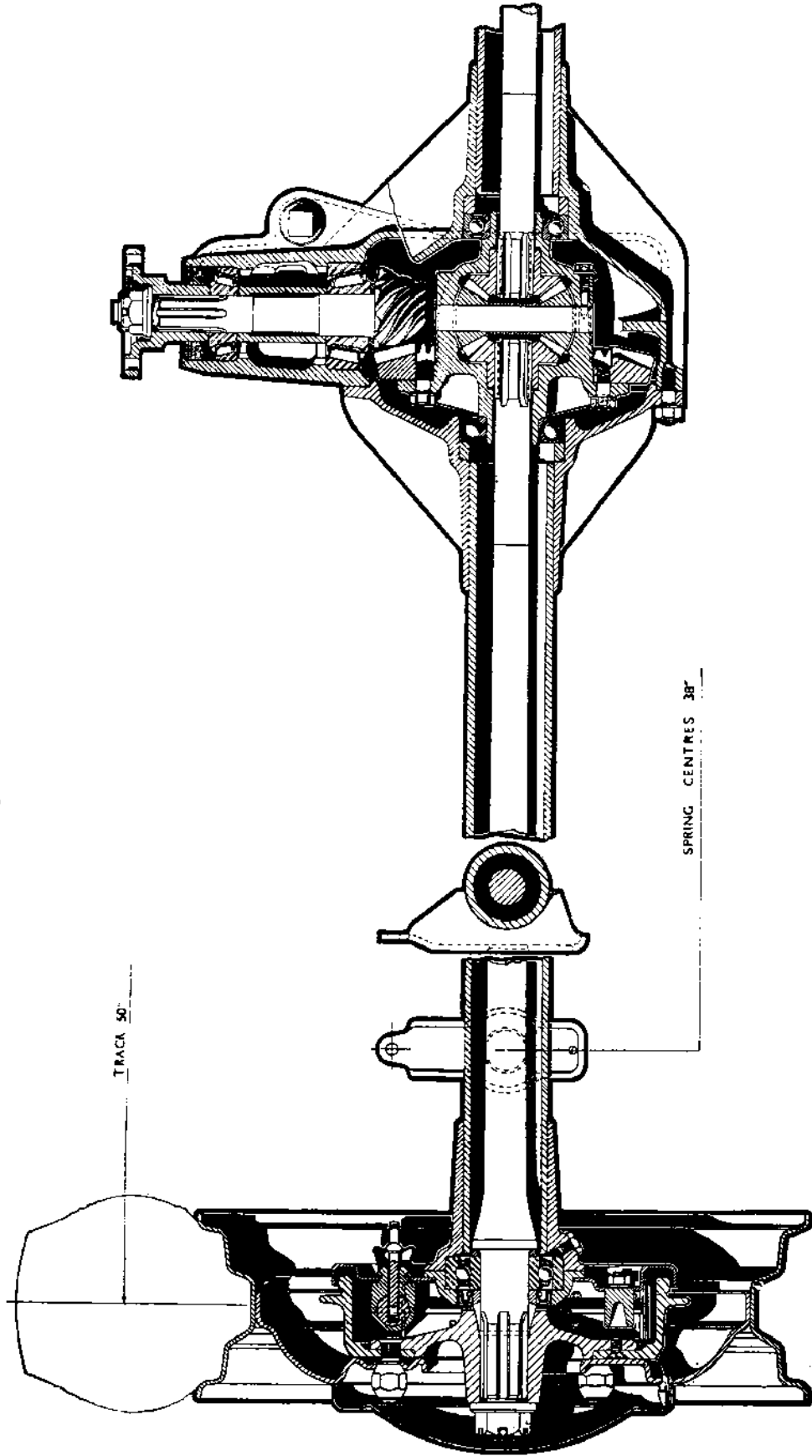
Jack up the axle and connect the propeller shaft, making sure the self-locking nuts are quite tight.

Next re-connect the rebound straps and the hand brake cables.

Fit the shock absorbers to their brackets and connect up the brake hoses.

Finally bleed the brake system as explained in Section M.

THE M.G. MIDGET (Series "TD") REAR AXLE



H THE REAR AXLE

Section H.17

IDENTIFICATION OF "UNIFIED" SCREW THREADS

The general standardisation of "Unified" screw threads makes it necessary to identify all nuts, bolts, and set screws with these threads in order to ensure their correct use with correspondingly threaded components and the fitting of correct replacements. Later M.G. Midget axles have A.N.F. or "Unified" screw threads.

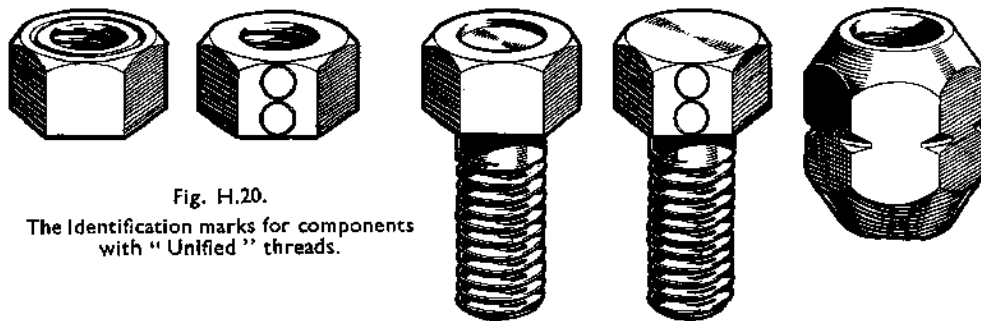


Fig. H.20.
The identification marks for components with "Unified" threads.

Identification has been standardised and is effected in the following manner :—

Nuts. By a circular groove turned on the end face of the nut or by connected circles stamped on one flat of the hexagon.

Bolts and Set Screws. By a circular depression turned on the head or by connected circles stamped on one flat of the hexagon.

Wheel Stud Nuts. By a notch cut in all the corners of the hexagon.

These identification marks are clearly shown in the illustration above and it is obviously of the utmost importance that any nuts, bolts, or set screws so marked are used only in conjunction with their associated components having "Unified" threads and that only replacement parts with "Unified" threads are used, as these are *not* interchangeable with Whitworth, B.S.F. or Metric threads.

The "Unified" thread is, however, interchangeable with the American National Fine (A.N.F.) thread for all practical purposes.

As an interim measure, prior to the standardisation of the "Unified" thread, certain of the Hypoid axles fitted to Nuffield vehicles have been manufactured with A.N.F. threaded components, and such axles are identifiable from the fact that they are fitted with wheel stud nuts having the notch-type identification on the corners of the hexagon.

Care must be taken, in the case of these axles, to use the correct nuts, bolts and set screws when

reassembling or when fitting new components. With the exception of the wheel nuts (which are notched) there is no identification mark on A.N.F. threaded bolts, nuts, and set screws by which they can be identified readily.

Components and assemblies which have "Unified" threads or A.N.F. threads will be identifiable by the new part numbers which have been allocated to them.

Certain service parts supplied with B.S.F. threads will bear no part numbers.

Thus—Assemblies with the old part numbers or without part numbers have B.S.F. threads.

Assemblies with the new part numbers have "Unified" threads or A.N.F. threads.

Spanners. It is to be noted that all A.N.F. and "Unified" threaded nuts and hexagon-headed bolts are made to the standard American hexagon sizes and that spanners of the appropriate size must be used when tightening or loosening them.

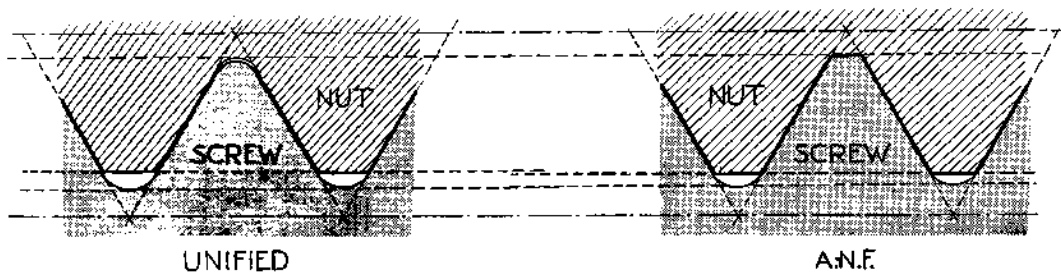


Fig. H.21.

This illustration of the "Unified" thread and A.N.F. thread to the same scale indicates their close relationship.

KEY TO SPANNER SIZES Nominal widths between jaws

<i>Nuffield Standards</i>	<i>Diameter of Screw Thread (inches)</i>									
	$\frac{1}{4}$ "	$\frac{5}{16}$ "	$\frac{3}{8}$ "	$\frac{7}{16}$ "	$\frac{1}{2}$ "	$\frac{9}{16}$ "	$\frac{5}{8}$ "	$\frac{3}{4}$ "	$\frac{7}{8}$ "	1"
For B.S.F. screws and nuts ... ..	.448	.529	.604	.705	.825	.925	1.016	1.207	1.309	1.489
For A.N.F. screws and nuts ... ..	.440	.504	.566	.629	.755	.880	.944	1.132	1.320	1.508
For "Unified" screws ... ..	.440	.504	.566	.630	.755	.817	.943	1.132	1.321	1.509
For "Unified" nuts (normal) ... ..	.440	.504	.566	.692	.755	.880	.943	1.132	1.321	1.509
For "Unified" nuts (heavy)	—	—	—	—	—	—	1.069	1.258	1.446	—

NOTE.—In the case of some "Unified" threaded components the size of the hexagon for the nut is different from that of the bolt. Where this occurs the spanner size is shown in heavy type in the above table.

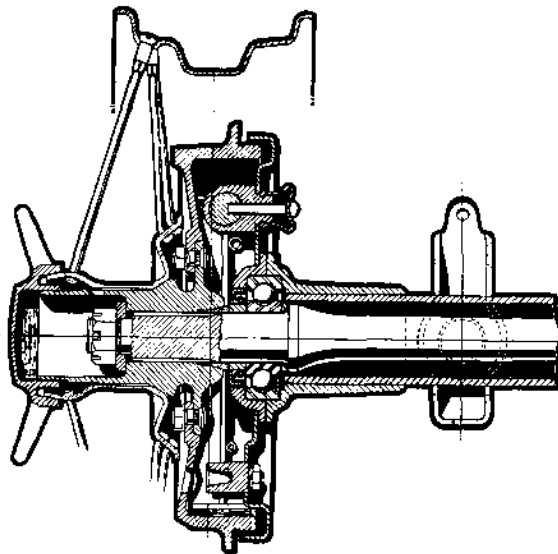
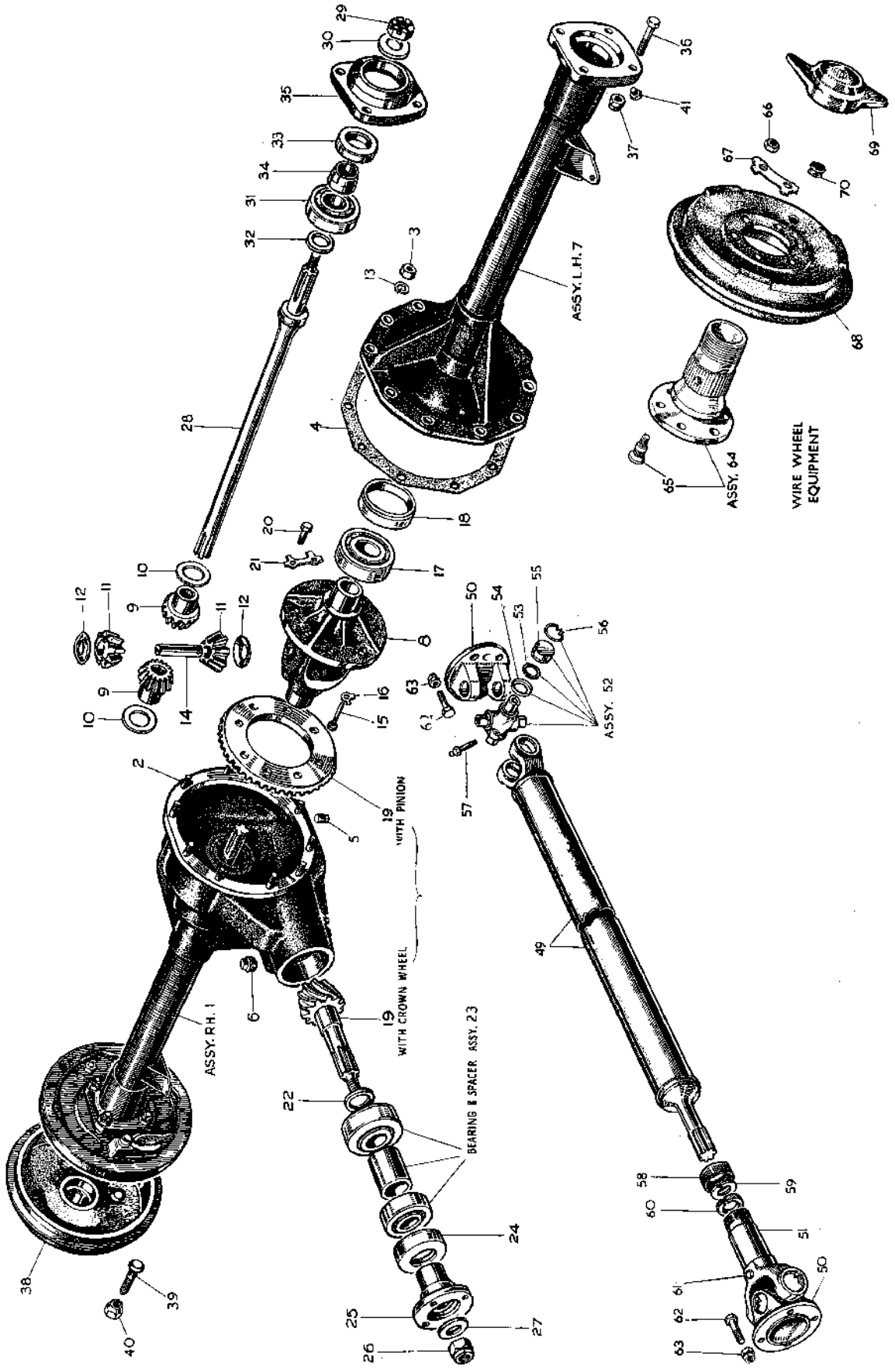


Fig. H.22.

The arrangement of the rear hub and brake-drum on Series "TF" cars fitted with detachable wire wheels.

THE REAR AXLE AND PROPELLER SHAFT COMPONENTS

(Series "TF")



KEY TO THE REAR AXLE AND PROPELLER SHAFT COMPONENTS

No.	Description	No.	Description
1.	Axle tube assembly—R./H.	22.	Distance washer—pinion—rear.
2.	Stud—cover.	23.	Bearing and spacer assembly.
3.	Nut—axle cover stud.	24.	Oil seal—pinion—front.
4.	Joint.	25.	Flange—universal joint.
5.	Drain plug.	26.	Castle nut—pinion.
6.	Oil filler plug.	27.	Washer—castle nut.
7.	Axle tube assembly—L./H.	28.	Rear axle shaft.
8.	Cage—differential.	29.	Nut—axle shaft.
9.	Gear—differential.	30.	Washer—axle shaft nut.
10.	Washer—gear.	31.	Bearing—rear hub.
11.	Pinion—differential.	32.	Distance washer—hub bearing.
12.	Washer—pinion.	33.	Oil seal—hub.
13.	Washer—cover stud.	34.	Collar—oil seal.
14.	Pin—pinion.	35.	Support—brake plate.
15.	Locking bolt—pinion pin.	36.	Bolt for support.
16.	Tab washer—locking bolt.	37.	Nut.
17.	Bearing—differential.	38.	Hub and brake drum assembly.
18.	Distance collar—bearing.	39.	Wheel stud.
19.	Crown wheel and pinion.	40.	Nut—wheel stud.
20.	Bolt—crown wheel.	41.	Grease plug—axle tube.
21.	Locking tab—crown wheel bolt.	49.	Tubular shaft assembly.
		50.	Flange yoke.
		51.	Sleeve yoke assembly.
		52.	Journal assembly less greaser.
		53.	Gasket—journal.
		54.	Retainer—gasket.
		55.	Needle bearing assembly.
		56.	Snap ring.
		57.	Grease nipple.
		58.	Dust cap.
		59.	Steel washer.
		60.	Cork washer.
		61.	Grease nipple.
		62.	Bolt—coupling.
		63.	Nut—coupling bolt.
		64.	Hub assembly—L./H.
		65.	Stud—hub.
		66.	Nut—hub.
		67.	Locking tab.
		68.	Brake drum.
		69.	Hub cap—L./H.
		70.	Plug—rubber.

Wire wheels.

Disc wheels.

SECTION I

THE REAR ROAD SPRINGS

General Description.

Section No. 1.1 Removal and replacement of the rear springs.

Section No. 1.2 Dismantling and reassembling the springs.

Section No. 1.3 Maintenance of rear springs.

GENERAL DESCRIPTION

The semi-elliptic leaf springs provided for the rear suspension are secured beneath the rear axle by "U" bolts.

The front ends of the springs are anchored in flexing rubber bushes, while the rear ends are mounted in similar bushes in swinging shackles.

Rubber pads are fitted between the spring and the axle, and moulded rubber packing pads are inserted round the leaves and the spring clips, while rubber insertions are also fitted at the ends of the spring leaves. It is essential that no lubricant be used on the spring leaves or shackles.

Section 1.1

REMOVAL AND REPLACEMENT OF THE REAR SPRINGS

Raise the rear of the car and block up under the chassis forward of the rear springs.

Remove the nuts holding the "U" bolts to the axle casing and allow the axle to hang from the rebound straps.

Remove the spring anchorage bolts and shackle bolts, when the springs may be lifted away.

Section 1.2

DISMANTLING AND REASSEMBLING THE SPRINGS

Slacken off and remove the spring clip bolts, distance-pieces, and rubber packings.

Release the locknut and nut from the spring centre bolt and remove the distance-piece and bolt.

The leaves may now be separated, releasing the twelve interleaf rubber pads.

Inspection

Clean each leaf, and examine for cracks or breakage. Check the centre bolt for wear or distortion (this bolt forms the location for the spring on its axle pad and should be in good condition).

Important.—When fitting new leaves it is important that they are of the correct length and thickness, and have the same curvature as the remaining leaves.

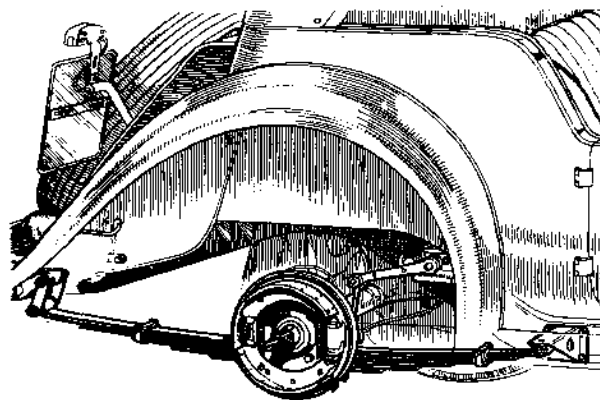


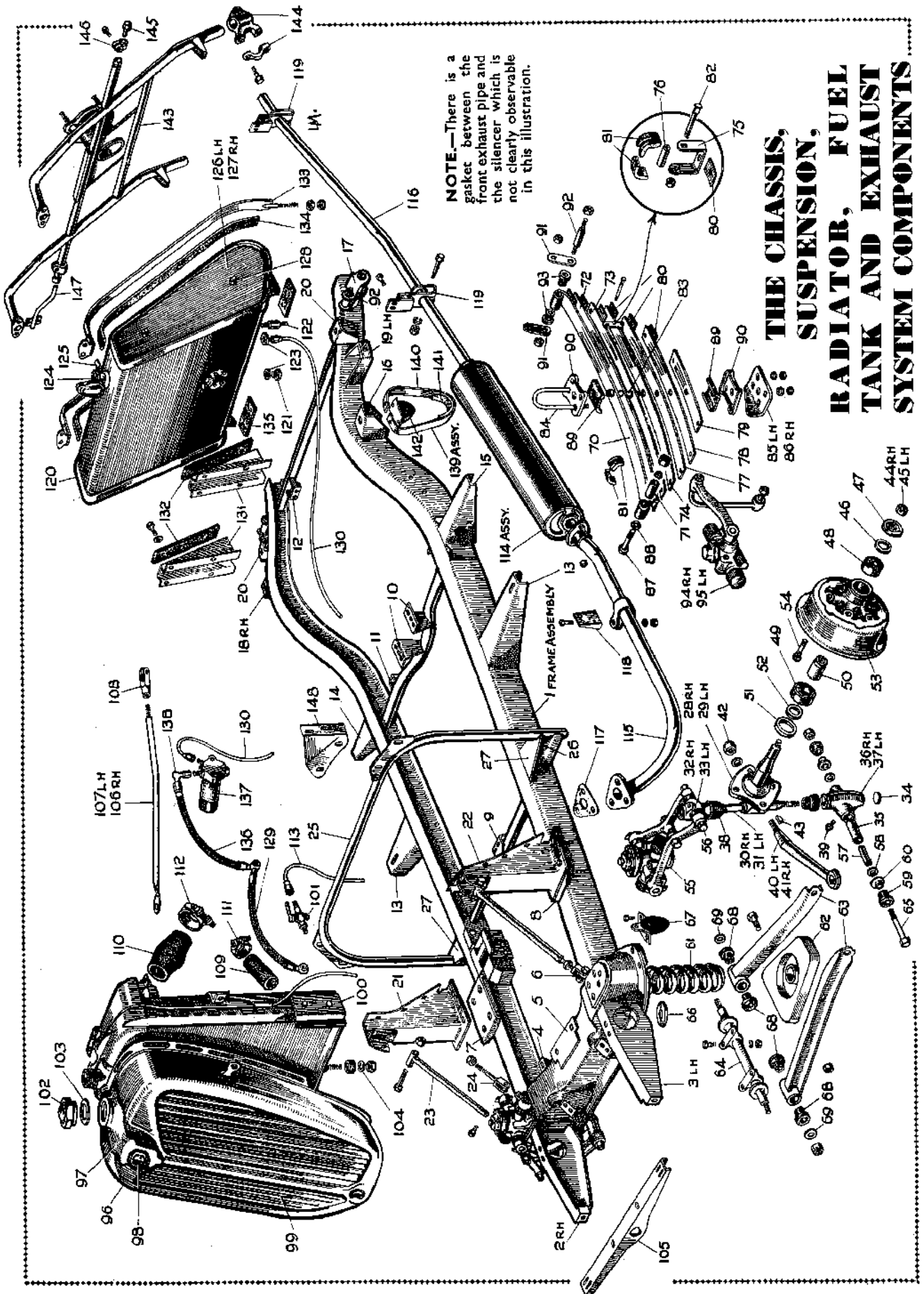
Fig. 1.1.

The semi-elliptic rear springs are mounted in flexing rubber bushes with rubber interleaving between the spring leaves.

It is advisable, even when no leaves are broken, to fit replacement springs when the originals have lost their camber due to settling.

Reassembling

The springs should be assembled clean, dry and free from any lubricant.



KEY TO CHASSIS AND SUSPENSION COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Chassis frame—complete.	51.	Distance washer—hub.	100.	Radiator film block complete (w/lt tanks).
2.	Extension—front R/H—frame.	52.	Oil seal—hub.	101.	Drain tap.
3.	Extension—front L/H—frame.	53.	Hub and brake-drum assembly—front.	102.	Filler cap—radiator.
4.	Bracket—engine steady.	54.	Wheel studs.	103.	Ring—rubber—filler cap.
5.	Bracket—engine mounting support.	55.	Damper complete—front.	104.	Packing washer—radiator mounting.
6.	Anchor—stay tube.	56.	Bolt—wishbone to link.	105.	Support member—radiator.
7.	Bracket—frame stiffener R/H.	57.	Link—distance tube.	106.	Stay tube—radiator R/H.
8.	Bracket—frame stiffener L/H.	58.	Thrust washer—link.	107.	Stay tube—radiator L/H.
9.	Bracket—engine mounting rear.	59.	Seal—link.	108.	Yoke end—stay tube.
10.	Bracket—propeller shaft tunnel.	60.	Support—link.	109.	Hose—bottom—radiator.
11.	Bracket—exhaust pipe.	61.	Spring coil.	110.	Hose—top—radiator.
12.	Bracket—exhaust pipe.	62.	Spring pan assembly.	111.	Clip—bottom hose.
13.	Bracket—centre—body mounting.	63.	Bottom wishbone assembly.	112.	Clip—top hose.
14.	Bracket—front—rear spring R/H.	64.	Wishbone pivot.	113.	Drain pipe.
15.	Bracket—front—rear spring L/H.	65.	Bolt—wishbone to link.	114.	Exhaust system assembly. } Welded assembly on later models.
16.	Bracket—rear—body mounting.	66.	Spigot for spring.	115.	Front pipe.
17.	Bracket—rear—rear spring.	67.	Check rubber.	116.	Silencer and rear pipe assembly.
18.	Mounting bracket—rear wing R/H.	68.	Bush—bottom wishbone.	117.	Gasket—exhaust pipe flange.
19.	Mounting bracket—rear wing L/H.	69.	Washer—wishbone.	118.	Bracket—front support.
20.	Mounting bracket—rear balance.	70.	Main leaf complete with bush.	119.	Support—tail pipe.
21.	Stiffener bracket—R/H.	71.	Bush—Silentbloc.	120.	Fuel tank complete.
22.	Stiffener bracket—L/H.	72.	Second leaf.	121.	Drain plug—fuel tank.
23.	Stay tube assembly.	73.	Third leaf.	122.	Main feed adaptor.
24.	Fork end.	74.	Fourth leaf complete with clips.	123.	Washer (drain plug and main feed).
25.	Dash stiffener assembly.	75.	Leaf clips.	124.	Filler cap (Westwood) complete.
26.	Gusset plate—dash stiffener.	76.	Distance tube.	125.	Trigger—cap.
27.	Gusset plate—top—dash stiffener.	77.	Fifth leaf.	126.	End cover—fuel tank L/H.
28.	Steering knuckle—R/H.	78.	Sixth leaf.	127.	End cover—fuel tank R/H.
29.	Steering knuckle—L/H.	79.	Seventh leaf.	128.	Special bolt—tank end cover.
30.	Swivel pin—R/H.	80.	Rubber pad.	129.	Pipe (between carburetters).
31.	Swivel pin—L/H.	81.	Rubber—spring clip.	130.	Pipe (tank to pump) complete with washer and union washer.
32.	Link—swivel pin—upper R/H.	82.	Bolt— $\frac{1}{2}$ in. B.S.F.	131.	Mounting bracket.
33.	Link—swivel pin—upper L/H.	83.	Locating bolt.	132.	Rubber for mounting bracket.
34.	Plate—link.	84.	Clip—rear spring.	133.	Strap—fuel tank.
35.	Bush—link.	85.	Bracket—L/H (damper to rear spring).	134.	Packing—tank strap.
36.	Link—swivel pin—lower R/H.	86.	Bracket—R/H (damper to rear spring).	135.	Rubber packing—tank to frame.
37.	Link—swivel pin—lower L/H.	87.	Pin—rear spring front end.	136.	Pipe—pump to carburetters.
38.	Seal—swivel pin.	88.	Washer—Silentbloc.	137.	Fuel pump.
39.	Grease nipple ($\frac{1}{8}$ in. \times 90°)—link.	89.	Seating pad—rear spring.	138.	Elbow—fuel pump.
40.	Steering lever—L/H.	90.	Locating plate—rear spring.	139.	Check strap assembly—rear axle.
41.	Steering lever—R/H.	91.	Shackle plate.	140.	Check strap.
42.	Nut—Simmonds thin, $\frac{1}{2}$ in. B.S.F.	92.	Shackle pin.	141.	Buffer—check strap.
43.	Key—Woodruff No. 8.	93.	Bush.	142.	Rebound rubber—rear axle.
44.	Nut—steering knuckle—R/H.	94.	Damper complete—R/H.	143.	Spare wheel carrier bracket assembly.
45.	Nut—steering knuckle—L/H.	95.	Damper complete—L/H.	144.	Clamp bracket—lower—carrier.
46.	Felt washer—hub.	96.	Radiator case (with medallion, grille and false nose).	145.	Plug—spare wheel carrier.
47.	Grease retainer—hub.	97.	Radiator false nose.	146.	Clamp—rear number-plate.
48.	Bearing hub—inner.	98.	Medallion—M.G.—radiator.	147.	Mounting bracket—rear number-plate.
49.	Bearing hub—outer.	99.	Radiator grille.	148.	Attachment plate—dash stiffener.

I THE REAR ROAD SPRINGS

Place the leaves together in their correct order, locating them with the centre bolt and positioning the interleaf rubber packings between the ends of the leaves before the bolt is tightened.

The dowel head of the bolt must be be on top of the spring.

Replace the spring clip rubber packings, clips, distance-pieces, and bolts.

Before replacing the shackle bolts, bushes and shackle plates they must be inspected for wear and, if necessary, replaced by new components.

Before tightening the spring bolts it is absolutely essential that the normal working load be applied to the springs so that the flexing rubber

bushes are deflected to an equal extent in both directions during service. Failure to take this precaution will inevitably lead to early deterioration of the bushes.

Section I.3

MAINTENANCE OF THE REAR SPRINGS

As the rear springs are mounted in rubber, spraying with oil should be strictly avoided.

The only attention required is an occasional tightening of the spring seat bolts to make sure they are quite tight.

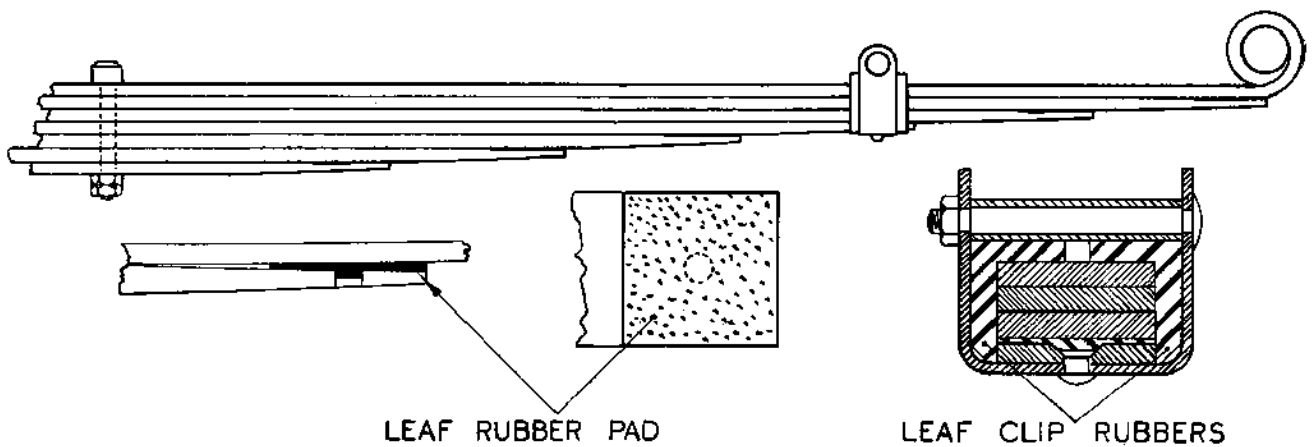


Fig. I.2.

The rubber interleafing and rubber mounting for the spring clips on the rear springs. On some models the leaf rubber pad is circular and not square in shape as shown.

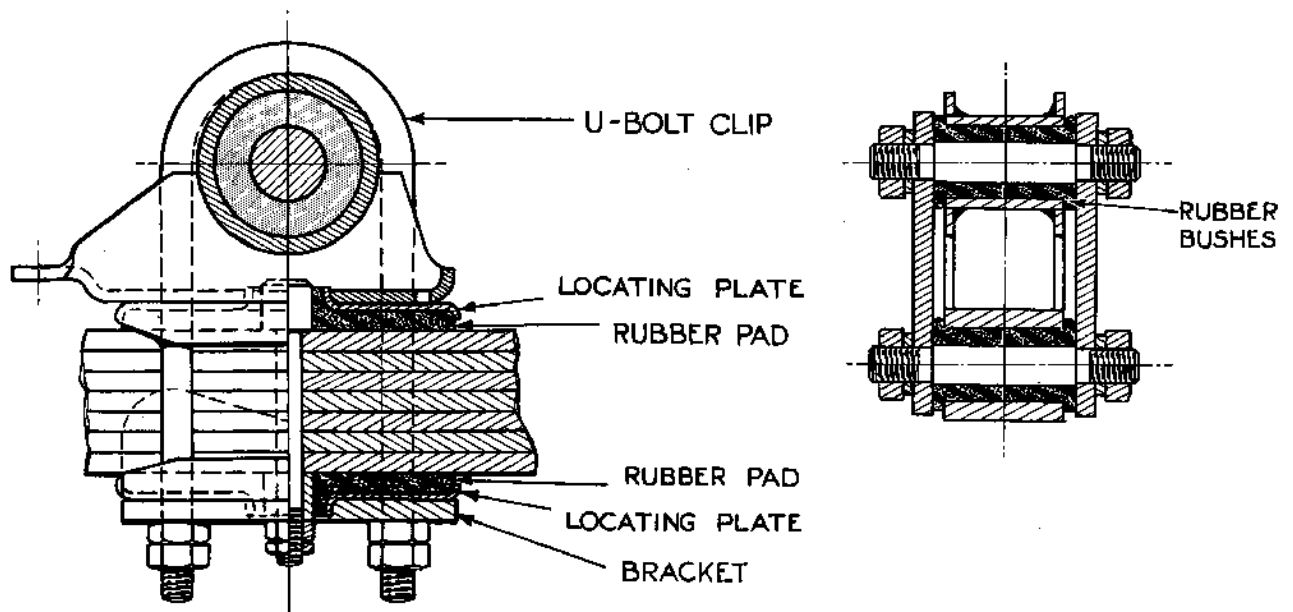


Fig. I.3.

The rubber mounting of the rear springs on the axle.

SECTION J

THE STEERING GEAR

General Description.

Maintenance.

- Section No. J.1 To remove the steering wheel and telescopic extension.
- Section No. J.2 To replace the steering column bushes (top and bottom).
- Section No. J.3 To take out the steering column.
- Section No. J.4 Removal and replacement of the steering gearbox.
- Section No. J.5 Dismantling the steering gearbox.
- Section No. J.6 Adjustment of the inner steering ball joint.
- Section No. J.7 Adjustment of the rack damper.
- Section No. J.8 Steering arm ball joints.
- Section No. J.9 Steering ball socket assembly threads.

GENERAL DESCRIPTION

The steering gear is of the direct-acting rack-and-pinion type, providing light and accurate control under all conditions.

It consists of a rack bar and toothed pinion, both working in the plain bearings of the housing.

No adjustment for bearing wear in the box is provided, except by the fitting of the necessary new parts.

When in new condition the backlash in the tooth engagement is hardly perceptible, i.e. .001 in. to .003 in. (.025 mm. to .075 mm.).

The steering mast is attached to the steering gearbox by a rubber-bushed coupling to insulate it from road shocks.

MAINTENANCE

All working parts are immersed in oil and an oilgun nipple is provided in the centre of the box. (See Fig. J.1.)

Felt bushes are fitted to the steering column. (See illustration on page J.2.) These are impregnated

with oil and graphite, and no lubrication should be necessary, but if after long periods a dry squeak develops, this may be cured by a small application of oil.

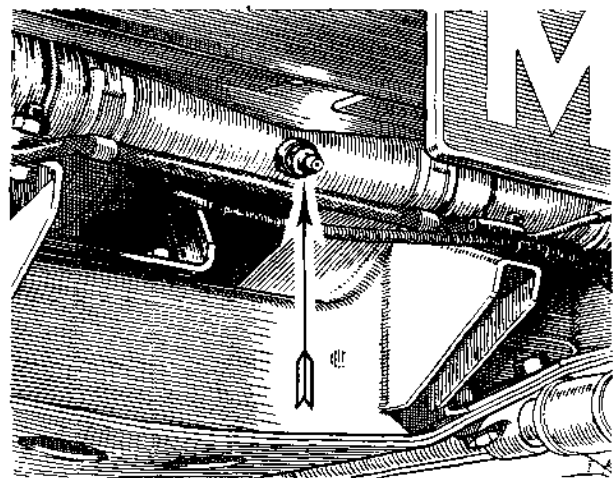
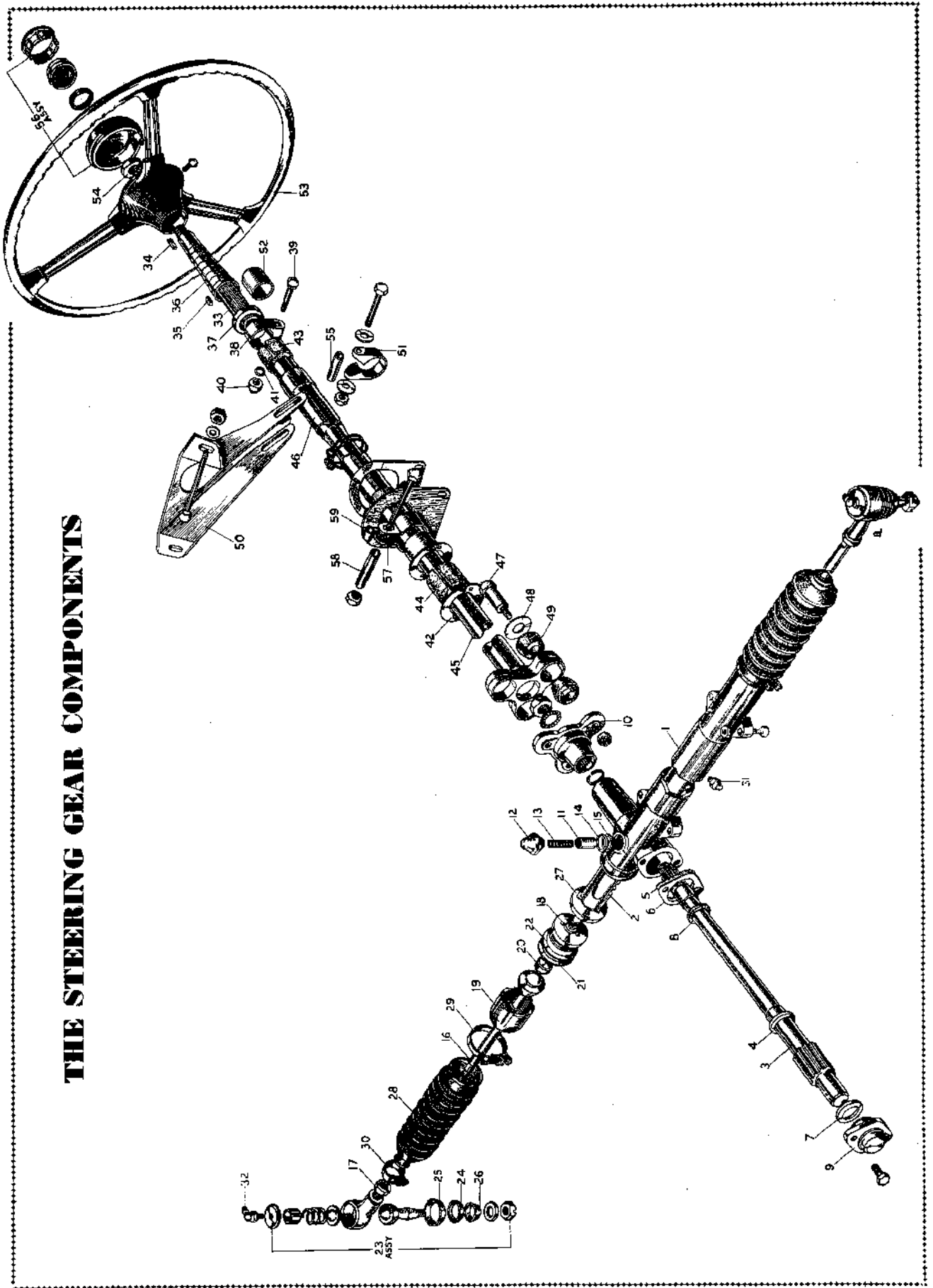


Fig. J.1.

The oil nipple in the centre of the steering gearbox is readily accessible from underneath the front number-plate.



THE STEERING GEAR COMPONENTS

KEY TO THE STEERING GEAR COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Rack housing—steering.	21.	Shim—ball seat adjuster (.003 in.).	41.	Washer—clamp bolt.
2.	Rack—steering.	22.	Shim—ball seat adjuster (.005 in.).	42.	Plate—bottom bush.
3.	Pinion—steering.	23.	Ball socket assembly—outer.	43.	Bush—top.
4.	Thrust washer—top—pinion.	24.	Cap—inner—grease retaining.	44.	Bush—bottom.
5.	Shim (.005 in. thick)—tail bearing.	25.	Cap—outer—grease retaining.	45.	Inner column—welded—complete.
6.	Shim (.007 in. thick)—tail bearing.	26.	Pressure ring—for caps.	46.	Outer column.
7.	Thrust washer—bottom—pinion.	27.	Lock washer—ball housing—inner.	47.	Bolt—column flange to box flange.
8.	Seal—pinion.	28.	Seal—ball joint.	48.	Washer—column flange bolt.
9.	Tail bearing—pinion.	29.	Clip—large.	49.	Rubber bearing—column.
10.	Flange—pinion.	30.	Clip—small.	50.	Support bracket—top.
11.	Damper pad—rack.	31.	Grease nipple ($\frac{1}{8}$ in. straight)—rack housing.	51.	Clamp—steering column.
12.	Housing cap—damper pad.	32.	Grease nipple ($\frac{1}{8}$ in. \times 90°)—steering arm.	52.	Distance tube—column adjustment.
13.	Spring—damper pad.	33.	Adjustable top end.	53.	Steering wheel.
14.	Shim (.003 in.)—damper pad housing.	34.	Key—steering wheel.	54.	Nut—steering wheel.
15.	Shim (.020 in.)—damper pad housing.	35.	Key—connector.	55.	Distance piece—steering column clamp.
16.	Tie-rod.	36.	Spring cover.	56.	Decorative horn push and steering column control head assembly.
17.	Locknut or tie-rod.	37.	Cover cup.	57.	Clip—steering column steady.
18.	Ball housing—male.	38.	Clamp—steering column.	58.	Distance tube—long.
19.	Ball housing—female.	39.	Bolt—clamp.	59.	Distance tube—short.
20.	Ball seat.	40.	Nut—clamp bolt.		

J THE STEERING GEAR

Section J.1

TO REMOVE THE STEERING WHEEL AND TELESCOPIC EXTENSION

Remove the clamping nut from the telescopic adjustment clamp and extract the clamping bolt.

This will permit the wheel to be withdrawn to its full extent and enable the plated helical sleeve to be contracted towards the wheel to reveal the key at the upper end of the column which engages the long keyway in the splined adjustable shaft.

Remove the key from the column by pushing a strip of thin metal into the keyway and under the key. Lift it out of its housing in the column sufficiently to enable it to be picked out.

This will release the steering wheel and telescopic column assembly which can then be removed to a bench for further dismantling if necessary, but this will seldom be required.

Take off the "M.G." medallion at the wheel boss. There is a countersunk locating screw which enters from the side.

Undo the large nut holding the wheel to the shaft.

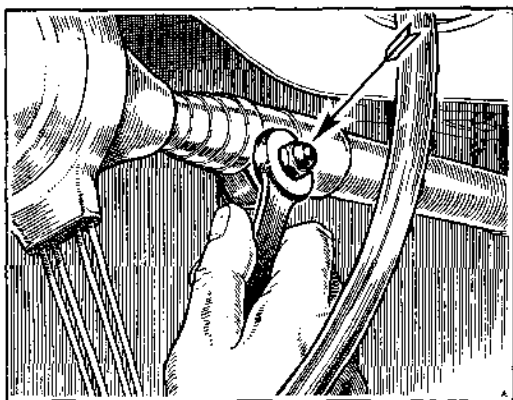


Fig. J.2.

The clamping nut for the adjustable steering column.

Support the hub of the wheel suitably and with a shouldered copper drift carefully drive the splined shaft out of the wheel, taking care of the flat key locating the wheel to the splined shaft. Alternatively an extractor can be used to part the two components.

Section J.2

TO REPLACE THE TOP AND BOTTOM STEERING COLUMN BUSHES

Remove the wheel and extension as described in Section J.1.

Pick out the old felt bush and feed in the new one which should be coated with graphite grease on the face which contacts the inner column.

J.4

Bottom

Remove the thin cover-plate by undoing the three small screws. Then pick out the old felt bush and insert a new one after first coating it with graphite grease on its inner face.

Section J.3

TO TAKE OUT THE STEERING COLUMN

Remove the steering wheel as in Section J.1.

Take out the bolt and nut from the support clip under the dash. Then take out the bolt and nut holding the steering column to the body steady bracket (this is on the engine side of the bulkhead).

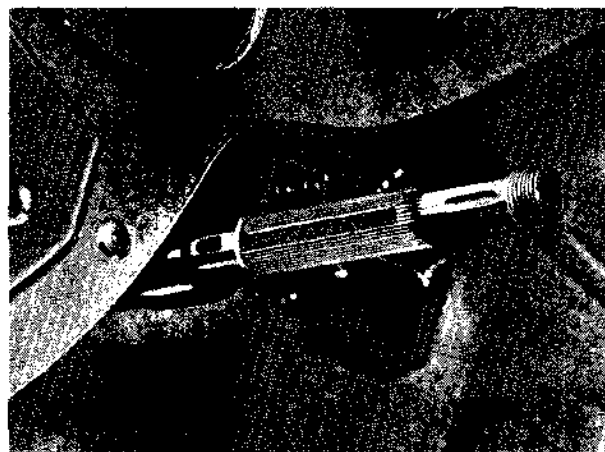


Fig. J.3.

The splined upper end of the steering column, showing the keyways.

Remove the split pins, take off the nuts and unscrew the three bolts at the universal joint. Do not lose the rubber inserts.

This will free the inner and outer columns, which may be pulled out towards the front in the space between the radiator and the wing.

When reassembling note that the screws on the universal joint should be tightened fully up against their shoulders.

Section J.4

REMOVAL AND REPLACEMENT OF THE STEERING GEARBOX

Raise the car at the front and block up under the chassis. Remove the wheels and disconnect the two track-rods at their outer ends.

Detach all electric cables which, it will be found, are secured to the unit by means of clips.

Remove the outer ball joint on the same side as the steering column, taking care not to lose its position for reassembly.

Undo the engine steady rod and remove its mounting bracket from the chassis.

Remove the three screws and nuts at the universal joint on the steering column and then detach the steering gearbox from the frame (four bolts and nuts).

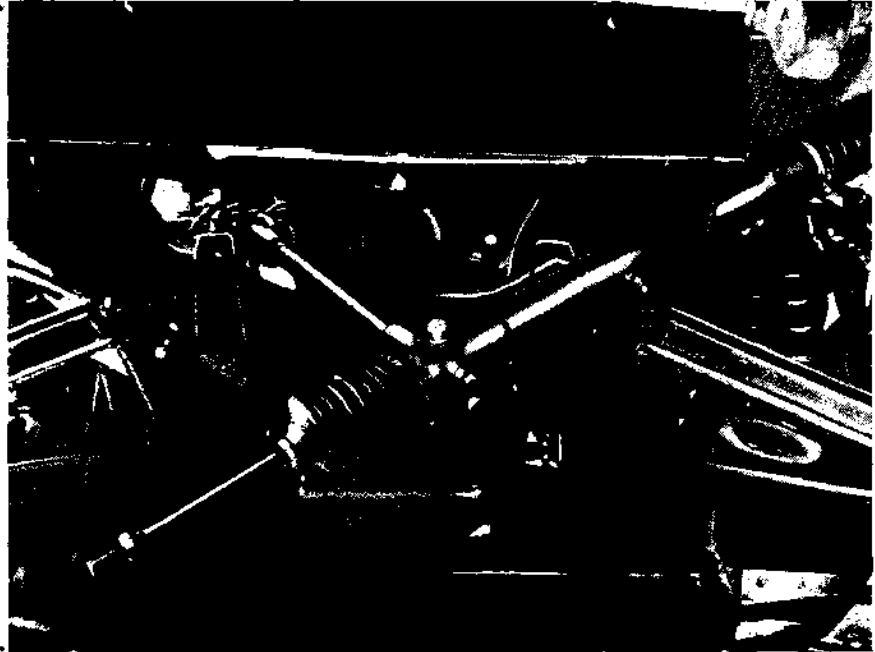
By sliding the complete unit to one side it will be

Hold the rack bar in suitable clamps in a vice, knock back the lock washers and undo the ball joint caps with the special spanner, Tool No. T.114 (see Section Q). The ball seat and shims should now drop out.

Screw out the ball seat housing with a special claw spanner, Tool No. T.113 (see Section Q).

Note.—Should the ball joint caps come away complete with the ball seat housing it will be necessary to dismantle with the use of Tool No. T.122 (see Section Q).

Fig. J.4.
Showing the method of withdrawing the steering gearbox assembly from the front under side of the vehicle.



possible to pull the track-rod, from which the ball end has been removed, through the large hole in the chassis and then the whole unit may be lifted away to the front.

Replacement is a reversal of this process.

Section J.5

DISMANTLING THE STEERING GEARBOX

Undo the clips and remove the concertina rubber dust excluders.

Unscrew the rack damper housing cap and remove the damper spring. The pressure pad can then be lifted away. A number of shims will be found under the cap (see Fig. J.5), which should be kept carefully.

Remove the pinion shaft cap bolts and cap.

Remove the coupling nut and slide off the coupling. Take off the circlip against which the coupling locates.

Withdraw the pinion shaft, holding the gear with the pinion upwards and leaving behind the thrust washer. This thrust washer is trapped behind the rack teeth.

Remove the rack damper and shims and withdraw the rack bar from the housing.

Examination

Fractures in the teeth, hollows or any roughness on the surfaces of the teeth will render the parts unserviceable.

Check the rack bar and pinion shaft in the housing for wear or scoring.

The diameter of the rack bar is 1.121 in. to 1.120 in. (28.47 mm. to 28.45 mm.) and the bore of the housing is 1.136 in. to 1.130 in. (28.85 mm. to 28.7 mm.) at the pinion end and 1.124 in. to 1.126 in. (28.55 mm. to 28.60 mm.) at the other end.

The pinion shaft is .748 in. to .7485 in. (19.00 mm. to 19.01 mm.) diameter at the top and .624 in. to .6235 in. (15.85 mm. to 15.84 mm.) at the bottom. The bore of the housing is .7505 in. to .750 in. (19.06 mm. to 19.05 mm.) and the bore of the cap .6255 in. to .626 in. (15.90 mm. to 15.91 mm.). If a new cap is fitted this will be found to be supplied with an undersize bore and will need reaming in line with the housing with a special reamer, Tool No. T.112 (see Section Q).

J THE STEERING GEAR

Make sure that the oil groove is fitted to the top when reaming.

Check the felt washer and the rubber bellows and renew if necessary.

Examine the steering rod balls and caps for wear and renew as necessary or readjust as detailed later.

Replacement is a reversal of the above process.

Note.—When replacing the pinion shaft see that the thrust washers have their chamfered sides towards the pinion. End float should be .002 in. (.05 mm.) to .005 in. (.13 mm.) and is set by the shims.

The oilway in the cap should be at the top and the damper pad must be adjusted as detailed under J.7.

With the rack in the central position engage the pinion with the arrow uppermost.

Refit the coupling with a coupling bolt in line with the arrow on the shaft. This will ensure that the steering wheel spokes are in the correct position in the car.

Oil all parts before reassembling and refill the box with $\frac{3}{4}$ pint (.4 litre) of lubricant as specified on page P.2 (Ref. B).

Section J.6

ADJUSTMENT OF THE INNER STEERING BALL JOINT

Fit the lock plate and shims and screw home the ball seat housing into the rack bar.

Insert the ball seat.

Screw the ball cap home against its shoulder after inserting the ball-ended tie-rod. The ball should have no play, but must be a free rolling fit. Adjustment can be altered by varying the shims, which are supplied in .003 in. (.08 mm.) and .005 in. (.13 mm.) sizes.

Section J.7

ADJUSTMENT OF THE RACK DAMPER

This is provided to ensure the required amount of damping in the steering tie-rods, and to maintain the minimum of backlash in the gear teeth.

This should be adjusted in the following manner:—

Check the damper spring, which should have a free length of approximately 1.024 in. (26.01 mm.), and should give a load of 80 lb. (36.3 kg.) when compressed to .75 in. (19.05 mm.).

When the steering gearbox is completely assembled, fit the plunger, spring and cap, but omit the shims. Screw down the cap until the plunger bottoms.

Note.—The steering wheel fixing nut should be tightened with a torque spanner set to 500 in./lb. (5.75 m./kg.).

While screwing down the plunger rotate the pinion shaft. When it is felt to just lock the rack bar in the housing the plunger has bottomed. With feeler gauges take a measurement of the gap left and add to this measurement .051 in. (1.30 mm.).

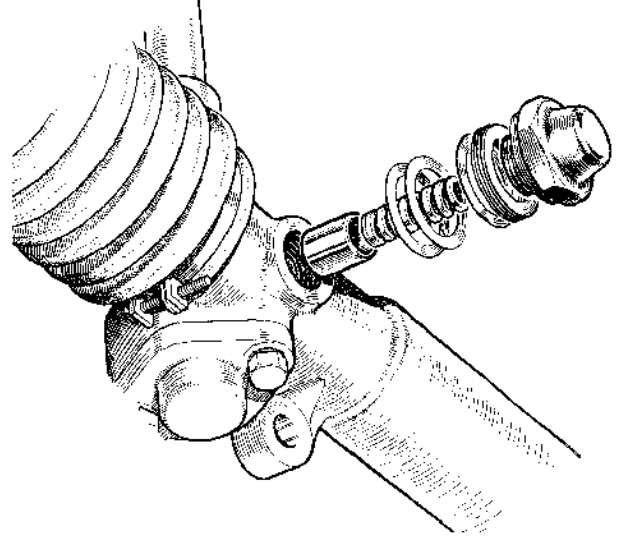


Fig. J.5.
The steering gearbox damper assembly, showing its components.

Select shims to this total amount and insert under the cap. This gives the correct standard pre-load. If, when checked on the road, this is found to be too slack or too tight, it is permissible to decrease the added measurement of .051 in. (1.30 mm.) to .030 in. (.76 mm.) or increase to .070 in. (1.78 mm.).

Section J.8

STEERING ARM BALL JOINTS

If it is found necessary, through slackness, to renew the ball joints on the outer ends of the tie-rods, the complete assembly must be changed, as no adjustment is provided. If necessary, the dirt excluders may be renewed separately.

Section J.9

STEERING BALL SOCKET ASSEMBLY THREADS

Chassis Nos. TF4910 (LH) and TF4760 (RH) onwards are fitted with modified steering ball-end assemblies which incorporate "Unified" threads for the ball-pin nut and for the grease nipple. The threaded bore for the steering tie-rod remains a B.S.F. thread.

SECTION K

FRONT SUSPENSION

General Description.

Maintenance.

- | | |
|------------------|---|
| Section No. K.1 | Checking and adjusting front wheel alignment. |
| Section No. K.2 | Checking the wheel camber, castor angle and swivel pin angle. |
| Section No. K.3 | To measure camber. |
| Section No. K.4 | To measure castor angle. |
| Section No. K.5 | To measure king-pin inclination. |
| Section No. K.6 | Removing the front suspension. |
| Section No. K.7 | To dismantle the swivel pins. |
| Section No. K.8 | Examination of front suspension parts for wear. |
| Section No. K.9 | Hub ball bearings. |
| Section No. K.10 | Replacing the front suspension. |
| Section No. K.11 | Reassembly of swivel pins. |
| Section No. K.12 | Removal and replacement of the brake-drum and hub. |
| Section No. K.13 | Replacement of the front hub. |
| Section No. K.14 | Removing and replacing the front coil spring. |
| Section No. K.15 | Fitting new rubber bushes to lower wishbone inner fulcrum. |
| Section No. K.16 | Grease leakage from front hub. |
| Section No. K.17 | Modified front hub grease cap. |

GENERAL DESCRIPTION

The independent front suspension layout is of the wishbone type, incorporating coil springing. The front wheels follow the road surface without influencing each other, and each wheel is permitted to rise and fall vertically. It gives perfect stability with riding comfort, and by the combination of the direct-acting rack-and-pinion steering gear it also provides light and accurate control under all conditions.

The inner mountings of the lower wishbones are fitted with flexing rubber bearings, which require no lubrication and form a silent and resilient connection to the robust box-section chassis frame cross-member.

The steering swivels, or king-pins, are of a special design, with the top and bottom bearings threaded to provide large bearing areas and absorb both thrust and journal loads. The swivel pin threads are of opposite hand on each side of the car and are therefore not interchangeable. The steering connection from wheel to wheel is provided by the steering gearbox rack bar and two short track-rods, with ball joints at each end. The outer ball joints are fitted with grease gun nipples, but the inner ball sockets are enclosed in the telescopic rubber dust excluders and automatically lubricated from the steering gearbox.

K THE FRONT SUSPENSION

MAINTENANCE

In ordinary maintenance it is unlikely that it will be necessary to do more than attend to replenishment as indicated in Section P.6, and check the front wheel alignment. This is the setting that may be affected by striking high kerbs or similar obstacles.

In view of the importance of maintaining the correct steering geometry the use of special locating jigs as indicated in Fig. K.2 is strongly advised when checking and setting.

Section K.1

CHECKING AND ADJUSTING FRONT WHEEL ALIGNMENT

When checking the track width at the front and the rear of the front wheels, use a suitable trammel, or any special proprietary alignment equipment available.

The wheels should run parallel and have no toe-in. The correct setting is obtained with equal measurements back and front.

See that the tyres are inflated to the correct pressures.

Set the wheels in the straight-ahead position.

Set the arms of a suitable trammel to the height of the hub centre.

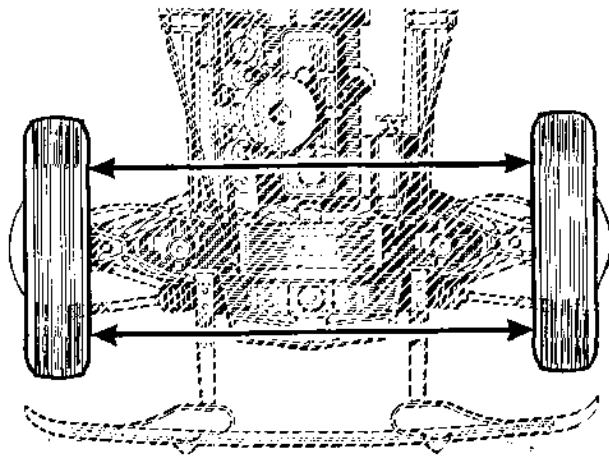


Fig. K.1.

The front wheels should be set so that they are exactly parallel to each other when in the straight-ahead position.

Place the trammel to the rear of the wheels and adjust to the centre of the tyre treads. Chalk the tread of the tyres and mark chalked patch with the trammel vertically. Push the car forward one half-turn of the wheels and take the front reading from the same marks on the tyres.

If adjustment is necessary, proceed as follows :—

Slacken off the locknuts at the ends of the short tie-rods.

By means of the spanner flats on the rods, rotate each of the tie-rods equally in the desired direction. These both have right-hand threads.

Note.—To ensure that the steering gearbox rack is in the central position and that the steering geometry is correct, it is important that the tie-rods are adjusted to exactly equal lengths. This can be ascertained by measuring from the end of the flats to the locknuts.

Section K.2

CHECKING THE WHEEL CAMBER, CASTOR ANGLE AND SWIVEL PIN ANGLE

If, due to accident or collision, it is thought necessary to check the steering angles, we recommend the use of any of the good proprietary equipment available for this purpose, such as the "Dunlop" Wheel Camber, Castor and King-pin Gauge. Each maker provides full instructions on the use of their instrument, to which you should refer.

Section K.3

TO MEASURE CAMBER

In the static position the wheel has no camber (tolerance $\pm 1^\circ$), but from this static position to full bump or rebound the camber changes as a result of the geometry of the suspension.

Ensure that the tyre inflation pressures are correct and that the load on the axle is 9 cwt. 3 qr. (495 kg.).

Make sure also that the wheels are in the straight-ahead position when the check is made.

Repeat this procedure on the other wheel.

Section K.4

TO MEASURE CASTOR ANGLE

In the static position this angle is $2^\circ \pm \frac{1}{2}^\circ$.

Check that the vehicle is on a level surface, that the front wheels are in line with the rear wheels, i.e. in the straight-ahead position, that the tyres are correctly inflated, and that the load on the axle is 9 cwt. 3 qr. (495 kg.).

Section K.5

TO MEASURE KING-PIN INCLINATION

In the static position this angle is 9° , but from full bump to rebound this varies by $1\frac{1}{2}^\circ$, making it important to take the measurements **with the correct load on the axle.**

Note.—To ensure correct checking of the steering angles we recommend the use of locating jigs and jacks. This ensures that the chassis frame is square and in the correct static position. Their method of application is clearly shown in Fig. K.2.

Place the car on a flat surface, remove the rear wheels and drop the frame down onto the screw-type jack (Fig. K.2).

Place the front support under the centre of the front suspension wishbone pivots. Weight down or pull down the front end of the car firmly onto the front support. Use manually operated jacks at the points shown to relieve the tyre grip when swinging the wheels to check the angles and to bring the frame members parallel to the ground surface.

hydraulic damper levers are just clear of the rebound rubbers.

Disconnect the hydraulic brake hoses. (See correct method explained on page M.12.)

Slacken the steering tie-rod nuts and screw the tie-rods out of the steering ball joints by means of the flats on the rods.

Remove the cotters and nuts from the two outer fulcrum bolts. Draw out the bolts and take away the front hub and swivel pin units complete. (Take care of the thrust washers, rubber seals, retainers and fulcrum pins.)

Release the jacks from under the spring pans.

Press down the lower wishbone assemblies and remove the coil springs.

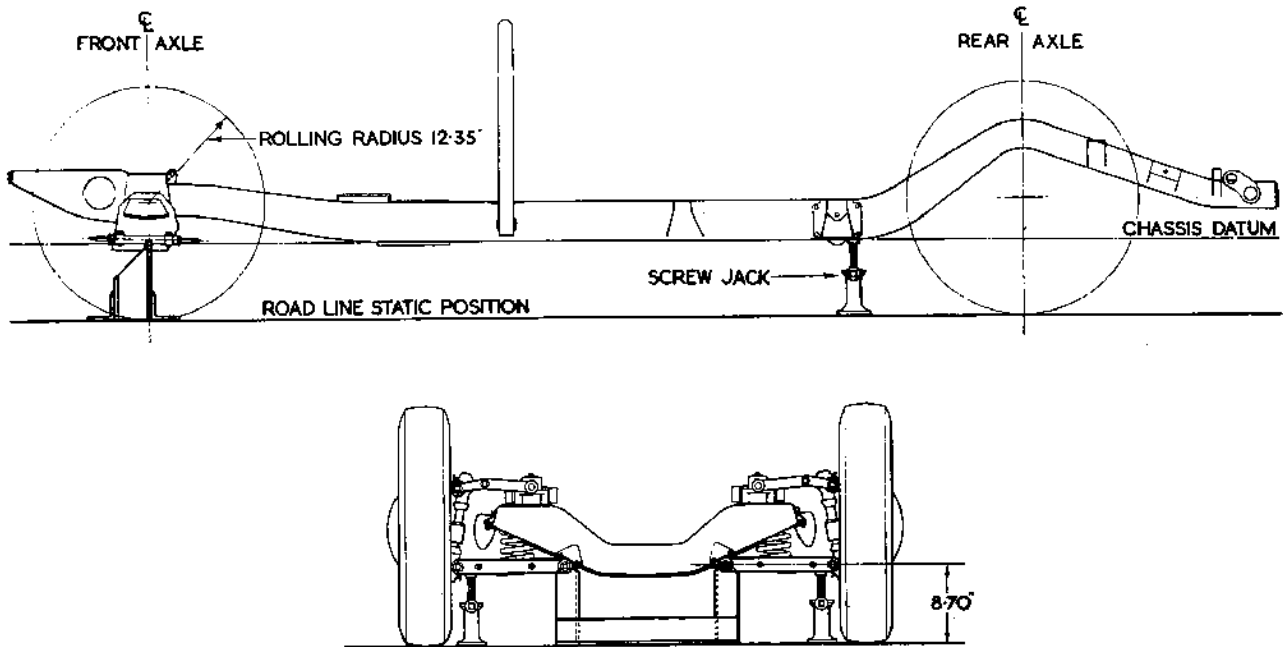


Fig. K.2.

The use of special locating jigs to set the chassis in its correct position for checking the steering geometry is advised to ensure the best results.

Section K.6

REMOVING THE FRONT SUSPENSION

Jack up the front of the car by a suitable jack placed under the centre of the front cross-member, until the front tyres are just clear of the ground.

Remove the front wheels. Block up under chassis.

Place two additional jacks under the spring pans (position as shown in Fig. K.8).

Jack these up, taking some of the weight, until the

Remove the four bolts holding the spring pan to the levers.

Remove the cotters, nuts and washers from the ends of the inner lower fulcrum pin and slide off the levers and the rubber bushes.

Remove the bolts holding the lower fulcrum pins to the chassis cross-member.

Remove the bolts holding the hydraulic dampers to the top of the chassis cross-member.

Inside the outer ends of the front cross-member will be found the coil spring locating plates. These are each attached by one small bolt.

THE FRONT SUSPENSION

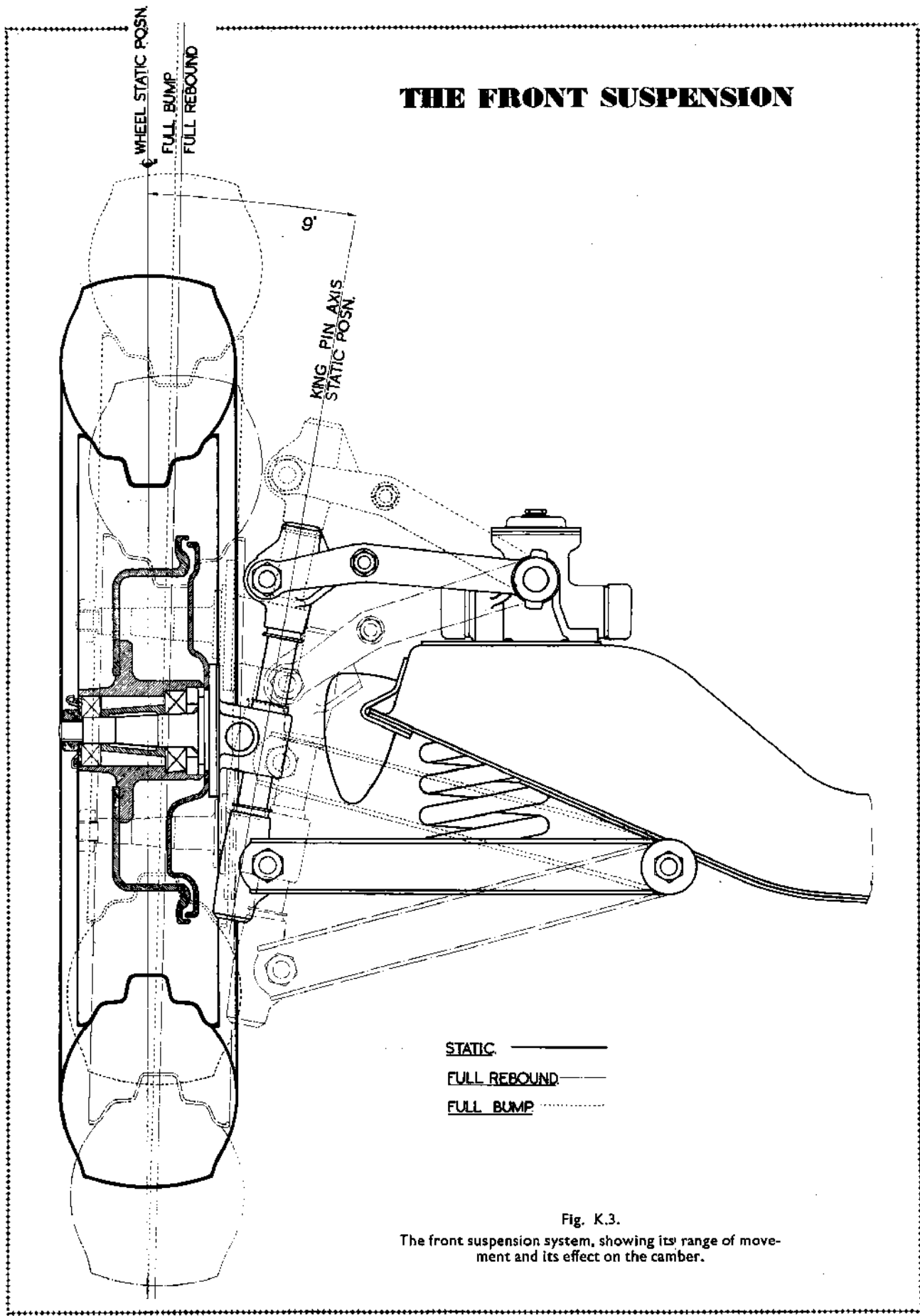


Fig. K.3.
The front suspension system, showing its range of movement and its effect on the camber.

Section K.7

TO DISMANTLE THE SWIVEL PINS

Unscrew the upper and lower links from the ends of the swivel pins. **The left-hand swivel pin has a left-hand thread at each end.**

The stub axle is located by a collar on the swivel pin and the stem of the steering lever engaging a groove in the pin. To separate the two the steering lever must be withdrawn from the stub axle, but this procedure is not advised unless absolutely necessary.

Section K.8

EXAMINATION OF FRONT SUSPENSION PARTS FOR WEAR

The following parts should be examined before reassembly :—

Bushes for bottom wishbone

If these are split or perished, eccentric, or oil-soaked, they should be renewed. A bush in new condition should have the dimensions given in Fig. K.10.

Bottom wishbone

Examine the end holes for elongation and the assembly for looseness. If there is any sign of slackness between the wishbone arms and the pan, separate the components and check the bolt holes for elongation. The bolt holes are $\frac{3}{4}$ in. (8.33 mm.) dia.

Coil spring

Examine for cracks and check for tension, if necessary, to details below. Renew the springs if they are defective.

Free length	...	...	9.59 in. $\pm \frac{1}{16}$ in.
Loaded to 1,095 lb. (496.7 kg.)			6.44 in. $\pm \frac{1}{32}$ in.

Swivel link assemblies

Check the swivel links. The dimension across the thrust faces should be 2.327 in. ± 0.015 in. (59.11 mm. ± 0.4 mm.). If these are appreciably worn the assembly of link and bush should be renewed. If the bush only is worn, a new one should be pressed in and reamed and burnished to .750 in. ± 0.005 in. (19.05 mm. ± 0.1 mm.).

Note.—When pressing in this bush see that the hole in the bush faces the threaded bore. (See Fig. K.4.)

Check the threaded bores on the swivel pins. When new, these are a free turning fit without slack. An appreciable amount of slack is permissible in these threaded bearings and they do not require renewal unless they are very slack.

Check the fulcrum pin distance tubes for scoring or wear. These should be 2.337 in. ± 0.015 in. (59.36 mm. ± 0.4 mm.) long by .7485/.7480 in. (19.01 mm./19.00 mm.) diameter.

Examine the case-hardened thrust washers for ridges ; the faces should be flat and parallel within .0005 in. (.01 mm.).

The thickness should be .068 in./0.066 in. (1.73 mm./1.68 mm.), the bore .510 in./0.505 in. (12.95 mm./12.83 mm.) and the outside dia. 1.25 in. (31.75 mm.).

When the swivel links, distance tubes and thrust washers are assembled, the **total** end clearance between the link and the thrust washers should be .008 in. to .013 in. (.2 mm. to .33 mm.). (See "A," Fig. K.4.)

Check that all grease nipples are clear.

Examine the rubber seals, and if these are perished or split, renew them.

Section K.9

HUB BALL BEARINGS

As far as possible, bearings which come under review during the overhaul of the car should be cleaned and inspected without being withdrawn from the housings to which they are fitted. Unnecessary withdrawal causes deterioration of the fitting surfaces, and may damage the bearing, whereas if bearings are examined in position and found still to be serviceable, they can be left undisturbed with advantage.

Rust on the exterior surfaces of the bearing is not detrimental unless the fit is affected, but if the tracks, balls or rollers are severely pitted, the running life of the bearing is at an end and a new one should be fitted.

Ball bearings should be cleaned thoroughly with paraffin. Bearings which have been washed in this manner should be rinsed thoroughly and dried, and should be immersed in mineral oil as soon as possible after they have been examined.

After cleaning, bearings should be examined for cracks in the races, chipped or broken balls, and worn or damaged tracks or cages.

If either race is cracked or chipped, or if the tracks have spalled or flaked, the bearing should be scrapped.

Section K.10

REPLACING THE FRONT SUSPENSION

Bolt up the coil spring top locating plates inside the front cross-member.

Bolt on the hydraulic dampers.

K THE FRONT SUSPENSION

The dampers are interchangeable from side to side. Bolt up the lower fulcrum pins. The two rear inner bolts have their nuts uppermost and the six other bolts have their nuts below.

Fit the rubber bushes into the lower levers. These bushes will be found to be quite a loose fit in the lever, but when clamped up by the nut and washer will expand into their housing. These bushes do not rotate on their surfaces, the angular movement being taken up by the rubber itself flexing.

Special care should be taken when assembling these bushes to maintain a central location, so that the expansion of each half of the bush is equal.

To attain this insert each bush so that it protrudes equally each side of the housing (see Fig. K.5), and then clamp up with the washer and nut and fit the cotter pins. When central, the outer flanges of the bushes should all be of equal proportions.

It is essential to clamp up the bushes when the lower suspension levers are set parallel with the ground to ensure even stresses on the bushes in service.

Fit the spring pans between the levers, but with the heads of the bolts inside the spring pan.

Do not tighten up the spring pan bolts solid, but leave them half a turn slack.

Press down the lower wishbone assemblies.

Smear each end of the coil springs with grease to prevent any slight squeaking in operation.

Push the coil springs up into the cross-member and over the locating plates.

Jack up the lower wishbone assemblies to the position shown in Fig. K.2 until they are approximately parallel to the ground.

Assemble the hub units and swivel pins as detailed in Sections K.11 and K.13.

Note.—The stub axle and nut is right-hand thread for the right-hand side and left-hand thread for the left-hand side.

The king-pin bearing threads are also right-hand thread for the right-hand side and left-hand thread for the left-hand side.

Fit the front hub units to the suspension levers.

Ensure that the thrust washers, rubber seals and

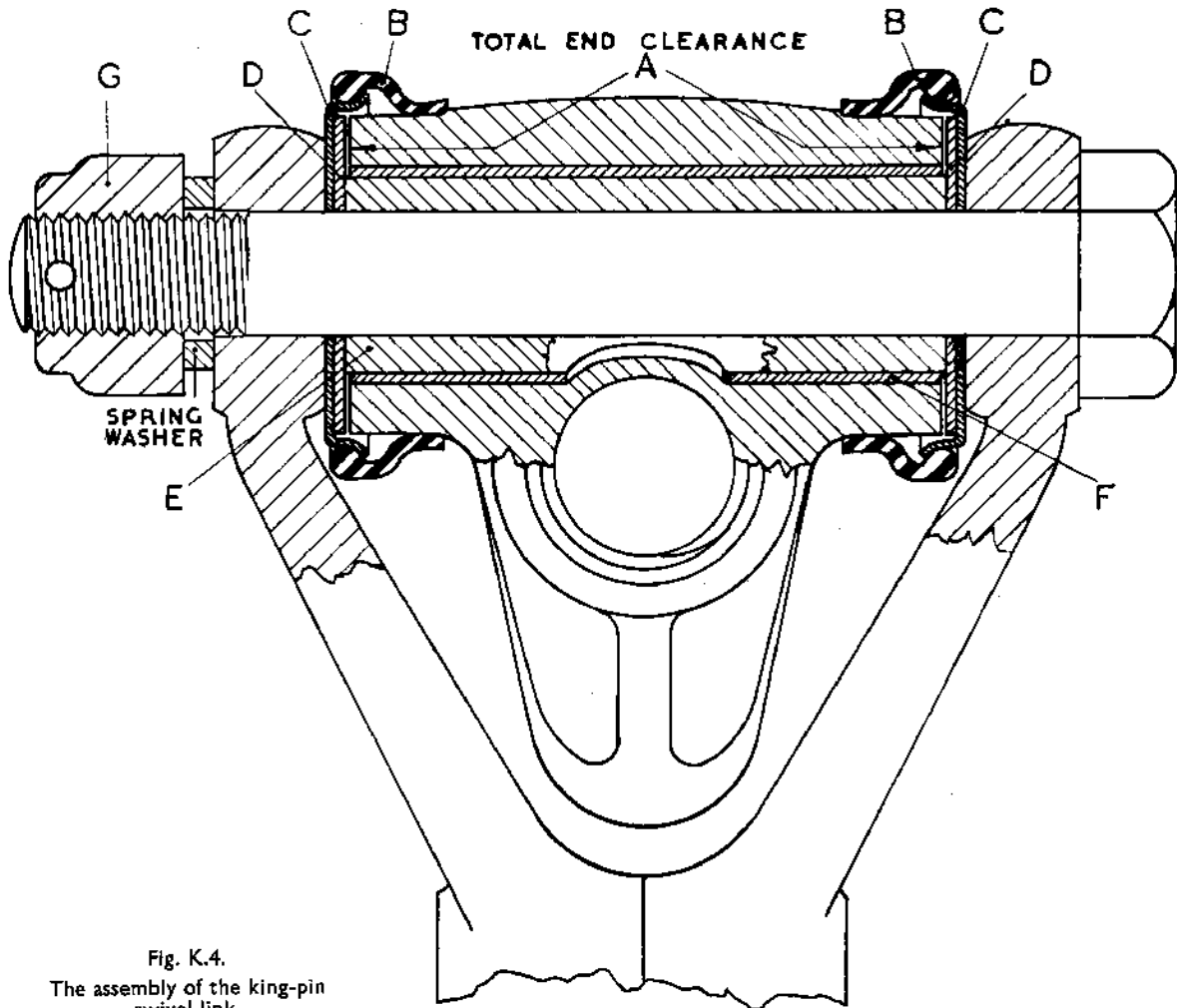


Fig. K.4.
The assembly of the king-pin swivel link.

retainers are assembled in the right order. (See Fig. K.4.)

Lubricate these parts and the fulcrum pins during assembly and again afterwards with the grease gun, using the recommended lubricant as detailed on page P.2.

Do not tighten up the top or the bottom slotted nuts solid, but leave them half a turn slack.

Connect up the hydraulic brake hoses. See correct method as explained on page M.12.

Screw the steering tie-rods into the outer steering ball joints. Screw the rods right in and then slack off five complete turns. This will give a rough wheel alignment and render subsequent accurate alignment easier.

Bleed and adjust the front brakes as detailed in Sections M.2 and M.3.

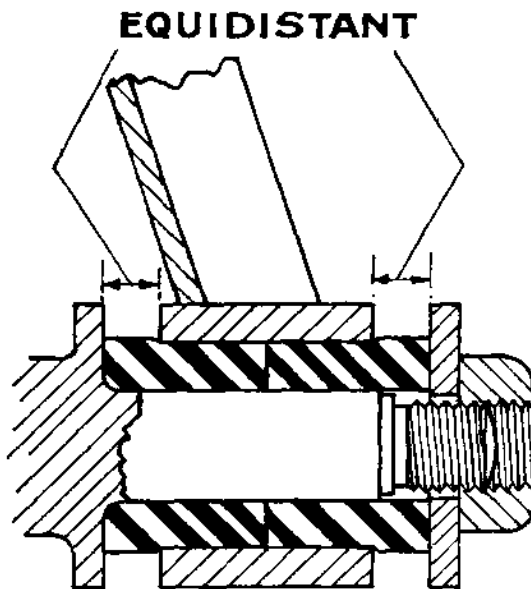


Fig. K.5.

The correct method of clamping the rubber bushes of the lower suspension arm.

Fit the front wheels.

Bounce the front end of the car up and down a few times. This allows the suspension fulcrums to settle down.

Now tighten the spring pan bolts and then tighten and cotter up the outer fulcrum bolts.

Check and adjust the front wheel alignment as detailed in Section K.1.

Section K.11

REASSEMBLY OF SWIVEL PINS

The swivel pin assembly may be reassembled without difficulty by carrying out the removal instructions in

the reverse order, provided the following points are given special attention :—

1. The swivel pin and links fitted to the left-hand side of the car have left-hand threads at each end and those fitted to the right-hand side have right-hand threads.
2. The swivel pin links screw onto threads on each end of the swivel pin and the threads are waisted at their centre to avoid fouling the pivot bolts passing through the links. Before the pivot bolt is replaced the link must be correctly positioned on the thread.

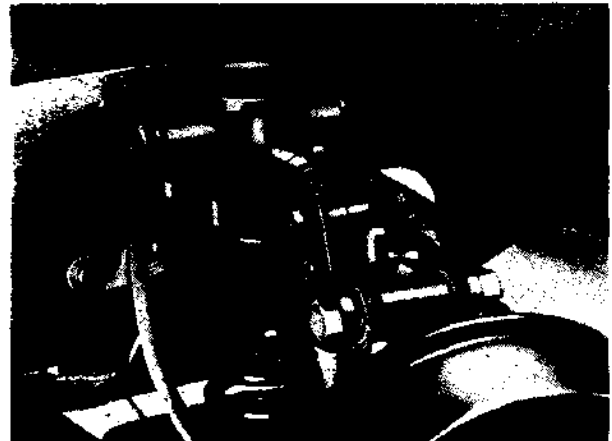


Fig. K.6.

The upper suspension arm assembly.

First screw the link onto the swivel pin until the waisted portion of the pin lines up with the pivot bolt hole.

Place the pivot bolt in position in the link and screw the link to the extent of its maximum travel on the swivel pin thread; this is about three revolutions total. Screw the link back approximately one and a half times to obtain the maximum clearance for the pivot pin in each direction.

If the brake plate has been removed from the swivel pin assembly, the lower link must also be centralised in a similar manner before the brake plate is replaced and before the swivel pin is fitted to the suspension arm.

3. Before the lower steering knuckle link is bolted in position ensure that both thrust washers and rubber seals are fitted correctly (see Fig. K.4) and make sure that the links have a total end clearance of .008 in. to .013 in. (.2 mm. to .33 mm.) between the end faces of the link and the thrust washers.

Note.—Make sure to locate the lower link assembly correctly because it cannot be set once the brake back plate is fitted.

K THE FRONT SUSPENSION

Section K.12

REMOVAL AND REPLACEMENT OF THE BRAKE-DRUM AND HUB

Prise off the hub cover by inserting the flattened end of the wheel nut spanner in the depressions provided adjacent to the cover holding studs and giving a side-ways twist—not a radial movement.

Slacken the wheel stud nuts.

Raise the car until the wheel to be operated on is clear of the ground.

Unscrew the stud nuts and remove the wheel.

The brake-drums are attached to the wheel hubs by countersunk-headed screws, the inner ends of which



Fig. K.7.

Removing the front hub inner bearing with an extractor.

are riveted over. These screws must not be disturbed and a complete brake-drum and hub assembly must be used for replacement. The brake-drum, complete with hub, must be removed to give access to the brake-shoes. In some cases the hub and brake-drum are cast in one piece.

Remove the split pin from the stub axle nut and unscrew the nut, remembering that the axle on the left-hand side of the car has a left-hand thread.

Remove the grease retaining disc and felt washer.

Place the hub extractor (Special Tool, Part No. 68822) in position over the wheel studs and replace the stud nuts to retain it in position. Use the central extractor screw to withdraw the brake-drum and hub assembly.

The inner ball race bearing spacer and oil seal will remain on the stub axle and must be withdrawn with the aid of a separate extractor of the type shown in

K.8

Fig. K.7; this is the special service extractor Part No. 68895 (see Section Q). Care must be taken not to damage the oil seal at the rear of the bearing.

Important.—When the front hub has been removed the inner bearing, oil seal and hub distance washer **must** be removed from the stub axle and replaced in the hub before it is refitted to the stub axle. If the hub is pressed on the shaft without first fitting the bearing and oil seal to it, the inner bearing will re-enter its housing but the oil seal will only be pushed farther from its correct position.

Section K.13

REPLACEMENT OF THE FRONT HUB

If all grease has been cleaned from the hub and the bearings washed for examination, ensure that they are repacked with grease before the hub is reassembled.

Replace the bearing spacer with the chamfered side towards the small outer bearing and then press the large bearing into position. Replace the oil seal and

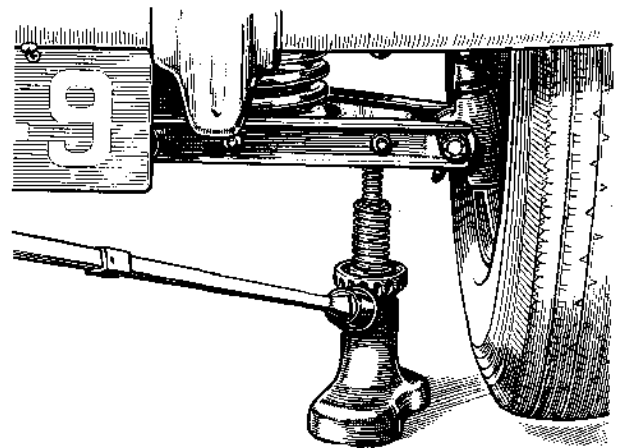


Fig. K.8.

The correct location of the jack when jacking up the front suspension.

distance washer. The metal face of the oil seal and the recessed side of the distance washer are fitted away from the bearing.

Replace the hub on the stub axle shaft and fit a new felt washer. Refit the grease retainer and replace and tighten the hub nut.

Section K.14

REMOVING AND REPLACING THE FRONT COIL SPRING

Jack up the front end of the car until the wheels are clear of the ground, using a suitable jack placed under the centre of the front cross-member.

Remove the front wheel on the side affected.

Place an additional jack under the lower spring pan in the position shown in Fig. K.8 and jack up until the hydraulic damper levers are clear of the rebound rubber.

Remove the lower fulcrum bolt.

Swing up the hub unit and rest on a suitable block.

Release the jack from under the spring pan, press down the lower wishbone assembly and remove the coil spring.

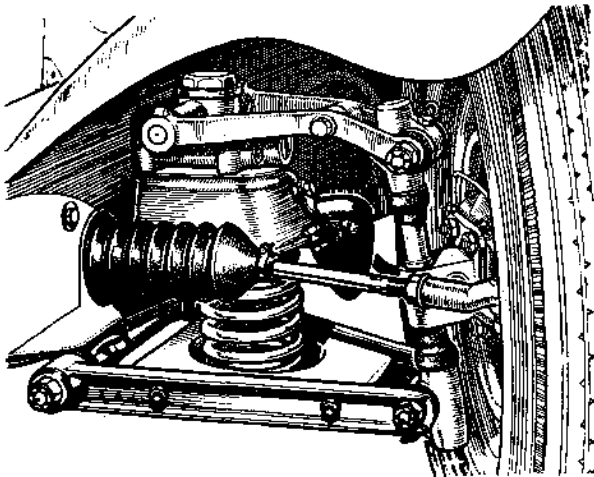


Fig. K.9.
The front suspension assembly.

Replacement is carried out in the reverse manner to that detailed for removal.

Note.—Take care that the thrust washers, rubber seals and retainers are assembled in the right order. (See Fig. K.4.)

Lubricate these parts and the fulcrum pins during and after assembly with the grease gun.

Smear each end of the coil spring with grease.

Section K.15

FITTING NEW RUBBER BUSHES TO LOWER WISHBONE INNER FULCRUM

Remove the coil springs as detailed in Section K.14.

Remove the four bolts holding the spring pan to the levers.

Remove the cotters, nuts and washers from the ends of the inner lower fulcrum pin and slide off the levers and the rubber bushes.

Fit the new rubber bushes into the levers. These will be found to be quite a loose fit in the lever, but when clamped up by the nut and washer will expand into their housing. These bushes do not rotate on their surfaces, the angular movement being taken by

the rubber deflecting torsionally in itself. Special care should be taken when assembling these bushes to maintain a central location, so that the expansion of each half of the bush is equal.

To attain this, insert each bush so that it protrudes equally each side of the housing (see Fig. K.5), and then clamp up with the washer and nut. When central, the outer flanges of the bushes should be of equal proportions.

It is essential to clamp up the bushes when the suspension levers are set parallel with the ground to ensure even stresses on the bushes.

Now fit the spring pan between the levers, but with the heads of the bolts inside the spring pan.

Do not tighten up the spring pan bolts solid, but leave them half a turn slack.

Press down the lower wishbone assembly.

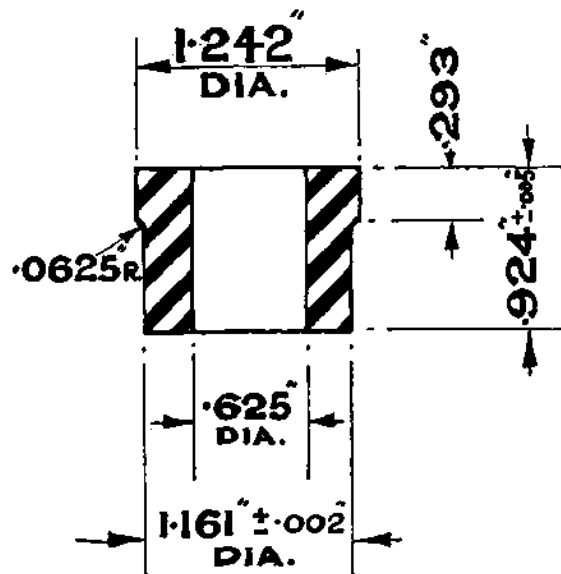


Fig. K.10.
The dimensions of the lower wishbone bushes when in new condition.

Smear each end of the coil spring with grease, and push the spring up into the front cross-member and over its top locating plate.

Jack up the lower wishbone assembly until it is approximately parallel to the ground.

Swing down the hub unit and fit the lower fulcrum bolt.

Note.—Take care that the thrust washers, rubber seals and retainers are assembled in the right order. (See Fig. K.4.)

Lubricate these and the fulcrum pin during and after assembly with the grease gun.

Remove the jack from under the wishbone assembly.

Finally tighten up the spring pan bolts, and insert the split cotter pins in all castellated nuts.

K THE FRONT SUSPENSION

Section K.16

GREASE LEAKAGE FROM FRONT HUB

The front hubs on earlier models have been subject to grease leakage from the outside felt, and later cars have a grease cap fitted to the hub end which eliminates this trouble.

For existing cars without grease caps a special service cap is available which is retained in position by a spring and provided with a rubber sealing gasket, as indicated in Fig. K.11.

The Service Parts for this conversion, per car, are as follow:—

500196	Seal	...	...	...	2 off
500195	Grease retainer cap	...	...	...	2 off
500198	Spring clip	...	...	...	2 off
434/F	Split pin ($\frac{1}{8}$ in. \times $1\frac{1}{8}$ in.)	...	...	...	4 off
500328	Washer	...	...	...	2 off
500197	Distance tube	...	...	...	2 off

(for one-piece hub and drum only).

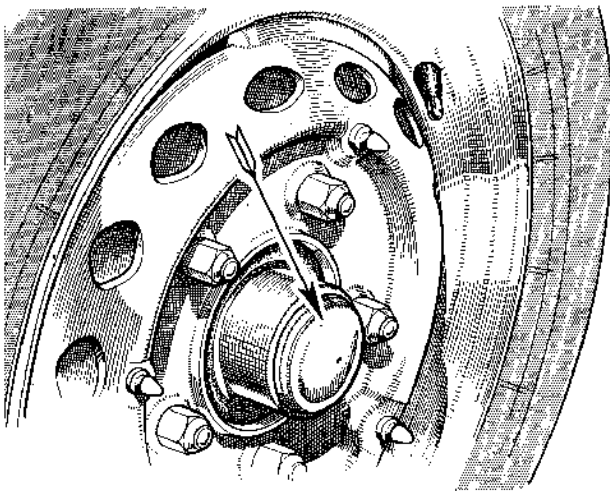


Fig. K.12.

The modified grease retaining cap fitted to the front hub of later models.

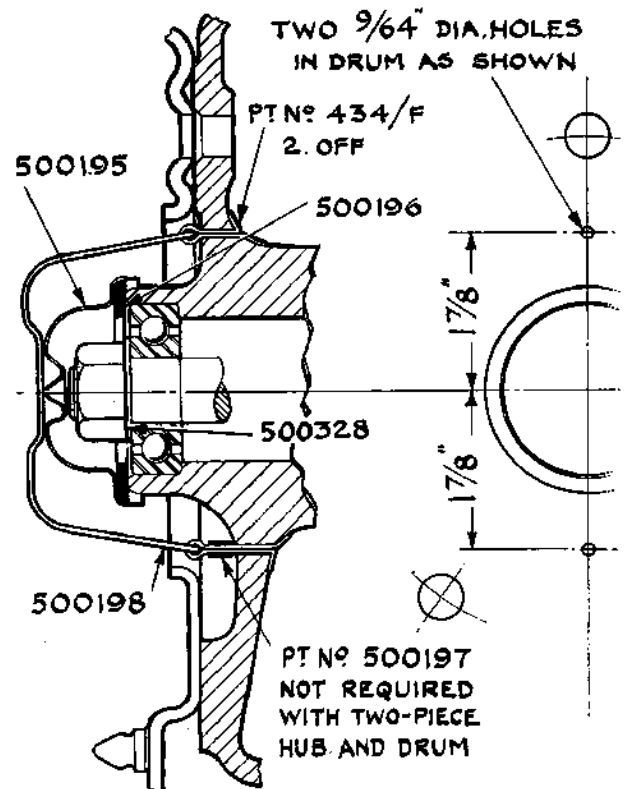


Fig. K.11.

The method of fitting the oil seal on the front hub of early models.

Section K.17

MODIFIED FRONT HUB GREASE CAP

Later models are provided with grease caps which are a push fit on the end of the front hubs, and these have to be prised off carefully for replenishment with grease at intervals of 6,000 miles (10,000 km.). Use one of the greases recommended under Ref. C (page P.2).

SECTION L

THE HYDRAULIC DAMPERS

Description.

Maintenance.

Section No. L.1	Replenishing.
Section No. L.2	Removal and replacement of rear hydraulic dampers.
Section No. L.3	Removal of front dampers.
Section No. L.4	Testing the hydraulic dampers.
Section No. L.5	Replacement of rear damper link bearings (Girling).
Section No. L.6	To dismantle the links (Girling).
Section No. L.7	Fitting new bearings to lever arm and lever arm link (Girling).
Section No. L.8	Damper settings.

DESCRIPTION

The hydraulic dampers are double acting, resistance being offered to the compression and to the recoil of the road springs. They are of either Girling or Armstrong manufacture.

MAINTENANCE

The maintenance of the hydraulic dampers, when in position on the vehicle, is confined to periodical replenishment and examination of the anchorage to the chassis, the fixing bolts being tightened as required. The renewal of the bearings requires the removal of the hydraulic dampers from the chassis, but replenishment can be carried out with the dampers either in position on the chassis or removed. No adjustment of the hydraulic dampers is required or provided. They are accurately set before leaving the Works to give the amount of damping most suitable for the car. **Any attempt to dismantle the piston assembly by removing the caps will seriously affect the operation and performance.**

Section L.1

REPLENISHING

Every 12,000 miles or 20000 kilometres the hydraulic dampers should be topped up by removing the filler plug and filling up to the bottom of the filler plug hole with **Girling or Armstrong official piston-type**

hydraulic damper fluid, according to the dampers fitted.

Before removing the filler cap, which is located on the top of the damper, carefully wipe the exterior, as it is of utmost importance that no dirt whatever enters through the filler hole.

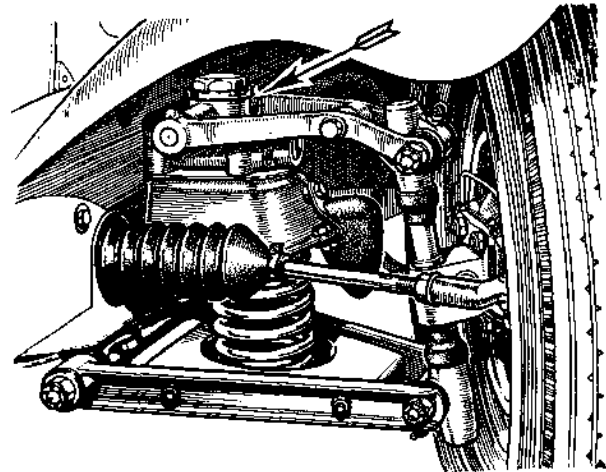


Fig. L.1.

The location of the filler for the front hydraulic dampers (Girling type).

On no account neglect the operation of "topping up," because if the low-pressure chamber of the unit is allowed to become empty, air will enter the pressure cylinders and the action of the damper will be impaired.

L THE HYDRAULIC DAMPERS

Section L.2

REMOVAL AND REPLACEMENT OF REAR HYDRAULIC DAMPERS

Jack up the rear of the car and remove the road wheel.

Remove the nut and spring washers securing the damper arm to the bracket on the rear axle.

Remove the two nuts and spring washers from the two bolts securing the damper to the chassis side-member.

Slide back the two bolts and withdraw the damper.

Replacement is carried out in the reverse manner to that detailed for removal, but before fitting the

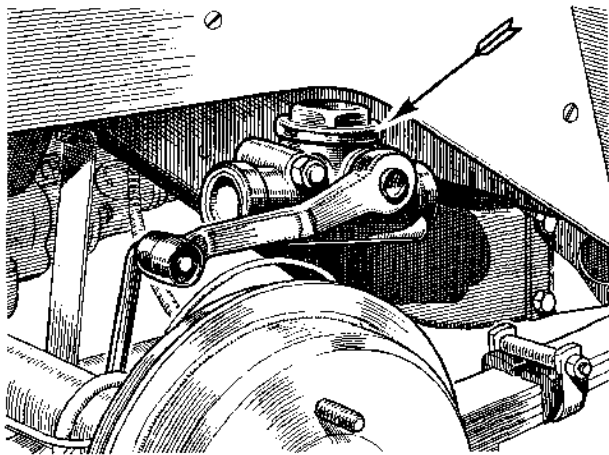


Fig. L.2.

The rear damper. The arrow indicates the filling plug on the Girling type.

link to the bracket on the axle, it is advisable to work the lever arm a few times, up and down, through its full stroke.

As these dampers are used through nearly the complete available angle of movement, it is advisable when replacement dampers are fitted to check the angle of the lever travel. If the levers have been removed from their splines and replaced in the incorrect position, a foul may occur within the damper mechanism when the car is driven.

Note.—When handling hydraulic dampers that have been removed from the chassis for any purpose, it is important to keep the assemblies upright as far as possible, otherwise air may enter the operating chamber, resulting in free movement.

Section L.3

REMOVAL OF THE FRONT DAMPERS

Jack up the car under the lower wishbone pan till the wheel is clear of the ground on whichever side it is wished to remove the damper.

Remove the wheel and detach the top pivot bolt for the swivel pin. Swing out the hub unit clear of the upper wishbone and support it on a suitable stand to prevent straining the brake hose. Then unscrew the four set screws holding the damper to the chassis frame.

Section L.4

TESTING THE DAMPERS

If the hydraulic dampers do not appear to function satisfactorily, the resistance may roughly be checked by bouncing each corner of the car up and down. A uniform movement indicates that no attention is required, but if the resistance is erratic or free movement of the car is felt, the damper should be removed for checking and topping up.

To remove the rear hydraulic dampers from the chassis see Section L.2.

Indication of their resistance can be obtained by carrying out the following check.

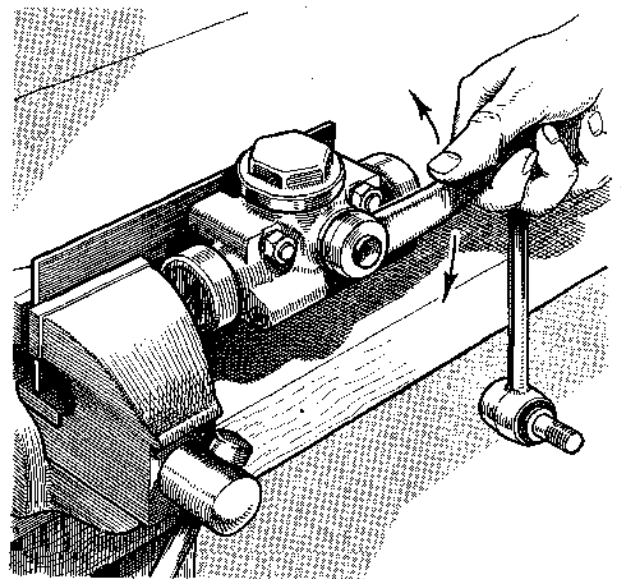


Fig. L.3.

The dampers should be tested for correct action by bolting them to a plate held in a vice and moving the arm through its full range.

Bolt the damper to a plate held in a vice. This will avoid distortion of the cylinder body. The damper must be held in an upright position.

Move the lever arm up and down through its complete stroke. A moderate resistance throughout the full stroke should be felt. If the resistance is erratic, and free movement in the lever arm is noted, it may indicate lack of fluid.

While adding fluid the lever arm must be worked throughout its full stroke to expel any air that may be present in the operating chamber.

If the addition of fluid gives no improvement a replacement damper should be fitted.

Too much resistance, i.e. when it is not possible to move the lever arm by hand, indicates a broken internal part or a seized piston.

Section L.5

REPLACEMENT OF THE REAR DAMPER LINK BEARINGS (GIRLING)

Special tools, as shown in Figs. L.4 and L.5, are necessary for fitting the bearings, and a hand press or equivalent apparatus such as a drilling machine should be available.

Tight rubber bearings of the flexing type are used between the link and the lever arm, and to connect the link to the axle.

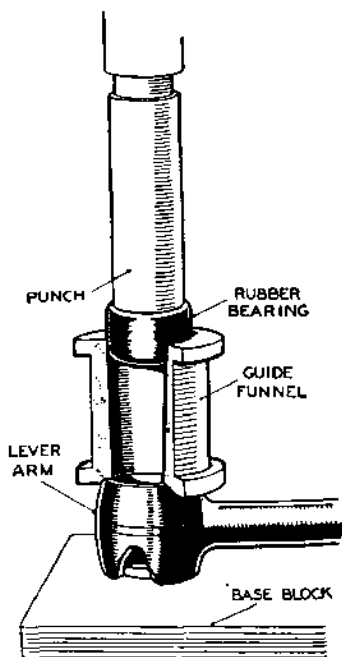


Fig. L.4.

Assembling the bearing to the lever arm end.

Section L.6

TO DISMANTLE THE LINKS (GIRLING)

Before dismantling the link from the lever arm, the position in which it is attached should be noted. The cranked end of the "L"-shaped link is fitted from the outside of the lever arm, with the assembled pin at the other end of the link, also facing outwards from the hydraulic damper movement.

Care should be taken to reassemble the links the correct way round or it will be impossible to connect them to the axle on refitting to the chassis.

Disconnect the link from the lever arm by pressing out the end of the link from the rubber bearing of the lever arm, and press out the rubber bearing from the lever arm. The lever arm is a permanent fixture and must not be removed.

Press out the pin and the rubber bearing in the end of the link.

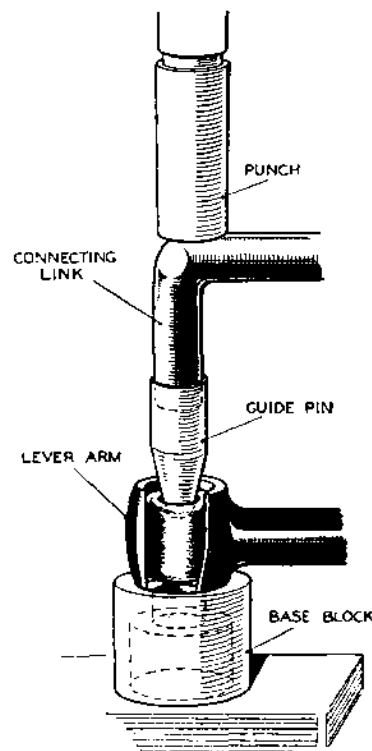


Fig. L.5.

The method of fitting the link to the lever arm of the rear dampers.

Section L.7

FITTING NEW BEARINGS TO THE LEVER ARM AND LEVER ARM LINK (GIRLING)

Wash out the boss end of the lever arm to remove any dirt or grease.

Rest the end of the lever arm on the base block. It will be noted from Fig. L.5 that this block is different from that used for the assembly of the rubber bearing.

Smear the bore of the rubber bearing with petroleum jelly.

Fit the connecting link into the guide pin as shown in Fig. L.5 and insert the assembly, guide first, into the rubber and, with a quick action, force the guide

L THE HYDRAULIC DAMPERS

tool, together with the connecting link, into the assembled rubber bearing.

Remove the guide pin through the base block tool.

The pin is fitted to the connecting link in a similar manner.

Section L.8

THE DAMPER SETTINGS

As it is essential for the dampers to apply the correct restraining action on the suspension, they should be checked whenever there is any doubt regarding their functioning.

For this purpose we give the initial settings for the dampers so that an accurate check can be made when required.

The arms should not be removed from the dampers at any time as it is essential that they should be assembled to the damper shaft in the right relation to the damper cam lever so that there is the full range of movement on either side of the centre line.

It must be clearly understood that there is no provision for adjusting the setting of the dampers, and if they are in any way defective they must be returned to the manufacturers for attention.

FRONT DAMPERS (Series "TD")

Range of movement

35 degrees either side of centre line.

Rebound stroke setting

20 degrees per sec. at 400 lb./in. (4.6 m./kg.) torque at a temperature of 18° C. (65° F.).

(Weight applied at end of 8 in. (20.32 cm.) arm = 50 lb. (22.67 kg.))

Compression stroke setting

20 degrees per sec. at 200 lb./in. (2.3 m./kg.) torque at a temperature of 18° C. (65° F.).

(Weight applied at end of 8 in. (20.32 cm.) arm = 25 lb. (11.34 kg.))

REAR DAMPERS (Series "TD")

Range of movement

35 degrees either side of centre line.

Rebound stroke setting

20 degrees per sec. at 400 lb./in. (4.6 m./kg.) torque at a temperature of 18° C. (65° F.).

(Weight applied at end of 6 in. (15.24 cm.) arm = 66 lb. 11 oz. (30.27 kg.))

Compression stroke setting

20 degrees per sec. at 250 lb./in. (2.9 m./kg.) torque at a temperature of 18° C. (65° F.).

(Weight applied at end of 6 in. (15.24 cm.) arm = 41 lb. 11 oz. (18.93 kg.))

FRONT DAMPERS (Series "TF")

Rebound stroke setting

1,000 ± 100 (11.6 m./kg. ± 1.16 m./kg.) torque at 180°/sec.

Mean lever arm speed :

20°/sec. at 250 ± 50 lb./in. (2.9 m./kg.) torque at a temperature of 18° C. (65° F.).

(Weight applied at end of 8 in. (20.32 cm.) arm = 31.25 lb. (14.171 kg.))

Compression stroke setting

500 ± 50 lb./in. (5.8 ± 5.8 m./kg.) torque at 180°/sec.

Mean lever arm speed :

20°/sec. at 250 ± 50 lb./in. (2.9 ± 5.8 m./kg.) torque at a temperature of 18° C. (65° F.).

(Weight applied at end of 8 in. (20.32 cm.) arm = 31.25 lb. (14.171 kg.))

REAR DAMPERS (Series "TF")

Rebound stroke setting

1,100 ± 110 lb./in. (12.76 ± 1.27 m./kg.) torque at 180°/sec. Mean lever arm speed :

20°/sec. at 250 ± 50 lb./in. (2.9 m./kg.) torque at a temperature of 18° C. (65° F.).

(Weight applied at end of 5 ³/₁₆ in. (13.17 cm.) arm = 49.2 lb. (22.3 kg.))

Compression stroke setting

450 ± 45 lb./in. (5.22 ± 5.2 m./kg.) torque at 180°/sec.

Mean lever arm speed :

20°/sec. at 250 ± 50 lb./in. (2.9 ± 5.8 m./kg.) torque at a temperature of 18° C. (65° F.).

(Weight applied at end of 5 ³/₁₆ in. (13.17 cm.) arm = 49.2 lb. (22.3 kg.))

SECTION M

THE BRAKING SYSTEM

General Description.

Maintenance.

The Master Cylinder.

Section No. M.1	Adjustment of the brake pedal.
Section No. M.2	Brake-shoe adjustments.
Section No. M.3	To bleed the system (expel air).
Section No. M.4	Removal of the master cylinder.
Section No. M.5	Dismantling the master cylinder.
Section No. M.6	Assembling the master cylinder.
Section No. M.7	Replacing the master cylinder.
Section No. M.8	Brake assembly.
Section No. M.9	Removal of the wheel cylinder.
Section No. M.10	Dismantling the wheel cylinder.
Section No. M.11	Assembling the wheel cylinder.
Section No. M.12	Replacement of the wheel cylinder.
Section No. M.13	Removal of the flexible hose.
Section No. M.14	Removal and replacement of the brake-shoes.
Section No. M.15	Relining the brake-shoes.
Section No. M.16	Brake fluid.
Section No. M.17	The hand brake.
Section No. M.18	Rear brake pipes.
Section No. M.19	Braking irregularities and their causes.

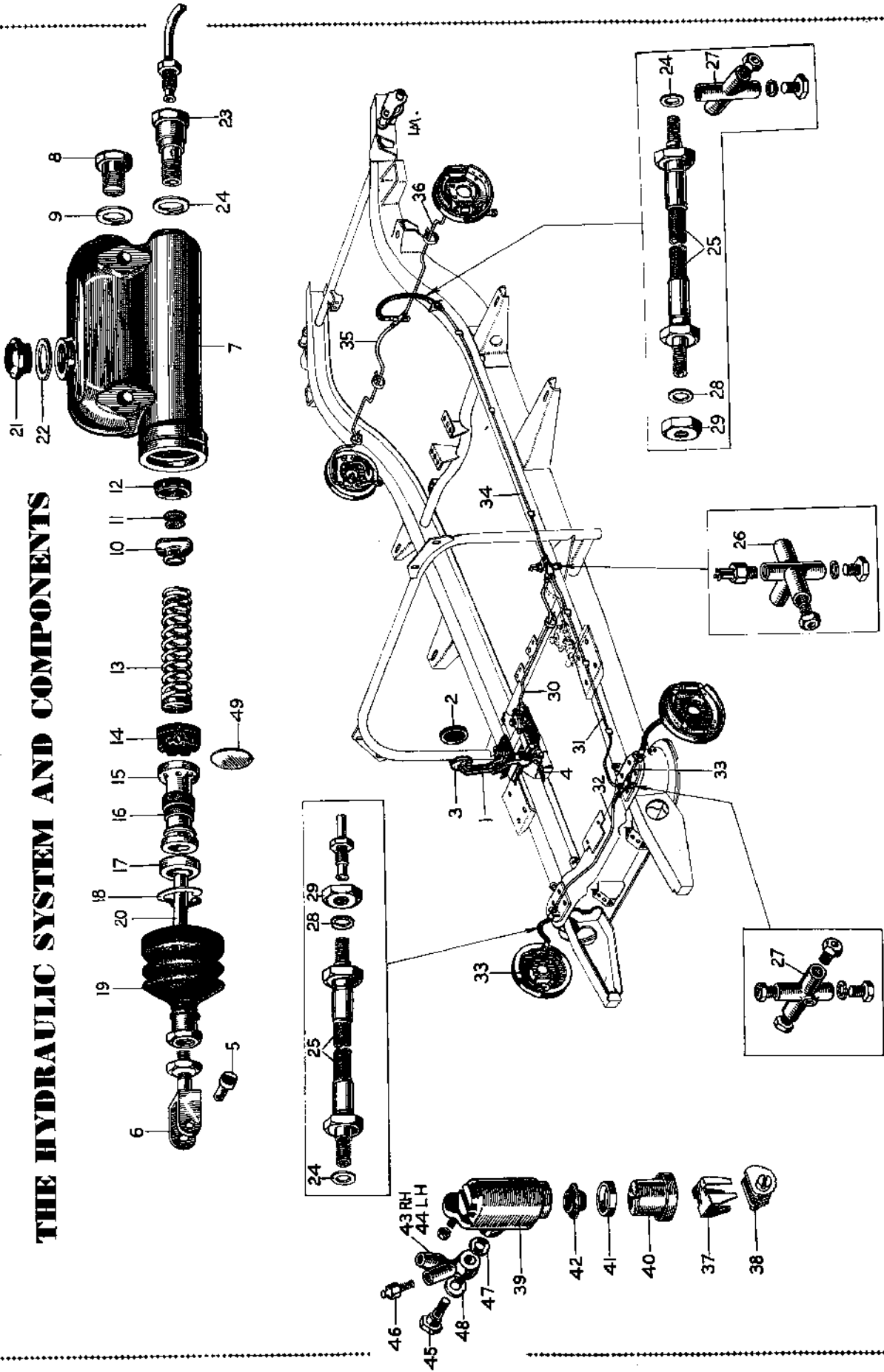
GENERAL DESCRIPTION

The Lockheed hydraulic brake operating equipment comprises a combined fluid supply tank and master cylinder in which the hydraulic pressure is generated, and wheel cylinders which operate the brake-shoes.

Steel pipe lines, unions and flexible hoses convey the hydraulic pressure from the master cylinder to each wheel cylinder.

Each brake-shoe on the front wheels has a separate wheel cylinder, thus providing two leading shoes. On the rear wheels a single wheel cylinder, operated both hydraulically and mechanically, floats on the brake plate and operates the two shoes, giving one leading and one trailing shoe in either direction of rotation to provide adequate braking in reverse.

THE HYDRAULIC SYSTEM AND COMPONENTS



KEY TO THE HYDRAULIC SYSTEM AND COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Brake pedal and bush.	18.	Clirclip—stop.	34.	Pipe (4-way to rear hose).
2.	Pad—rubber—brake pedal.	19.	Boot—master cylinder.	35.	Pipe (axle hose bracket to R/H rear).
3.	Pad—brake pedal.	20.	Push-rod—master cylinder.	36.	Pipe (axle hose bracket to L/H rear).
4.	Return spring—brake pedal.	21.	Filler plug assembly.	37.	Mask—shoe adjuster.
5.	Pin—brake pedal.	22.	Gasket—filler plug.	38.	Adjuster—brake-shoe.
6.	Fork end—master cylinder.	23.	Adaptor—master cylinder.	39.	Body with studs and abutment.
7.	Master cylinder and tank assembly.	24.	Gasket—master cylinder.	40.	Piston and dust cover assembly.
8.	Drain plug.	25.	Hose assembly.	41.	Cup—piston.
9.	Gasket—drain plug.	26.	Four-way piece.	42.	Cup—filler.
10.	Valve assembly.	27.	Three-way piece.	43.	Banjo connection—forward R/H.
11.	Cup—valve.	28.	Lock washer.	44.	Banjo connection—forward L/H.
12.	Washer—valve.	29.	Locknut—hose.	45.	Bolt—connection.
13.	Spring (with retainer)—piston return.	30.	Pipe (master cylinder to 4-way).	46.	Bleeder screw.
14.	Cup—piston.	31.	Pipe (4-way to 3-way).	47.	Gasket—banjo bolt—small.
15.	Piston—master cylinder.	32.	Pipe (front 3-way to R/H front hose pipe).	48.	Gasket—banjo bolt—large.
16.	Cup—piston secondary.	33.	Pipe (front 3-way to front hose).	49.	Washer.
17.	Stop—piston.				

M THE BRAKING SYSTEM

MAINTENANCE

Periodically examine the quantity of brake fluid in the master cylinder. It should never be less than half full or closer than $\frac{1}{8}$ in. (13 mm.) from the bottom of the filler neck. The necessity for frequent topping up is an indication of over-filling or a leak in the system, which should at once be traced and rectified.

Adjust the brake-shoes to compensate for wear of the linings. The need for this is shown by the pedal going down almost to the floorboards before solid resistance is felt. For brake-shoe adjustments see Section M.2.

Adjustment of the brake-shoes in the manner indicated also adjusts the hand brake automatically and no separate adjustment is required or permitted.

THE MASTER CYLINDER

The master cylinder is mounted on the driver's side of the car underneath the gearbox cover.

Within the cylinder is a piston, backed by a rubber cup, normally held in the "off" position by a piston return spring. Immediately in front of the cup, when

which is filled with fluid from the supply tank via the feed hole. Leakage of fluid from the open end of the cylinder is prevented by the secondary cup fitted to the flange end of the piston. On releasing the brake pedal, after application, the piston is returned quickly to its stop by the return spring, thus creating a vacuum in the cylinder; this vacuum causes the main cup to collapse and pass fluid through the small holes in the piston head from the annular space formed by the piston skirt. This additional fluid finds its way back

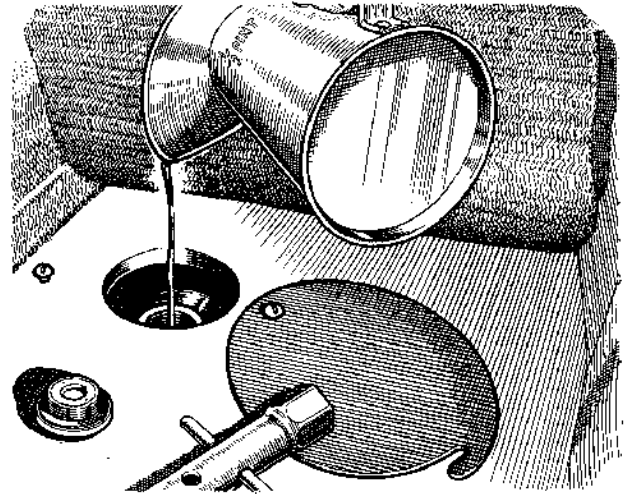


Fig. M.1.

Replenishment of the system is accomplished through the aperture in the floorboard closed by a pivoting metal cover.

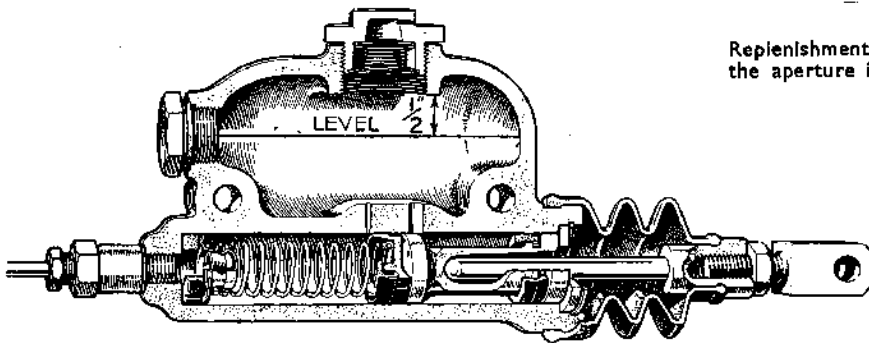


Fig. M.2.

The master cylinder in section, showing the correct fluid level and the disposition of the components.

it is in the "off" position, is a compensating orifice connecting the cylinder with the fluid supply. This port allows free compensation for any expansion or contraction of the fluid, thus ensuring that the system is constantly filled; it also serves as a release for additional fluid drawn into the system during brake applications. Pressure is applied to the piston by means of the push-rod attached to the brake pedal. The push-rod is adjustable and should have a slight clearance when the system is at rest to allow the piston to return fully against its stop. Without this clearance the main cup will cover the by-pass port, causing pressure to build up within the system, and produce binding of the brakes on all wheels. The reduced skirt of the piston forms an annular space

to the reserve supply under the action of the brake return springs, when the system finally comes to rest, through the outlet valve and compensating orifice. If the compensating orifice is covered by the piston cup when the system is at rest, pressure will build up as a result of the brake application. The combination inlet and outlet check valve in the head of the cylinder is provided to allow the passage of fluid under pressure from the master piston into the pipe lines, and control its return into the cylinder, so that a small pressure of approximately 8 lb. per square inch (.56 kg./cm.²) is maintained in the pipe lines to ensure that the cups of the wheel cylinders are kept expanded; it also prevents fluid pumped out from the cylinder "when bleeding" from returning to

the cylinder, thus ensuring a fresh charge being delivered at each stroke of the pedal.

Section M.1

ADJUSTMENT OF THE BRAKE PEDAL

The correct amount of free movement between the master cylinder push-rod and piston is set during erection of the vehicle, and should never need alteration.

In the event of the adjustment having been disturbed, adjust the effective length of the rod connecting the cylinder to the pedal until the pedal pad can be depressed approximately $\frac{1}{2}$ in. (13 mm.) before the piston begins to move. The clearance can be felt if the pedal is depressed by hand.

Note.—Before making any alteration it is important to ensure that neither the floorboard nor the floor carpet obstructs the pedal and that the piston has not stuck in the cylinder bore. In either case a false impression will be given, even though the adjustment is correct.

Remove the front hub cap and road wheel and rotate the brake-drum until both adjustment screws are visible through the holes provided in the face of the brake-drum. With a screwdriver turn both screws as far as they will go in a clockwise direction until the drum is locked solid, then turn them anti-clockwise

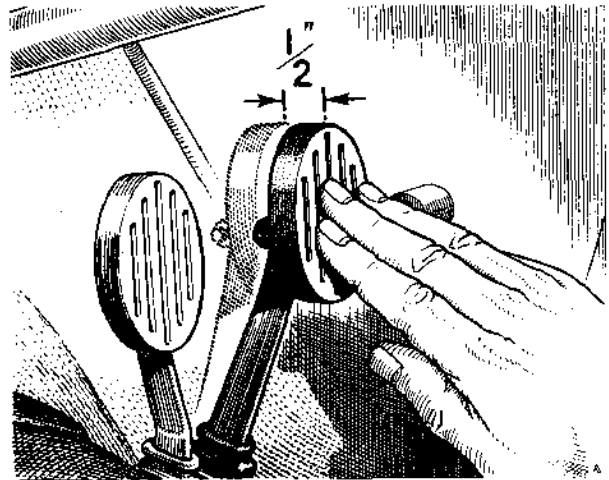


Fig. M.3.

There must be $\frac{1}{2}$ in. (13 mm.) of free movement at the brake pedal pad.

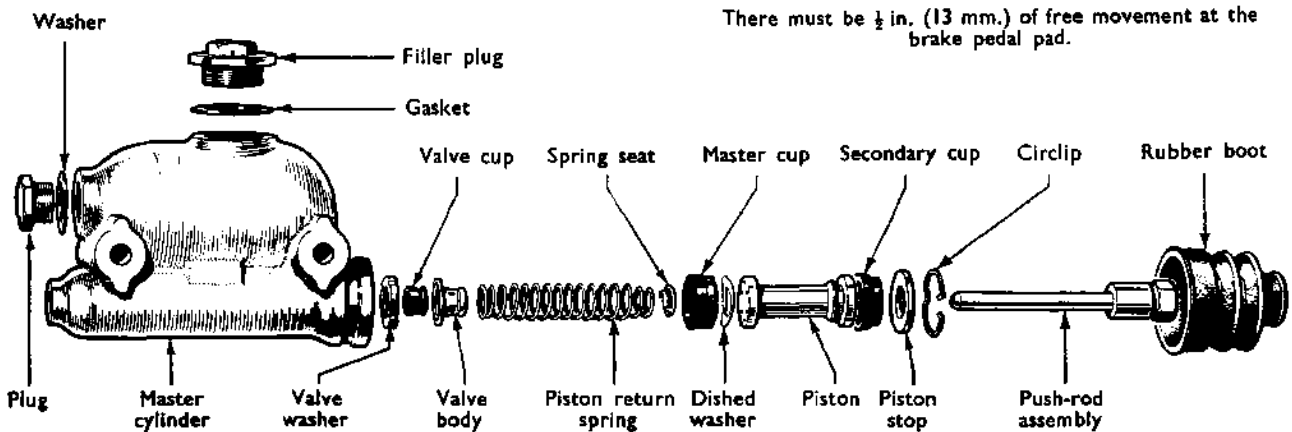


Fig. M.4.

The component parts of the master cylinder.

Later models have a thin dished copper washer between the end of the piston and the master cup which must be fitted with its concave face against the master cup and its convex face against the piston head as shown. (See also Fig. M.14.) If this washer is found to be missing when dismantling, a washer must be procured and fitted on reassembling. This is imperative.

Section M.2

BRAKE-SHOE ADJUSTMENTS

When lining wear has reached a point where the pedal travels to within 1 in. (25 mm.) of the floorboards before the brakes come into action, it is necessary to adjust the brake-shoes.

The front brakes

Jack up the wheel on which it is desired to set the brake.

one notch only. The brake-drum should then be free to rotate without the shoes rubbing, and the adjustment on this wheel is complete. The brake-shoes on the other front wheel must be adjusted by the same method.

The rear brakes

The procedure is similar to that detailed for the front brakes except that there is only one adjuster, and this controls both shoes and the hand-brake operation.

M THE BRAKING SYSTEM

Section M.3

TO BLEED THE SYSTEM (Expel Air)

Bleeding the system is not a routine maintenance job, and should only be necessary when some portion of the hydraulic equipment has been disconnected or the fluid drained off.

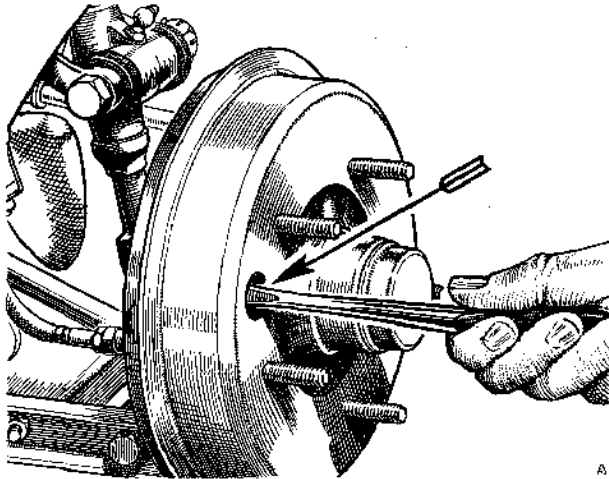


Fig. M.5.

Two holes are provided in the brake-drums to enable both the front brake-shoe adjusters to be reached easily with a screwdriver.

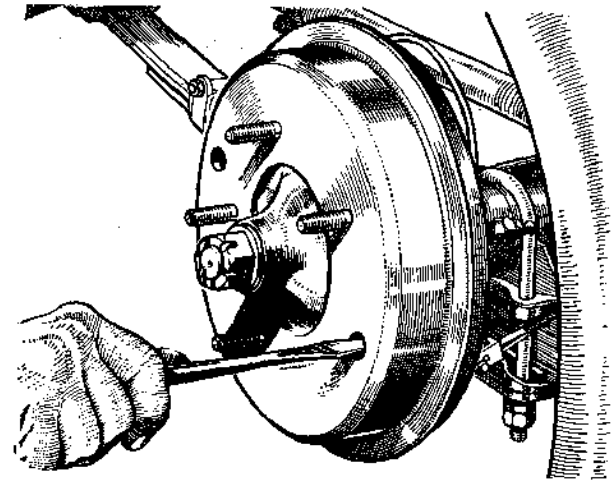


Fig. M.7.

The rear brake-shoes have only one adjuster which adjusts both shoes simultaneously.

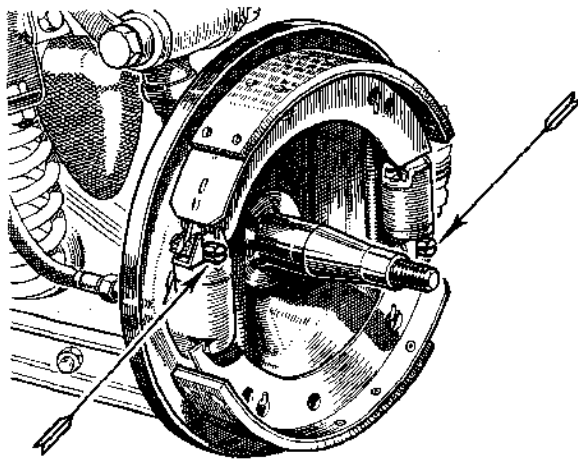


Fig. M.6.

The front brake-drum removed to show the two "Micram" adjusters for the shoes.

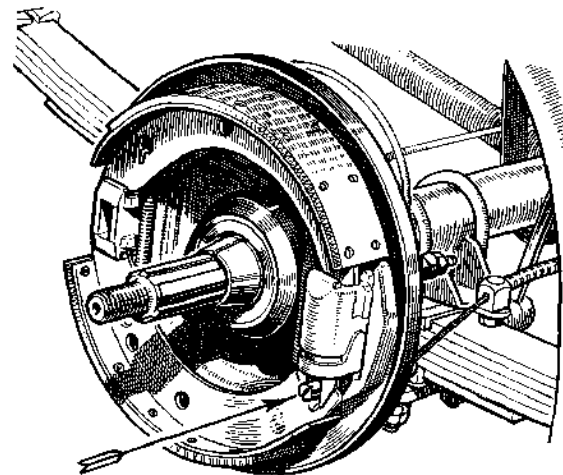


Fig. M.8.

The single "Micram" adjuster of the rear brakes. This adjusts the hand brake mechanism at the same time.

Fill the master cylinder with Lockheed Genuine Brake Fluid and keep it at least half-full throughout the operation, otherwise air will be drawn into the system, necessitating a fresh start.

Attach the bleeder tube to the wheel cylinder bleeder screw and allow the free end of the tube to be

submerged in a small quantity of fluid in a clean glass jar. against the floorboards while the bleeder screw is securely tightened.

Open the bleeder screw one full turn.

Depress the brake pedal quickly, and allow it to return without assistance. Repeat this pumping action with a slight pause before each depression of the pedal.

Watch the flow of fluid into the glass jar, and when air bubbles cease to appear, hold the pedal firmly

Repeat the operation on each wheel.

Note.—Clean fluid bled from the system must be allowed to stand until it is clear of air bubbles before using it again. Dirty fluid should be discarded.

Section M.4

REMOVAL OF THE MASTER CYLINDER

Remove the floorboard and disconnect the $\frac{3}{8}$ in. union nut connecting the pipe line to the master cylinder.

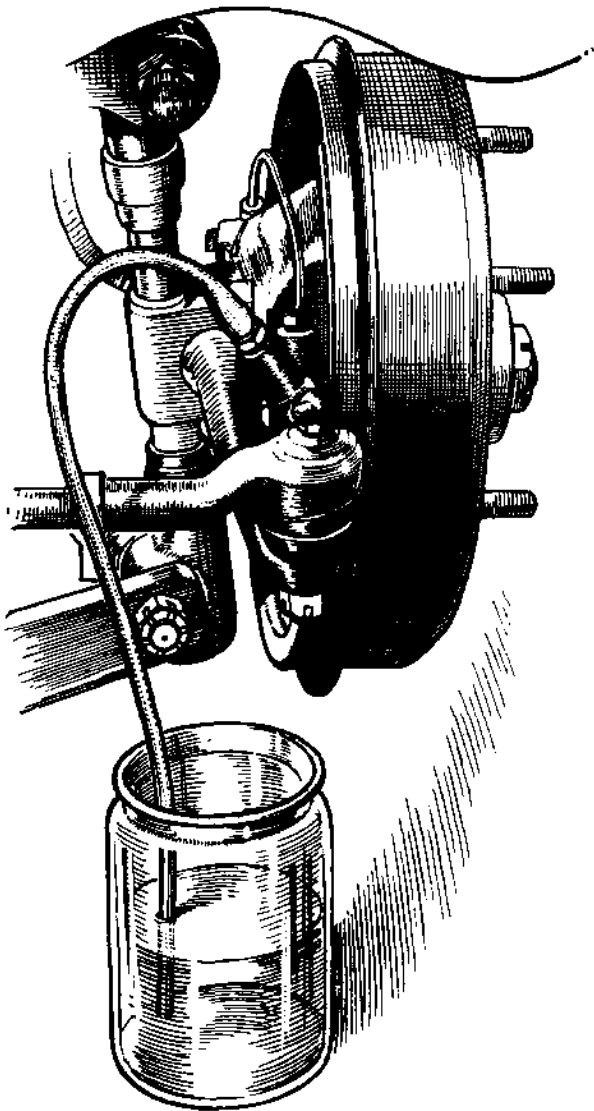


Fig. M.9.

The special bleeding tube in use in conjunction with a glass jar to clear the system of air.

Remove the $\frac{1}{8}$ in. nuts and spring washers from the two bolts passing through the master cylinder and securing it to the frame member. Withdraw the bolts.

Disconnect the brake pedal return spring from the frame.

Lift out the brake pedal complete with push-rod, rubber boot and pedal return spring.

The master cylinder complete with main supply pipe is now easily removed.

Section M.5

DISMANTLING THE MASTER CYLINDER

Remove the filler cap and drain the Lockheed hydraulic brake fluid from the master cylinder. Remove the main feed pipe, union and copper washers.

Push the piston down the cylinder bore and remove the retaining circlip.

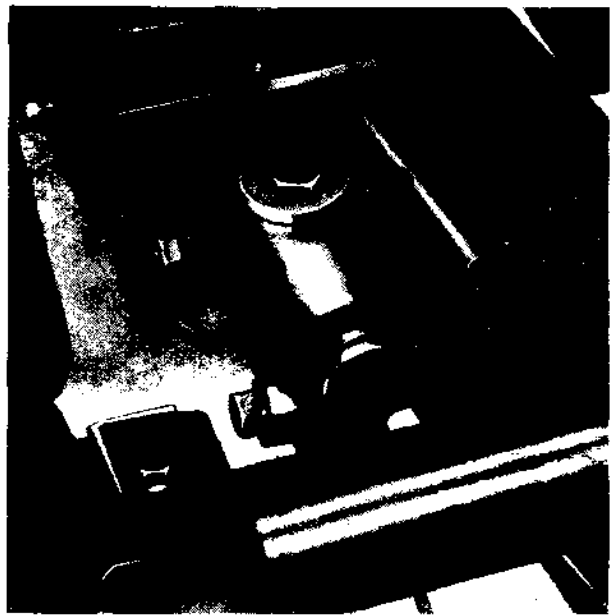


Fig. M.10.

Access to the master cylinder for removal is obtained by removing the floorboard.

Remove the remaining internal parts, i.e. the piston, piston master cup, return spring, valve cup assembly and valve seating washer.

To remove the secondary cup from the piston, carefully stretch it over the end flange, using the fingers only.

Section M.6

ASSEMBLING THE MASTER CYLINDER

Clean all parts thoroughly, using Lockheed Genuine Brake Fluid for all rubber components. All traces of fuel, kerosene or trichlorethylene used for cleaning the metal parts must be removed before assembly.

M THE BRAKING SYSTEM

Examine all the rubber parts for damage or distortion. It is usually advisable to renew the rubbers when rebuilding the cylinder.

Dip all the internal parts in brake fluid and assemble them wet.

Stretch the secondary cup over the end flange of the piston with the lip of the cup facing towards the opposite end of the piston. When the cup is in its groove, work it round gently with the fingers to make sure it is correctly seated.

Fit the valve washer, valve cup and body onto the return spring and insert the spring valve first into the cylinder. See that the spring retainer is in position.

Insert the master cup, lip first, taking care not to damage or turn back the lip, and press it down onto the spring retainer. Place the dished washer in place on the end of the master cup with its concave face in contact with the cup. It is imperative that this washer should be fitted in all cases.

Insert the piston, taking care not to damage or turn back the lip of the secondary cup.

Push the piston down the bore slightly, and insert the retaining circlip in the groove in the cylinder bore.

Test the master cylinder by filling the tank and by pushing the piston down the bore and allowing it to return; after one or two applications fluid should flow from the outlet.

Section M.7

REPLACING THE MASTER CYLINDER

The replacement procedure is the reverse of the removal instructions given in Section M.4 with the following additions :—

Replace the main feed pipe in its correct position

and fully tighten the union before replacing the master cylinder in its housing.

Check the shoe adjustment as detailed in Section M.2.

Connect the fluid pipes and bleed the system as in Section M.3.

Check the system for leaks with the brakes fully applied. Renew the copper washers on the two-way outlet connection if necessary.

Section M.8

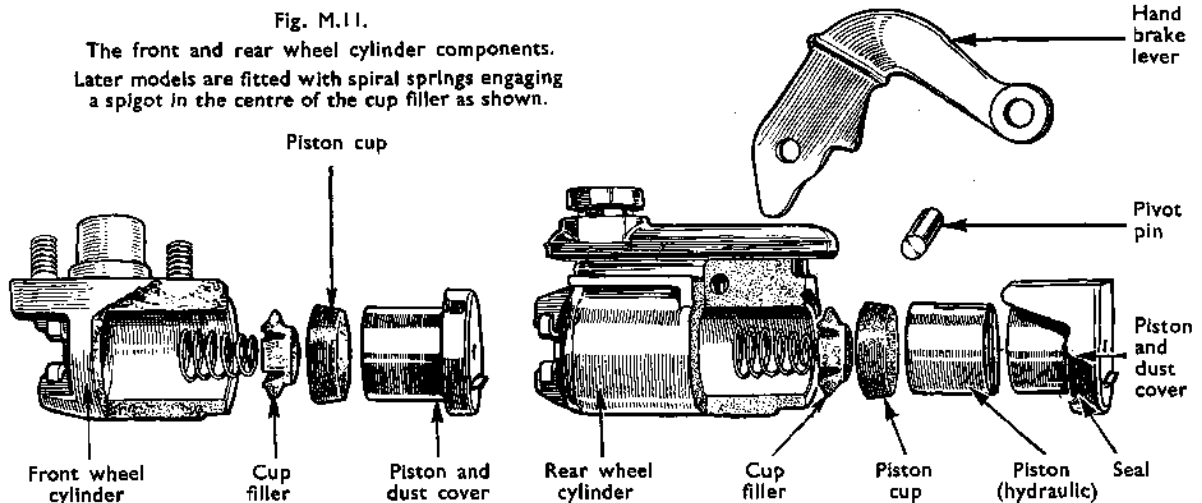
BRAKE ASSEMBLY

Two leading shoes are incorporated in the front wheel braking system and take the greater percentage of the braking load. The rear brakes are of the leading and trailing shoe type, giving the advantage of equal braking action when the brakes are used in reverse.

All the shoes have a floating anchorage, each front shoe utilising the closed end of the other shoe actuating cylinder as its abutment. The two rear shoes share one common abutment stop.

The hand brake lever operates the rear brakes mechanically through a linkage operating on the piston of the rear wheel cylinder which is made in two halves. The outer half of the piston applies the leading shoes when actuated by a lever pivoted in the cylinder body. The trailing shoe is applied by the movement of the cylinder body which slides on the brake plate as a result of the reaction of the mechanically operated lever on the pivot.

When operated hydraulically the inner half of the piston is forced outwards, carrying with it the outer half, thus applying the leading shoe, and the trailing shoe is applied by the floating cylinder body as a result of the reaction of the fluid pressure on the body.



Section M.9

REMOVAL OF THE WHEEL CYLINDER

Front

Raise the front of the car and remove the hub cap and road wheel. Remove the brake-drum and hub assembly as detailed in Section K.12.

Draw the brake-shoes apart until the assembly can be lifted from the wheel cylinders and brake plate.

Release the flexible hose as detailed in Section M.13.



Fig. M.12.

Removing the rear brake-shoes from the brake plate after releasing the return spring.

Remove the flexible hose union bolt from the wheel cylinder, observing that the copper washers on either side of the banjo union are of different sizes and that the small washer is next to the cylinder.

Remove the two 1/4 in. nuts and spring washers securing the wheel cylinder to the brake plate and remove the cylinder.

The other cylinder is removed after extracting the 1/8 in. banjo union bolt and the two bolts securing the cylinder to the brake plate.

Rear

Raise the rear of the car and remove the hub cap and road wheel. Remove the brake-drum and hub assembly as detailed in Section H.1.

Draw the brake-shoes apart until the assembly can be lifted from the brake plate.

Release the metal feed pipe from the wheel cylinder by undoing the 3/8 in. union nut. Remove the 1/4 in. adaptor securing the bleed screw banjo union to the wheel cylinder, observing that the large copper washer is fitted away from the cylinder.

Remove the clevis pin from the hand brake cable yoke and disconnect the cable from the wheel cylinder lever. Remove the rubber boot and withdraw the lower half of the piston from the wheel cylinder. Extract the wheel cylinder from the brake plate.

Section M.10

DISMANTLING THE WHEEL CYLINDER

Rear cylinders

Tap out the hand brake lever pivot pin and withdraw the lever. Withdraw the upper half of the piston, the rubber cup and the bakelite filler. In later models the centre of the filler has a spigot which engages a spiral spring.

Front cylinders

Withdraw the piston, the rubber cup and cup filler. Here again later models are fitted with a spiral spring engaging the filler.

Section M.11

ASSEMBLING THE WHEEL CYLINDER

Clean all parts thoroughly, using only Lockheed hydraulic brake fluid for the rubber components. All traces of petrol (gasoline), paraffin (kerosene) or trichlorethylene used for cleaning the metal parts must be completely removed before assembly.

Examine the rubber cups for damage, wear, or distortion. Dip all parts in brake fluid and assemble wet. Place the spiral spring with its small end engaging the spigot of the bakelite filler, on which it should be a push fit.

Insert the cup filler, shallow side and spring first (this is important), and the rubber cup concave side first.

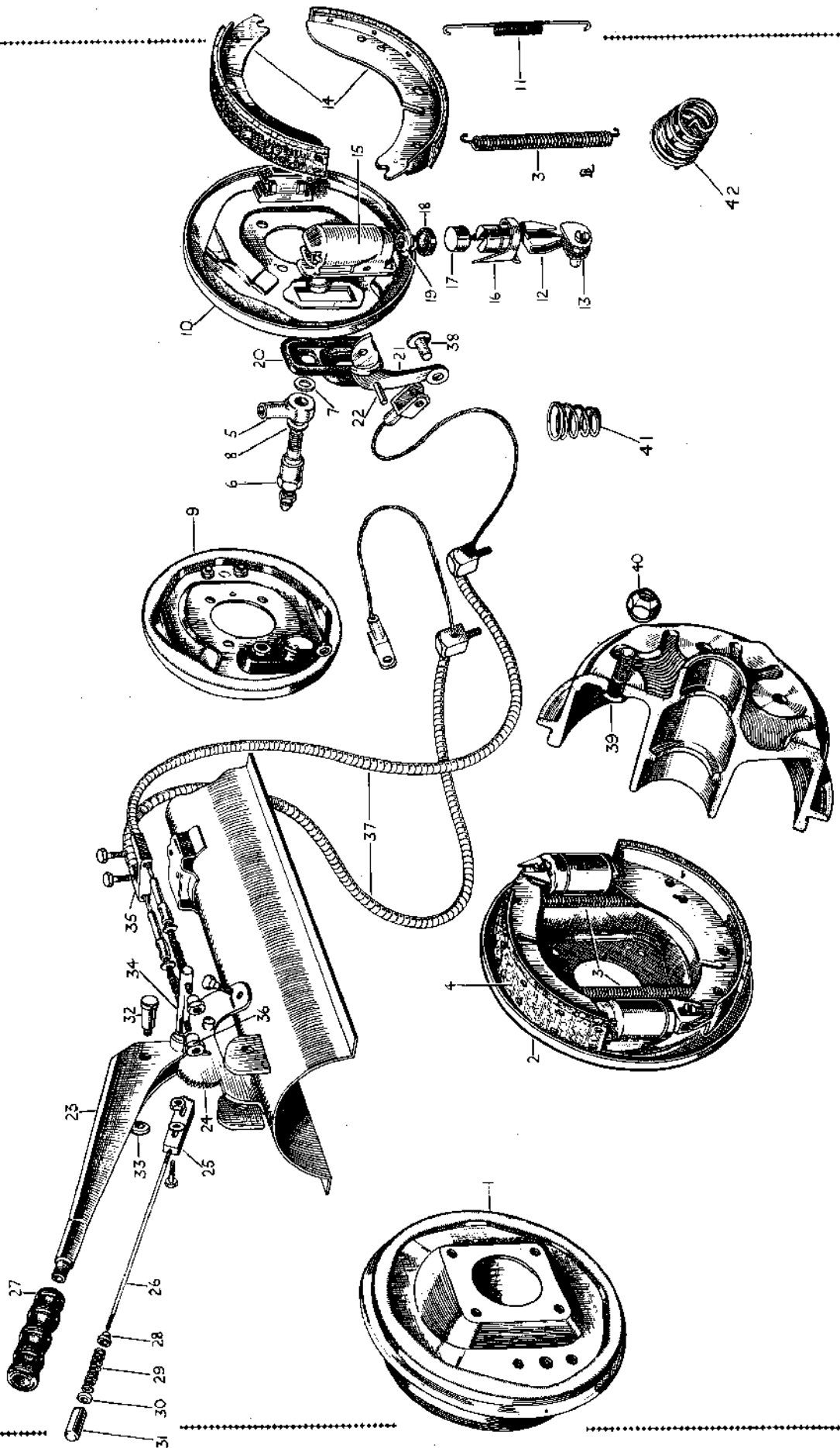
Replace the piston, and in the case of the rear cylinders, insert the hand brake lever and its pivot pin.

Section M.12

REPLACEMENT OF THE WHEEL CYLINDER

The procedure for replacing the wheel cylinder is a reversal of the sequence of operations given in Section M.9 but attention must be given to the important points noted on page M.12.

THE HAND BRAKE AND BRAKE-SHOE COMPONENTS



KEY TO THE HAND BRAKE AND BRAKE-SHOE COMPONENTS

No.	Description	No.	Description	No.	Description
1.	Brake gear (front axle) back plate assembly—R/H.	15.	Body and abutment strip.	29.	Spring—lever knob.
2.	Brake gear (front axle) back plate assembly—L/H.	16.	Piston and dust cover.	30.	Washer—spring.
3.	Spring—shoe pull-off.	17.	Piston (hydraulic).	31.	Knob—pawl rod.
4.	Front brake-shoe—lined complete.	18.	Cup—piston.	32.	Fulcrum pin.
5.	Banjo connections.	19.	Cup—filler.	33.	Washer—fulcrum pin.
6.	Bolt—connection.	20.	Boot—wheel cylinder.	34.	Trunnion—hand brake.
7.	Gasket—banjo bolt—small.	21.	Hand brake lever.	35.	Twin cable abutment.
8.	Gasket—banjo bolt—large.	22.	Pivot pin—hand brake lever.	36.	Adjuster nut—brake cable.
9.	Brake gear (rear axle) back plate assembly—R/H.	23.	Lever assembly.	37.	Cable—hand brake.
10.	Brake gear (rear axle) back plate assembly—L/H.	24.	Ratchet assembly	38.	Clevis pin.
11.	Spring—shoe tension.	25.	Hand brake pawl.	39.	Wheel stud.
12.	Mask—shoe adjuster.	26.	Pawl rod—hand brake.	40.	Nut—wheel stud.
13.	Adjuster—brake-shoe.	27.	Hand grip.	41.	Spring—wheel cylinder piston.
14.	Rear brake-shoe—lined complete.	28.	Bush for rod.	42.	Spring—brake-shoe steady.

M THE BRAKING SYSTEM

Front

The front brake wheel cylinders are interchangeable but the link pipe banjo unions must be fitted to them so that the flexible hose is connected to the forward cylinder and the bleed screw to the rear cylinder. The link pipe must pass above the brake plate.

The brake-shoes are interchangeable but the recessed ends must engage the "Micram" shoe adjusters and the brake-shoe pull-off springs must be fitted between the shoes and the brake plate.

Rear

The wheel cylinder must be fitted on the forward side of the axle casing with the bleed screw vertical.

The brake-shoes are interchangeable but the recessed end of the lower or leading shoe must engage the "Micram" shoe adjuster. The other shoe should also be fitted with its recessed end against the wheel cylinder.

The light brake-shoe pull-off spring must be fitted away from the wheel cylinder, and both springs are fitted between the shoes and the brake plate.

Section M.13

REMOVAL OF THE FLEXIBLE HOSE

Do not attempt to release the flexible hose by turning either end with a spanner. It should be removed as follows :—

Front

Unscrew the metal pipe line union nut (1) (Fig. M.13) from its connection to the hose.

Remove the locknut (2) securing the flexible hose union to the chassis and unscrew the hose from the wheel cylinder.

The union on the master cylinder side also incorporates the stop-lamp switch. Disconnect the two wires from their terminals and with a $\frac{1}{8}$ in. spanner undo the nut to release the switch and the two copper washers fitted either side of the two-way union.

Section M.14

REMOVAL AND REPLACEMENT OF THE BRAKE-SHOES

Remove the rear brake-drum and hub as detailed in Section H.1. Instructions for removing the front brake-drum and hub are given in Section K.12.

Draw the brake-shoes apart until they can be removed from the brake plate.

Important.—When replacing the shoes the pull-off springs must be between the shoes and the brake plate.

M.12

The brake-shoes are interchangeable but the recessed end must engage the "Micram" shoe adjuster on the wheel cylinder.

In the case of the rear brakes, the light pull-off spring is fitted away from the wheel cylinder. The recessed end of the upper or trailing shoe is fitted against the brake-shoe stop on the brake plate.

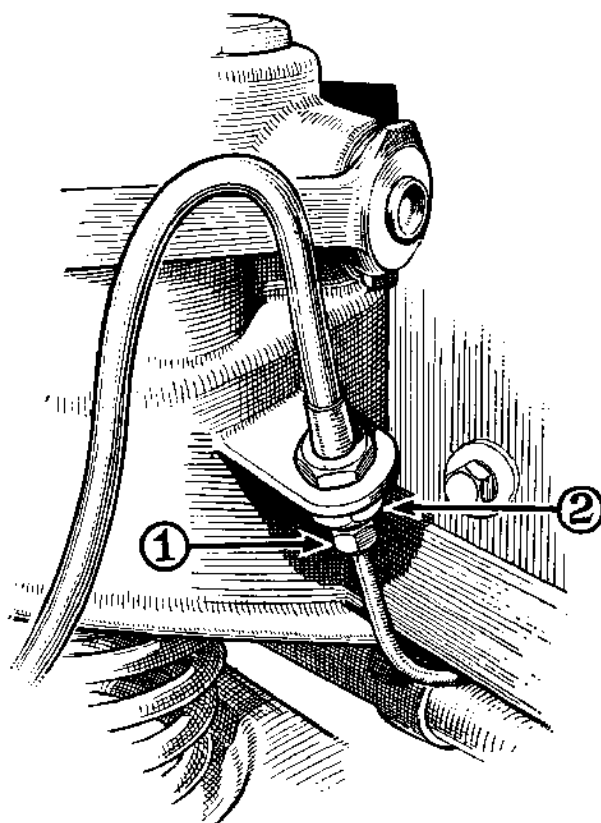


Fig. M.13

When uncoupling the flexible hoses the union nut (1) must first be undone and then the hexagon retaining nut (2). On no account must the other hexagon attached to the hose be turned.

Section M.15

RELINING THE BRAKE-SHOES

Owing to the need for the brake linings to be finished so that they are perfectly concentric with the brake-drums, to obtain the best results, relining of the brake-shoes is not satisfactory without special precautions.

If replacement of the brake-shoes and linings is necessary on account of excessive wear or other cause, it is most important that the material used for the lining is as specified by The M.G. Car Company Ltd. Any variations from this will give an unequal and unsatisfactory braking performance.

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After riveting the new brake linings to the brake-shoes it is essential that any high spots should be removed before replacement on the back plate assembly.

When new shoes and linings are fitted it must be appreciated that considerable adjustment has to be made to the foot brake mechanism, and it is necessary to return the "Micram" adjusters to their fully anti-clockwise position before attempting to refit the brake-drums over the new linings. The hand brake must also be in the fully released position.

Important.—Do not use any substitute for Genuine Brake Fluid, as a substitute will seriously affect the working of the system. In extremely cold conditions use Wagner No. 21 Fluid.

Do not allow grease, paint, oil or brake fluid to come in contact with the brake linings.

Do not clean the rubber parts with any fluid other than Lockheed hydraulic brake fluid. All traces of petrol (gasoline), paraffin (kerosene), etc., used for cleaning metal parts must be removed before reassembly.

Do not reline the brake-shoes with different types of linings, as this is bound to cause unequal braking.

Do not allow the fluid in the master cylinder and supply tank assembly to fall below the half-full mark. When full the fluid should be level with the bottom of the filler neck, with the brakes in the "off" position.

Section M.16

THE BRAKE FLUID

The only correct fluid for replenishment of the hydraulic brake system is Lockheed Genuine Brake Fluid.

In cases of difficulty in obtaining Lockheed Genuine Brake Fluid use must be made of a fluid conforming to S.A.E. specification 70.R2.

In cases of extreme cold consistently below 0° Fahrenheit or -18° Centigrade, Wagner No. 21 Fluid should be used either for topping up or refilling the system.

Section M.17

THE HAND BRAKE

The hand brake is of the quick-release type, the ratchet knob being depressed after the lever has been pulled up. A slight upward pull on the lever will allow it to move to the "off" position without depressing the ratchet knob.

It operates the rear brakes by means of cables, and no adjustment is necessary, as adjustment of the hydraulic brake automatically adjusts the hand brake. **If the two brass nuts on the lever are moved the whole braking system will be upset.**

Sufficient movement is allowed at the lever to deal with full wear at the linings.

If the wheel cylinder operating cables have been disconnected, they should be readjusted after re-assembly in the following manner:—

Return the hand brake pull lever to the fully released position.

Remove the split pin and clevis pin retaining the brake cable to each wheel cylinder lever.

Adjust the brake-shoes as in Section M.2.

Screw up the cable adjusting nuts by equal amounts until the cable clevis pins will fall into position in the cable forks without moving the wheel cylinder lever. Replace the split pins.

Section M.18

REAR BRAKE PIPES

Cases have been reported where the rear brake pipes lying along the axle rub against the rear axle strap, or, in the case of Mk. II competition cars, against the shock absorber arms. The pipes are adequately clipped, and care should be taken to see that the pipe is set to give at least 1 in. (2.5 cm.) clearance at these points.

Section M.19

BRAKING IRREGULARITIES AND THEIR CAUSES

Pedal travel excessive (requires pumping)

- (a) Brake-shoes require adjusting.
- (b) Leak at one or more joints.
- (c) Master cylinder cup worn.

Pedal feels springy

- (a) System requires bleeding.
- (b) Linings not "bedded in."
- (c) Master cylinder fixing loose.
- (d) Master cylinder cup worn.

Brakes inefficient

- (a) Shoes not correctly adjusted.
- (b) Linings not "bedded in."
- (c) Linings greasy.
- (d) Linings wrong quality.
- (e) Drums badly scored.
- (f) Linings badly worn.
- (g) Wrongly fitted cup fillers.

Brakes drag

- (a) Shoes incorrectly adjusted.
- (b) Shoe springs weak or broken.
- (c) Pedal spring weak or broken.
- (d) Hand brake mechanism seized.
- (e) Wheel cylinder piston seized.
- (f) Locked pipe line.
- (g) Filler cap vent choked.

M THE BRAKING SYSTEM

Brakes remain on

- (a) Shoes over-adjusted.
- (b) Hand brake over-adjusted.
- (c) No free movement on pedal.
- (d) Compensator port in master cylinder covered by swollen rubber cup, or incorrect adjustment of push-rod.
- (e) Swollen wheel cylinder cups.
- (f) Choked flexible hose.

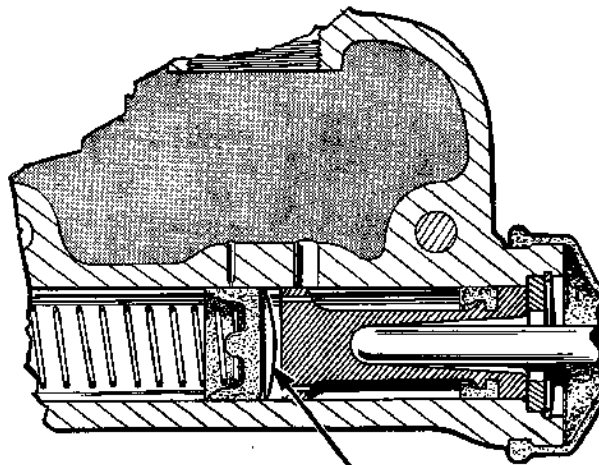
Unbalanced braking

- (a) Greasy linings.
- (b) Distorted drums.

- (c) Tyres unevenly inflated.
- (d) Brake plate loose on the axle.
- (e) Worn steering connections.
- (f) Worn suspension linkage.
- (g) Different types or grades of lining fitted.

Brakes grab

- (a) Shoes require adjusting.
- (b) Drums distorted.
- (c) Greasy linings.
- (d) Broken or loose road spring.
- (e) Scored drums.
- (f) Worn suspension linkage.



Dished washer

Fig. M.14.

The correct method of fitting the thin dished washer between the piston head and the master cup of the master cylinder. It is imperative to make sure that the washer is in position and correctly fitted in all master cylinder assemblies.

SECTION N

ELECTRICAL EQUIPMENT

General Description.

- Section No. N.1 The battery.
- Section No. N.2 The dynamo.
- Section No. N.3 Removal and replacement of the dynamo.
- Section No. N.4 Dismantling the dynamo.
- Section No. N.5 Servicing the dynamo.
- Section No. N.6 The starter.
- Section No. N.7 Removal and replacement of starter.
- Section No. N.8 The starter switch.
- Section No. N.9 Starter commutator and brush gear.
- Section No. N.10 The starter drive.
- Section No. N.11 Servicing the starter.
- Section No. N.12 The control box.
- Section No. N.13 Windscreen wiper (Series "TD").
- Section No. N.14 The electric horns.
- Section No. N.15 The fuses.
- Sections Nos. N.16 to N.23 Lamps (Series "TD").
- Section No. N.24 Location and remedy of faults.
- Section No. N.25 The headlamp beam warning light.
- Section No. N.26 Modified dipping switch.
- Wiring Diagrams (Series "TD").
- Section No. N.27 The "correct-acid-level" device.
- Section No. N.28 Modified tail- and stop-lamps.
- Sections Nos. N.29 to N.40 Lamps (Series "TF").
- Section No. N.41 Replacement bulbs (12 volt) (Series "TF").
- Section No. N.42 Windscreen wiper (Series "TF").
- Wiring Diagram (Series "TF").

GENERAL DESCRIPTION

The electrical equipment fitted to the M.G. Midget is of the 12-volt type incorporating constant voltage control for the charging circuit. The positive earth system of wiring is employed.

The battery is mounted on the dash under the bonnet and is readily accessible for examination and maintenance attention.

The dynamo is mounted on the left of the cylinder block and driven by endless belt from the engine

crankshaft. A hinged mounting enables the belt tension to be adjusted.

The control box is sealed and should not normally need attention. The fuses are carried in external holders, as are the spare fuses, so that there is no need to remove the control box cover to gain access to them.

The starter motor is mounted on the flywheel housing on the right-hand side of the engine unit and operates on the flywheel through the usual sliding pinion device.

N ELECTRICAL EQUIPMENT

The headlamps on early Home models are of the "dip and switch" type, in which the near-side lamp beam is dipped and the off-side lamp extinguished on operation of the dipping switch. On Export models and later Home models both lamps are fitted with double-filament bulbs.

Section N.1

THE BATTERY

Model GTW9A. Capacity (10-hour rate)
51 ampere hours.

ROUTINE MAINTENANCE

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

(i) Topping up

About once a month (more often in warmer climates), remove the vent plugs from the top of each of the cells and examine the level of the electrolyte. If necessary, add distilled water until the top edges of the separators are just covered on early models. Do not fill above this level, otherwise the excess electrolyte will be thrown out of the cell. Later models are fitted with a "correct-acid-level" device, which is described in Section N.27. A hydrometer will be found useful for topping up, as it prevents distilled water from being spilled on the top of the battery.

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

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

(ii) Testing the condition of the battery

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

The specific gravity readings and their indications are as follow :—

1.280—1.300	Battery fully charged.
About 1.210	Battery about half discharged.
Below 1.150	Battery fully discharged.

These figures are given assuming an electrolyte temperature of 60° F. (16° C.). If the temperature of the electrolyte exceeds this, .002 must be added to hydrometer readings for each 5° F. (2.8° C.) rise to give the true specific gravity. Similarly .002 must be subtracted from the hydrometer readings for every 5° F. (2.8° C.) below 60° F. (16° C.).

The readings for each of the cells should be approximately the same. If one cell gives a reading very different from the rest it may be that the electrolyte has been spilled or has leaked from one of the cells, or there may be an internal fault. In this case it is advisable to have the battery examined by a

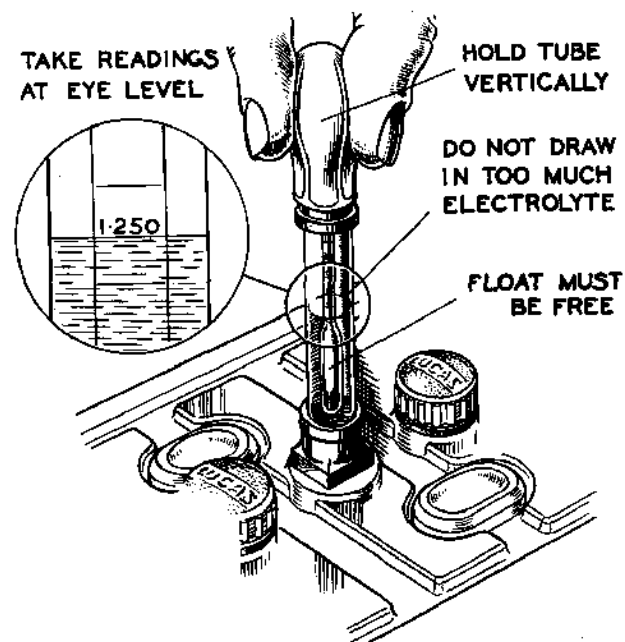


Fig. N.1.

The hydrometer in use to determine the condition of the individual cells.

battery specialist. Should the battery be in a low state of charge, it should be recharged by taking the car for a long daytime run or by charging from an external source of D.C. supply at a current rate of 5 amperes until the cells are gassing freely.

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

STORAGE

If a battery is to be out of use for any length of time, it should first be fully charged and then given a freshening charge about every fortnight.

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

INITIAL FILLING AND CHARGING

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

(a) Preparation of electrolyte

The specific gravity of the electrolyte necessary to fill the new battery, and the specific gravity at the end of the charge, are as follow :—

Climate	S.G. of Filling Acid (corrected to 60° F. (16° C.))	S.G. at End of Charge
Ordinarily below 80° F. (27° C.)	1.350	1.280—1.300
Between 80°—100° F. ...	1.320	1.250—1.270
Over 100° F. (38° C.) ...	1.300	1.220—1.240

The electrolyte is prepared by mixing distilled water and concentrated sulphuric acid 1.835 S.G. The mixing must be carried out in a lead-lined tank or a suitable glass or earthenware vessel. Steel or iron containers must **not** be used. The acid must be added slowly to the water, while the mixture is stirred with a glass rod. **Never add the water to the acid**, as the resulting chemical reaction may have dangerous consequences.

To produce electrolyte of the correct specific gravity, use the following proportions of acid and distilled water :—

	<i>Add 1 part by volume of</i>
<i>To obtain Specific Gravity</i>	<i>1.835 S.G. acid to distilled</i>
<i>(corrected to 60° F. (16° C.))</i>	<i>water by volume as below</i>
1.350	1.8 parts
1.320	2.2 "
1.300	2.5 "

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

(b) Filling in and soaking

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

Carefully break the seals in the filling holes and half-fill each cell in the battery with dilute sulphuric acid solution of the appropriate specific gravity (according to temperature) (see table in (a) above). The quantity of electrolyte required to half-fill a two-volt cell is ½ pint (.28 litre). Allow to stand for at least six hours, then complete the filling of the cells by the addition of more diluted acid of the same specific gravity as before until the level reaches the bottom of the filling holes, and allow the battery to stand for at least another two hours before commencing the first charge.

(c) Duration and rate of initial charge

Charge at a constant current of 3.5 amps. until the voltage and temperature-corrected specific gravity readings show no increase over five successive hourly readings. This period is dependent upon the length of time the battery has been stored since manufacture, and will be from forty to eighty hours, but usually not more than sixty.

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

If, during charge, the temperature of the acid in any cell of the battery reaches the maximum permissible temperature of 120° F. (49° C.), the charge must

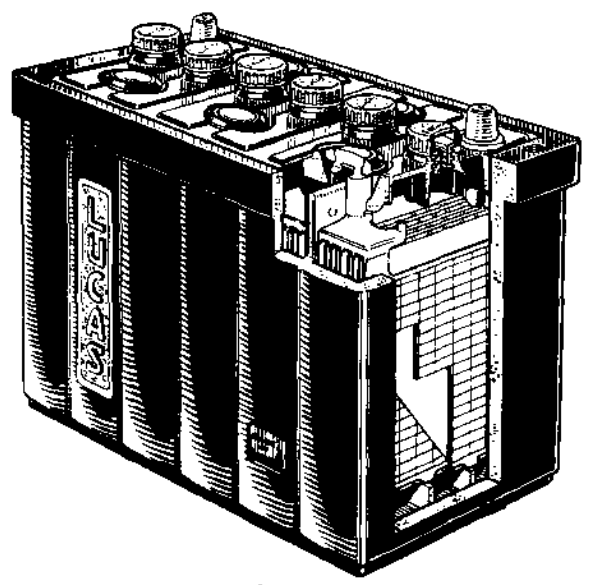


Fig. N.2.

The early type Lucas battery partly sectioned to show the arrangement of the plates and separators. Later models are fitted with a correct acid level device and rubber vent plugs.

be interrupted and the battery temperature allowed to fall at least 10° F. (5.5° C.) before charging is resumed.

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

Section N.2

THE DYNAMO

Type

The dynamo on early models is a Lucas Model C39PV, Service No. 22257A. On later models a Lucas Model C39PV2, Service No. 22265B is fitted. These identification marks are stamped on the yoke. When ordering replacements always quote these numbers.

To test on vehicle

The cutting-in speed is from 1,050 to 1,200 r.p.m. at 13 dynamo volts.

The output of the C39PV model is 17 amps. at 1,800–2,000 r.p.m. and of the C39PV2 model 19 amps. at 1,850–2,100 r.p.m., both at 13.5 dynamo volts taken on a resistance load of 0.8 ohm without regulator.

- (a) Make sure that the driving belt is not slipping, and it should be capable of being deflected approximately $\frac{1}{2}$ in. (12.7 mm.) at the centre

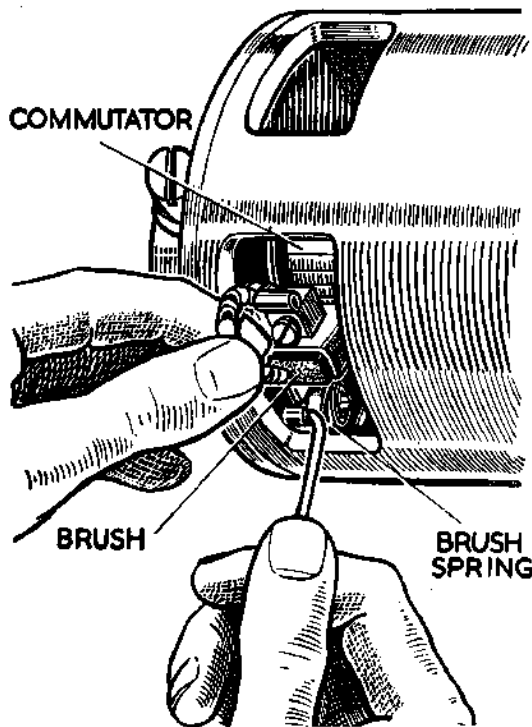


Fig. N.3.

To release the brushes hold back the brush spring with a piece of bent wire as shown.

of its run between the pulleys with moderate hand pressure. If the belt is too slack, tightening is effected by slackening the two bolts attaching the dynamo end plate extensions to the cylinder head, loosening the bolt attaching it to the slotted adjustment link and gently pulling the dynamo outwards by

hand until the correct tension is obtained. The slotted link bolt must then be tightened, followed by the two lower bolts.

- (b) Check that the dynamo and control box are connected correctly. The dynamo terminal "D" should be connected to the control box terminal "D" and the dynamo terminal "F" connected to the control box terminal "F."
- (c) After switching off all lights and accessories, disconnect the cables from the terminals of dynamo marked "D" and "F" respectively.
- (d) Connect the two terminals with a short length of wire.

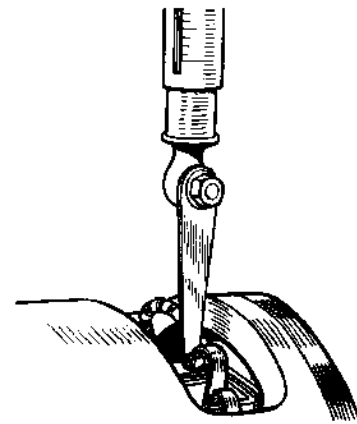


Fig. N.4.

Testing the tension of the brush springs with a spring balance. (See Section N.5.)

- (e) Start the engine and set it to run at normal idling speed.
- (f) Clip the negative lead of a moving coil type voltmeter, calibrated 0–20 volts, to one dynamo terminal and the other lead to a good earthing point on the dynamo yoke.
- (g) Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to reach 20 volts. Do not race the engine in an attempt to increase the voltage. It is sufficient to run the dynamo up to a speed of 1,000 r.p.m.

If there is no reading—check the brush gear.

If the reading is low (approximately 1 volt) the field winding may be faulty.

If the reading is approximately 5 volts the armature winding may be faulty.

- (h) Remove the dynamo cover band and examine the brushes and commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush

from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they no longer bear on the commutator, or if the brush flexible has become exposed on the running face, new brushes must be fitted. If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the engine is turned slowly by hand cranking. Re-test the dynamo ; if there is still no reading on the voltmeter, there is an internal fault and the complete unit should be renewed, if a spare is obtainable.

If the dynamo is in good order, leave the temporary link in position between the terminals and restore the original connections, taking care to connect the dynamo terminal "D" to the control box terminal "D," and the dynamo terminal "F" to the control box terminal "F." Remove the lead from the "D" terminal on the control box and connect the voltmeter between this cable and a good earthing point on the vehicle. Run the engine as before. The reading should be the same as that measured directly at the dynamo. No reading on the voltmeter indicates a break in

Section N.3

REMOVAL AND REPLACEMENT OF THE DYNAMO

Remove the set screw securing the insulator pad to the rear face of the dynamo.

Disconnect the dynamo leads from the dynamo terminals.

Disconnect the revolution counter drive from the dynamo.

To remove the dynamo, slacken its three attachment bolts and swing the dynamo towards the engine to give maximum belt slackness. Carefully free the belt from the dynamo pulley.

Supporting the dynamo, completely remove its attachment bolts, enabling it to be lifted from the engine.

Replacement of the dynamo is an exact reversal of this procedure.

Section N.4

DISMANTLING THE DYNAMO

Take off the dynamo pulley.

Remove the cover band, hold back the brush springs and remove the brushes from their holders.

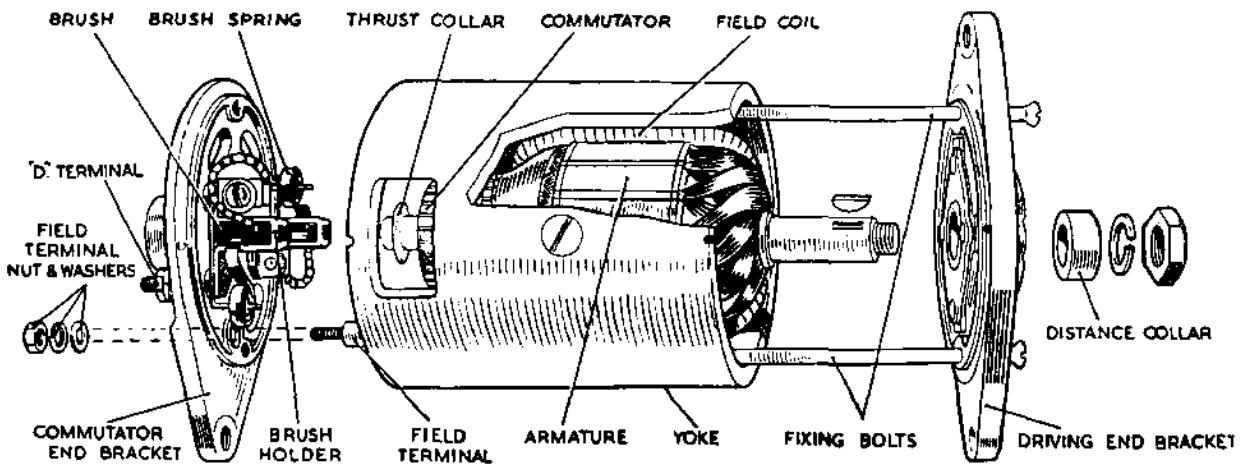


Fig. N.5.
The dynamo components.

the cable to the dynamo. Carry out the same procedure for the "F" terminal, connecting the voltmeter between cable and earth. Finally remove link from the dynamo.

If the reading is correct test the control box (see Section N.12).

Unscrew the locking nuts from the through bolts at the commutator end.

Withdraw the two through bolts from the driving end.

Remove the nut, spring washer and flat washer from the smaller terminal (i.e. field terminal) on the

commutator end bracket and remove the bracket from the dynamo yoke.

The driving end bracket, together with the armature, can now be lifted out of the yoke.

The driving end bracket which, on removal from the yoke, has withdrawn with it the armature and armature shaft ball bearing, need not be separated from the shaft unless the bearing is suspected and requires examination, in which event the armature should be removed from the end bracket by means of a hand press.

Section N.5

SERVICING THE DYNAMO

Brushes

Test if the brushes are sticking. Clean them with petrol and, if necessary, ease the sides by lightly polishing with a smooth file. Replace the brushes in their original positions.

Test the brush spring tension with a spring scale if available. The correct tension is 20/25 oz. (567/709 grams). Fit a new spring if the tension is low.

If the brushes are worn so that the flexible is exposed on the running face, new brushes must be fitted. Brushes are pre-formed so that bedding to the commutator is unnecessary.

Commutator

A commutator in good condition will be smooth and free from pits or burned spots. Clean the commutator with a petrol-moistened cloth. If this is

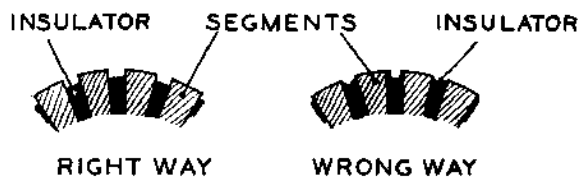


Fig. N.6.

The correct method of undercutting the dynamo commutator segments.

ineffective, carefully polish with a strip of fine glass-paper while rotating the armature. To remedy a badly worn commutator, mount the armature (with or without the drive end bracket) in a lathe, rotate at high speed and take a light cut with a very sharp tool. Do not remove more metal than is necessary. Polish the commutator with very fine glass-paper. Undercut the insulators between the segments to a depth of $\frac{1}{32}$ in. (.8 mm.) with a hack-saw blade ground down to the thickness of the insulator.

N.6

Field coils

Test the field coils, without removing them from the dynamo yoke, by means of an ohmmeter. The reading on the ohmmeter should be between 6.0 and 6.3 ohms. If this is not available, connect a 12-volt D.C. supply with an ammeter in series between the field terminal and dynamo yoke. The ammeter reading should be approximately 2 amps. If no reading is indicated the field coils are open-circuited and must be renewed. To test for earthed field coils, unsolder the end of the field winding from the earth

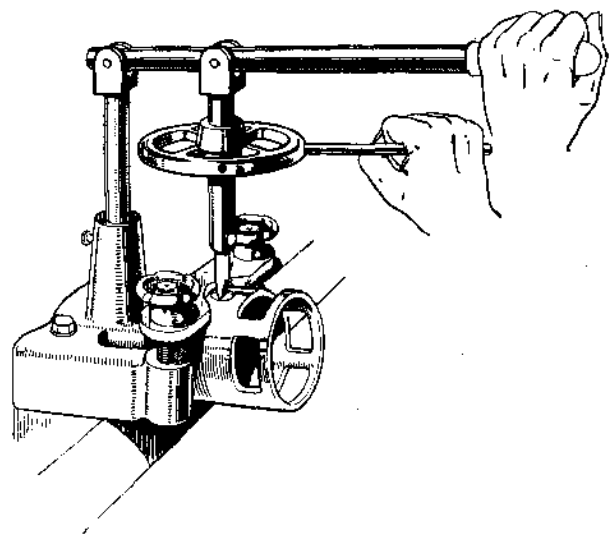


Fig. N.7.

The use of a wheel-operated screwdriver is necessary to remove and replace the pole shoe attachment screws.

terminal on the dynamo yoke and, with a test lamp connected from supply mains, test across the field terminal and earth. If the lamp lights the field coils are earthed and must be renewed.

When renewing field coils, carry out the procedure outlined below, using an expander and wheel-operated screwdriver.

- (a) Remove the insulation piece which is provided to prevent the junction of the field coils from contacting the yoke.
- (b) Mark the yoke and pole shoes in order that they can be fitted in their original positions.
- (c) Unscrew the two pole shoe retaining screws by means of the wheel-operated screwdriver.
- (d) Draw the pole shoes and coils out of the dynamo yoke and lift off the coils.
- (e) Fit the new field coils over the pole shoes and place them in position inside the yoke. Take care to ensure that the taping of the field coils is not trapped between the pole shoes and the yoke.

- (f) Locate the pole shoes and field coils by lightly tightening the fixing screw.
- (g) Insert the pole shoe expander, open it to the fullest extent and tighten the screws.
- (h) Finally tighten the screws by means of the wheel-operated screwdriver and lock them by caulking.
- (i) Replace the insulation piece between the field coil connections and the yoke.

Armature

The testing of the armature winding requires the use of a voltage drop test and growler. If these are not available, the armature should be checked by substitution. No attempt should be made to machine the armature core or to true a distorted armature shaft.

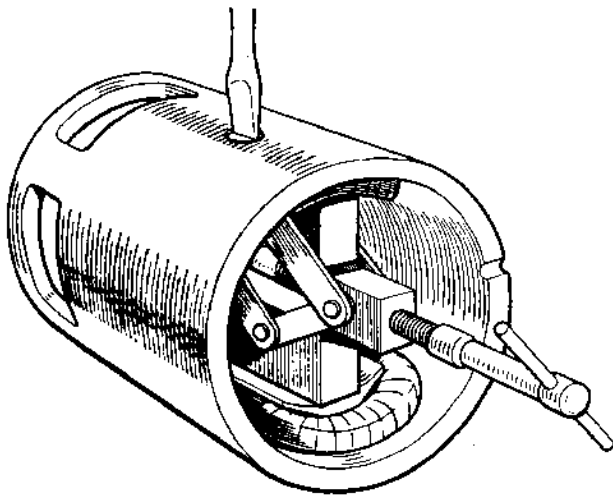


Fig. N.8.

To fit the pole shoes correctly an expander of the type illustrated is required.

Bearings

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

To renew the bearing bush at the commutator end, proceed as follows :—

- (a) Press the bearing bush out of the commutator end bracket.
- (b) Press the new bearing bush into the end bracket, using a shouldered mandrel of the same diameter as the shaft which is to fit in the bearing.

Note.—Before fitting the new bearing bush it should be allowed to stand completely immersed for twenty-four hours in thin engine oil to Ref. F

(page P.2). This will allow the pores of the bush to be filled with lubricant.

The ball bearing at the driving end is replaced as follows :—

- (a) Knock out the rivets which secure the bearing retaining plate to the end bracket and remove the plate.
- (b) Press the bearing out of the end bracket and remove the corrugated washer, felt washer and oil retaining washer.
- (c) Before fitting the replacement bearing see that it is clean and pack it with a high-melting-point grease.
- (d) Place the oil retaining washer, felt washer and corrugated washer in the bearing housing in the end bracket.
- (e) Locate the bearing in the housing and press it home by means of a hand press.
- (f) Fit the bearing retaining plate. Insert the new rivets from the inside of the end bracket and open the rivets by means of a punch to secure the plate rigidly in position.

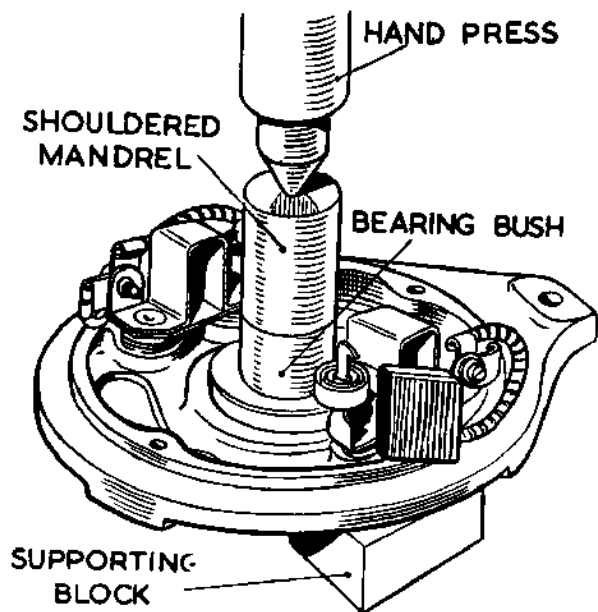


Fig. N.9.

The correct method of fitting the bronze bearing bush on the dynamo. Note the supporting blocks.

Reassembly

In the main the reassembly of the dynamo is a reversal of the operations described in Section N.4.

Before refitting the dynamo to the vehicle, unscrew the lubricator from the commutator end bracket, lift out the felt wick and spring and half fill the cap with high-melting-point grease to Ref. D (page P.2). Replace

N ELECTRICAL EQUIPMENT

spring and wick and screw the lubricator in position in the end bracket.

Section N.6

THE STARTER

Type

The starter is a Lucas Model M35G, Service No. 25022. These identification marks are stamped on the yoke. When ordering replacements always quote these numbers.

Its lock torque is approximately 9.3 lb./ft. (1.3 m./kg.), with 300–350 amps. and 7.5–8.0 volts.

To test on vehicle

Switch on the lamps and operate the starter control. If the lights go dim, but the starter is not heard to operate, an indication is given that current is flowing through the starter windings, but that the starter is meshed permanently with the geared ring on the

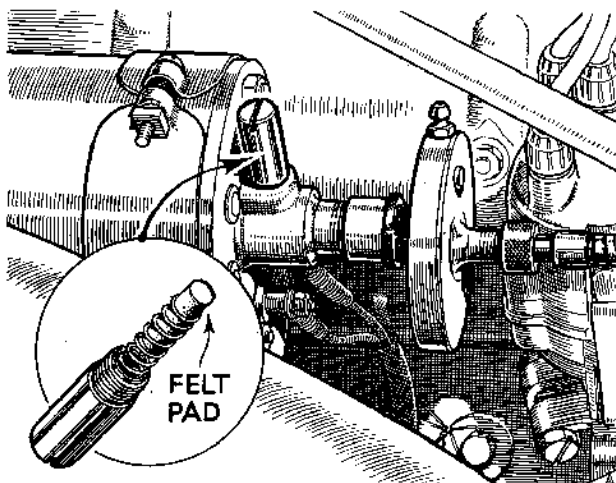


Fig. N.10.

The dynamo lubricator, with the felt pad and spring shown in the inset.

flywheel. This has probably been caused by the starter being operated while the engine was still running. In this case the starter must be removed from the engine for examination.

Should the lamps retain their full brilliance when the starter switch is operated, check that the switch is functioning. If the switch is in order, examine the connections at the battery, starter switch and starter, and also check the wiring between these units. Continued failure of the starter to operate indicates an internal fault in the starter, and the starter must be removed from the engine for examination.

N.8

Sluggish or slow action of the starter is usually caused by a poor connection in the wiring which produces a high resistance in the starter circuit. Check as described above.

Damage to the starter drive is indicated if the starter is heard to operate but does not crank the engine.

Section N.7

REMOVAL AND REPLACEMENT OF STARTER

Remove the two nuts, bolts and spring washers securing the rear exhaust bracket to the rear cross-member.

Remove the two nuts, bolts and spring washers securing the exhaust bracket to the third cross-member.

Remove the nut, bolt and spring washer securing the exhaust pipe clip to the exhaust bracket attached to the gearbox.

Remove the three nuts and spring washers attaching the exhaust pipe to the exhaust manifold and lower the exhaust system complete to the ground.

(The exhaust system should be supported at intervals during these operations.)

Remove the set screw securing the cable from the starter switch to the starter motor at the commutator end.

Unscrew the set bolts securing the starter motor to the flywheel housing and withdraw the starter.

Replacement is carried out in the reverse manner to that detailed for removal.

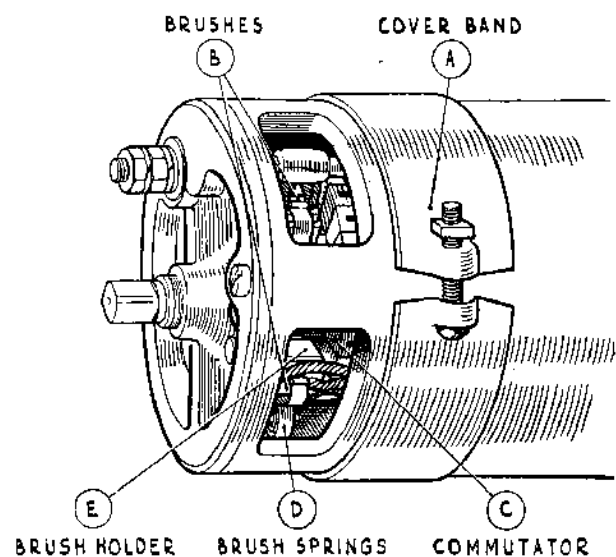


Fig. N.11.

The starter brush gear.

Section N.8

THE STARTER SWITCH

The starter switch is fitted on the engine side of the bulkhead and is operated by pulling the control knob in the instrument panel. The knob is connected to the switch by means of a cable. At the back of the starter switch are two terminals, from one of which two cables are connected, the heavy one to the battery and the other to the ammeter. From the second terminal a heavy cable is taken to the terminal on the commutator end bracket of the starter.

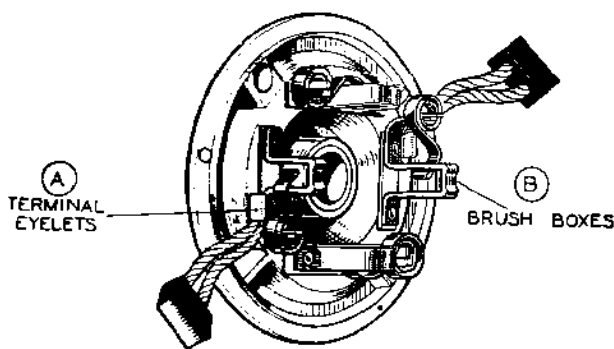


Fig. N.12.
The starter end cover.

Section N.9

THE STARTER COMMUTATOR AND BRUSH GEAR

Inspect the commutator and brush gear in the manner described for the dynamo in Sections N.4 and N.5. The brush spring tension should be 30-40 oz. (850-1134 grams). This operation should be carried out every 12,000 miles or 20000 kilometres.

In the unlikely event of brush replacement being necessary, this must be carried out by a Lucas Service Agent, as the operation entails dismantling of the starter.

Section N.10

THE STARTER DRIVE

It is recommended that the starter drive be examined every 12,000 miles or 20000 kilometres, taking particular care to ensure that the pinion moves freely on the screwed sleeve. Any dirt or other foreign matter on the sleeve must be washed away with paraffin (kerosene).

When the starter is operated, the rotation of the armature screws the pinion along the sleeve to mesh with the flywheel teeth. As soon as the engine starts firing, it will drive the flywheel faster than it is being driven by the starter. This will cause the pinion to screw back along the sleeve and so draw out of mesh with the flywheel teeth. A pinion restraining spring is fitted over the shaft to prevent the pinion from being vibrated into mesh when the engine is running.

In the event of the starter drive being jammed in mesh with the flywheel, it can usually be freed by turning the starter armature by means of a spanner

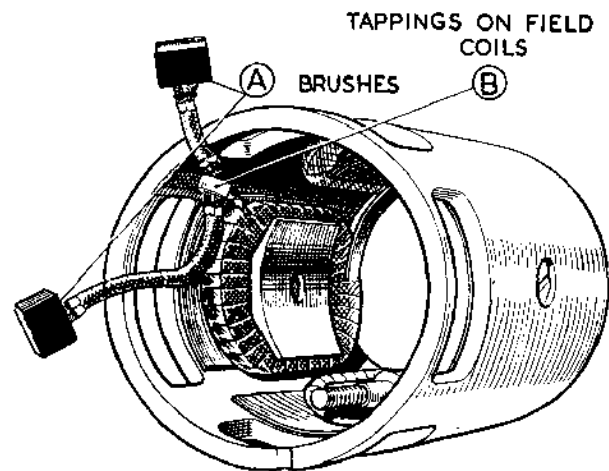


Fig. N.13.
The brush connections for the starter.

applied to the shaft extension at the commutator end. This is accessible by taking off the small cap, which is secured by two screws on some models and is a push fit on others.

If the pinion is found to be damaged or worn, it must be renewed together with the screwed sleeve. Similarly, if the main spring is broken, or the restraining spring weak or broken, replacement must be made.

Section N.11

SERVICING THE STARTER

Examination of commutator and brush gear

Remove the starter cover band "A" (Fig. N.11) and examine the brushes "B" and the commutator "C." Hold back each of the brush springs "D" and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder "E" and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are

N ELECTRICAL EQUIPMENT

worn so that they no longer bear on the commutator or if the brush flexible has become exposed on the running face they must be renewed.

If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the armature is rotated.

Dismantling

Take off the cover band "A" (Fig. N.11) at the commutator end, hold back the brush springs "D" and take out the brushes "B" from their holders.

Withdraw the two through bolts and remove the armature complete with driving end bracket.

Remove the terminal nuts and washers from the terminal post at the commutator end bracket and remove the commutator end bracket.

Brushes

(a) Test the brush springs with a spring scale. The correct tension is 30-40 oz. (850-1134 grams). Fit a new spring if the tension is low.

(b) If the brushes are worn so that they no longer bear on the commutator, or if the flexible connector has become exposed on the running face, they must be renewed. Two of the brushes are connected to terminal eyelets "A" (Fig. N.12) attached to the brush boxes

"B" on the commutator end bracket, and two "A" (Fig. N.13) are connected to a tapping "B" on the field coils.

The flexible connectors must be removed by unsoldering and the connectors of the new brushes secured in their place by soldering. The brushes are pre-formed so that bedding of their working face to the commutator is unnecessary.

Drive

- If the pinion is tight on the screwed sleeve, wash away any dirt with paraffin (kerosene).
- If any parts are worn or damaged they must be renewed.
- Remove the split pin "H" (Fig. N.14) from the shaft nut at the end of the starter drive. Hold the squared end of the starter shaft at the commutator end by means of a spanner and unscrew the shaft nut "J."
- Lift off the main spring "K" (Fig. N.14) and remove the retaining ring "L."
- The control nut "M," sleeve "N" and restraining spring "P" will now slide off.
- Withdraw the splined washer from the armature shaft and remove the pinion and barrel assembly.

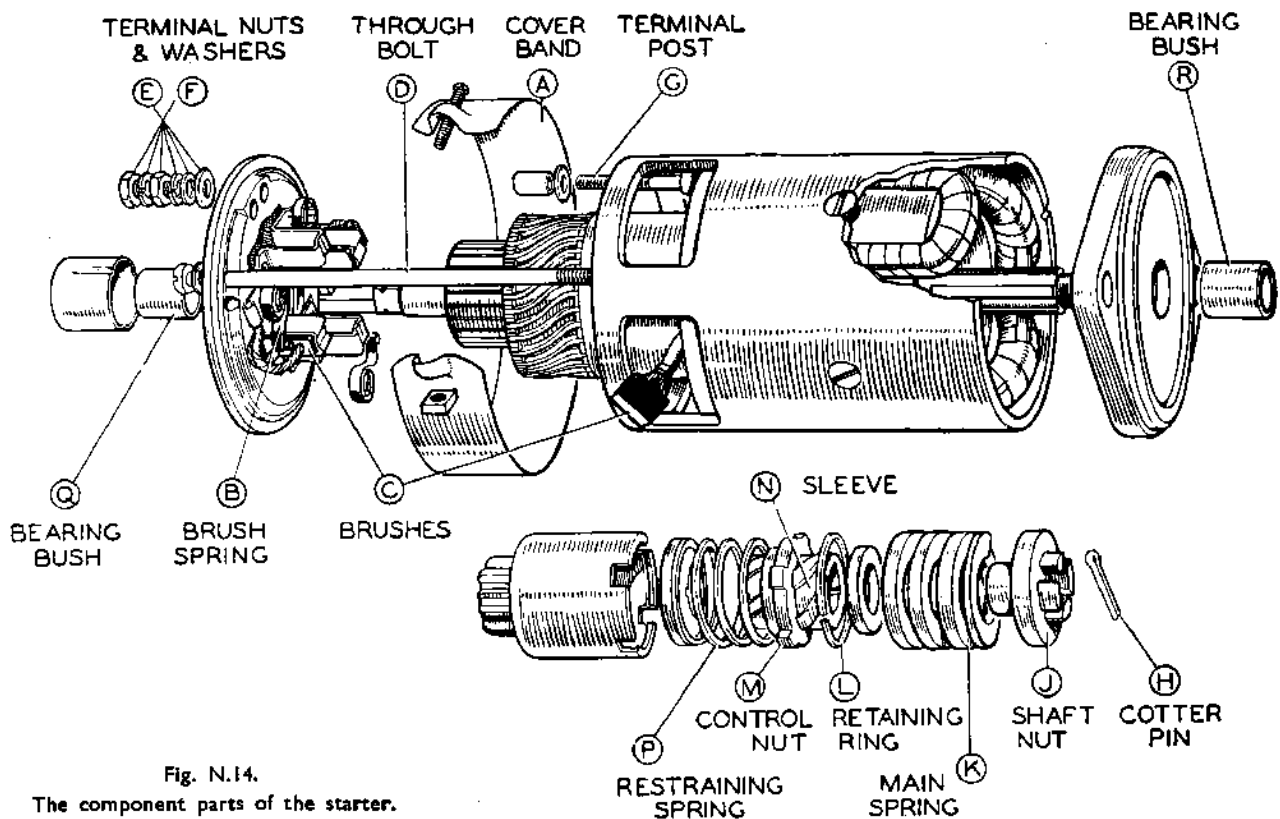


Fig. N.14.

The component parts of the starter.

Commutator

A commutator in good condition will be smooth and free from pits and burned spots. Clean the commutator with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of fine glass-paper, while rotating the armature. To remedy a badly worn commutator, dismantle the starter drive as previously described and remove the armature from the end bracket. Now mount the armature in a lathe, rotate it at a high speed and take a light cut with

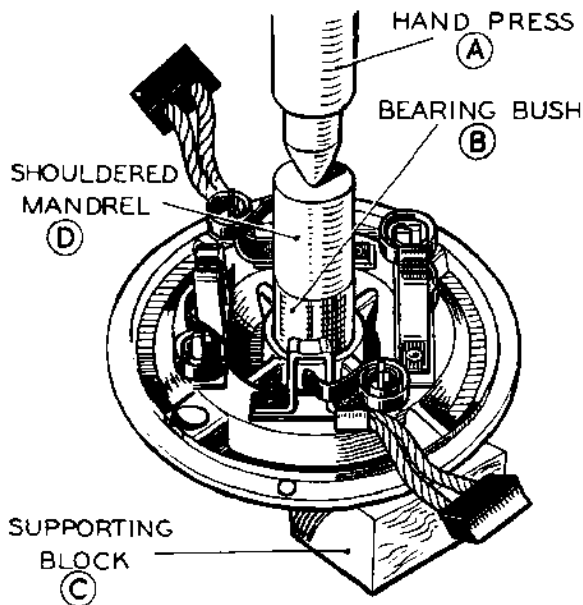


Fig. N.15.

The method of inserting a new bush in the starter end cover. Note use of supporting blocks.

a very sharp tool. Do not remove any more metal than is absolutely necessary, and finally polish with very fine glass-paper.

The insulator between the commutator segments **must not be undercut.**

Field coils

The field coils can be tested for an open circuit by connecting a 12-volt battery, with a 12-volt bulb in one of the leads, to the tapping point of the field coils to which the brushes are connected, and the field terminal post. If the lamp does not light, there is an open circuit in the wiring of the field coils.

Lighting of the lamp does not necessarily mean that the field coils are in order, as it is possible that one

of them may be earthed to a pole shoe or to the yoke. This may be checked by removing the lead from the brush connector and holding it on a clean part of the starter yoke. Should the bulb now light it indicates that the field coils are earthed.

Should the above tests indicate that the fault lies in the field coils, they must be renewed. When renewing field coils carry out the procedure detailed in the Dynamo Section N.5.

Armature

Examination of the armature will in many cases reveal the cause of failure, e.g. conductors lifted from the commutator due to the starter being engaged while the engine is running and causing the armature to be rotated at an excessive speed. A damaged armature must in all cases be renewed—no attempt should be made to machine the armature core or to true a distorted armature shaft.

Bearings

Bearings which are worn to such an extent that they will allow excessive side play of the armature shaft must be renewed. To renew the bearing bush, proceed as follows:—

- (a) Remove the old bearing bush by pressing it out of the end bearing, using a suitable shouldered mandrel in the press. Take care that the mandrel does not contact the bearing face and damage it during removal.
- (b) Press the new bearing bush into the end bracket, using a shouldered mandrel of the same diameter as the shaft which is to fit in the bearing.

Note.—The bearing bushes are of the porous phosphor-bronze type, and before fitting them they should be allowed to stand completely immersed for twenty-four hours in thin engine oil to Ref. F (page P.2) in order to fill the pores of the bush with lubricant.

Reassembly

The reassembly of the starter is a reversal of the operations described above.

Note.—Secure the body of the starter in a vice and test by connecting it with heavy-gauge cables to a battery of the correct voltage. One cable must be connected to the starter terminal and the other held against the starter body or end bracket. Under these light load conditions the starter should run at a very high speed.

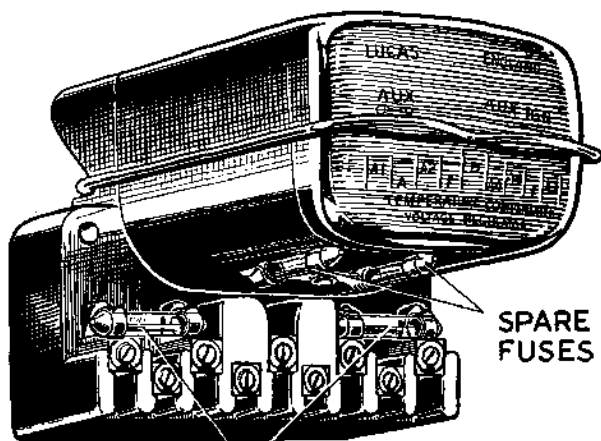
N ELECTRICAL EQUIPMENT

Section N.12

THE CONTROL BOX

Regulator adjustment

The regulator is carefully set before leaving the Works to suit the normal requirements of the standard equipment, and in general it should not be necessary to alter it. If, however, the battery does not keep in a charged condition, or if the dynamo output does not fall when the battery is fully charged, it may be advisable to check the setting and if necessary to re-adjust it.



FUSES IN CIRCUITS OF ACCESSORIES

Fig. N.16.

The control box on early models, showing the location of the fuses. On later models a separate fuse box is fitted (see Fig. N.21).

It is important, before altering the regulator setting, when the battery is in a low state of charge, to check that its condition is not due to a battery defect or to the dynamo belt slipping.

How to check and adjust electrical setting

The regulator setting can be checked without removing the cover on the control box.

Withdraw the cables from the terminals marked "A" and "A.1" at the control box and join them together. Connect the negative lead of a moving coil voltmeter (0—20 volts full scale reading) to the "D" terminal on the dynamo and connect the other lead from the meter to a convenient chassis earth.

Slowly increase the speed of the engine until the voltmeter needle "flicks" and then steadies; this should occur at a voltmeter reading between the limits given in the next column for the appropriate temperature of the regulator.

Setting at 10° C. (50° F.)	16.1—16.7 volts
" " 20° C. (68° F.)	15.8—16.4 "
" " 30° C. (86° F.)	15.6—16.2 "
" " 40° C. (104° F.)	15.3—15.9 "

If the voltage at which the reading becomes steady occurs outside these limits, the regulator must be adjusted.

Shut off the engine, remove the control box cover, release the locknut "A" (Fig. N.17) holding the adjusting screw "B." The screw turns in a clockwise direction to raise the setting or in an anti-clockwise direction to lower the setting. Turn the adjusting screw a fraction of a turn in the required direction and then tighten the locknut.

When the dynamo is run at a high speed on open circuit it builds up a high voltage. When adjusting the regulator do not run the engine up to more than half-throttle or a false voltmeter reading will be obtained.

Mechanical setting

The mechanical setting of the regulator is accurately adjusted before leaving the Works, and provided that the armature carrying the moving contact is not

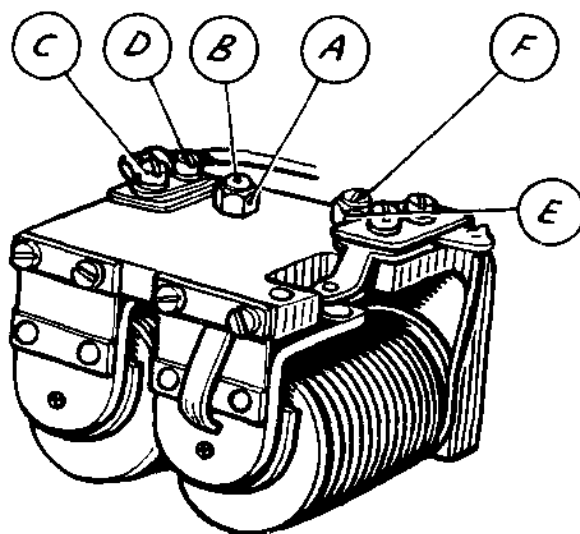


Fig. N.17.

The cut-out and regulator assembly.

removed, the regulator will not require mechanical adjustment. If, however, the armature has been removed from the regulator for any reason, the contacts will have to be reset. To do this, proceed as follows:—

- (i) Slacken the two armature fixing screws "E" (N.18). Insert a .018 in. (.46 mm.) feeler gauge

between the back of the armature "A" and the regulator frame "B."

- (ii) Press back the armature against the regulator frame and down on to the top of the bobbin core with the gauge in position, and lock the armature by tightening the two fixing screws.
- (iii) Check the gap between the under side of the arm and the top of the bobbin core. This must be $.012-.020$ in. ($.30-.50$ mm.). If the gap is outside these limits correct by adding or removing shims "F" at the back of the fixed contact "D."
- (iv) Remove the gauge and press the armature down, when the gap between the contacts should be between $.006$ in. ($.15$ mm.) and $.017$ in. ($.43$ mm.).

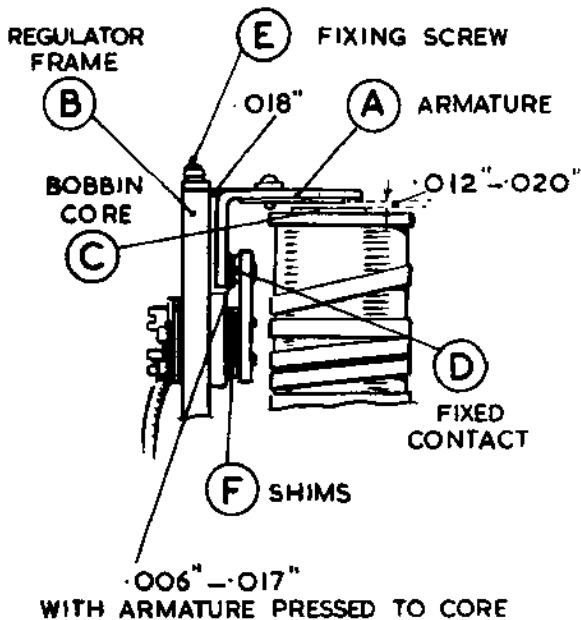


Fig. N.18.

The mechanical adjustment for the regulator.

Cleaning contacts

To render the regulator contacts accessible for cleaning, slacken the screws securing the plate carrying the fixed contact. It will be necessary to slacken the upper screw "C" (Fig. N.17) a little more than the lower "D" so that the contact plate can be swung outwards. Clean the contacts by means of fine carborundum stone or fine emery cloth. Carefully wipe away all traces of dirt or other foreign matter. Finally tighten the securing screws.

CUT-OUT

Adjustment

If it is suspected that the cutting-in speed of the dynamo is too high, connect a voltmeter between the terminals marked "D" and "E" at the control box and slowly raise the engine speed. When the voltmeter reading rises to between 12.7 and 13.3 the cut-out contact should close.

If the cut-out has become out of adjustment and operates at a voltage outside these limits it must be reset. To make the adjustment, slacken the locknut "E" (Fig. N.17), turn the adjusting screw "F" a fraction of a turn in a clockwise direction to raise the operating voltage or in an anti-clockwise direction to lower the voltage. **Tighten locknut after making the adjustment.**

Cleaning

To clean the contacts remove the cover, place a strip of fine glass-paper between the contacts and then, closing the contacts by hand, draw the paper through. This should be done two or three times, with the rough side towards each contact.

Radio suppression

When it is desired to fit suppressors for radio equipment on early models make sure that this is done only in accordance with the recommended practice. Suppressors and capacitors wrongly fitted may cause damage to the electrical equipment. Later models are fitted with suppressors at the factory.

Section N.13

WINDSCREEN WIPER—TYPE CW

The motor is a three-pole wound armature type running in a two-pole field. A celeron plate carries the brush gear for two carbon brushes which bear on the commutator.

If the wiper fails to operate or operates unsatisfactorily, proceed as follows :—

Ascertain if the battery is supplying current to the wiper by switching on and noting if the ammeter responds.

Examine the fuse protecting the wiper. If it has blown, examine the wiring for evidence of short circuits or chafed leads. If, on replacing the fuse, it blows again, remove the wiper from the car. Momentarily connect wiper to a battery and see if the wiper then operates satisfactorily.

N ELECTRICAL EQUIPMENT

1. Switch setting out of adjustment or switch contacts dirty

If the cover of the wiper has been damaged, or if the switch has been tampered with, the contacts may be remaining permanently open. Remove the cover and see that the switch control moves freely—when the cover is removed the switch contacts should remain closed. Examine the contacts and if necessary clean them with fine emery cloth.

2. Loose or broken connections

Remove the wiper cover and examine the wiring of the motor. If necessary, re-solder any connections which are loose or broken.

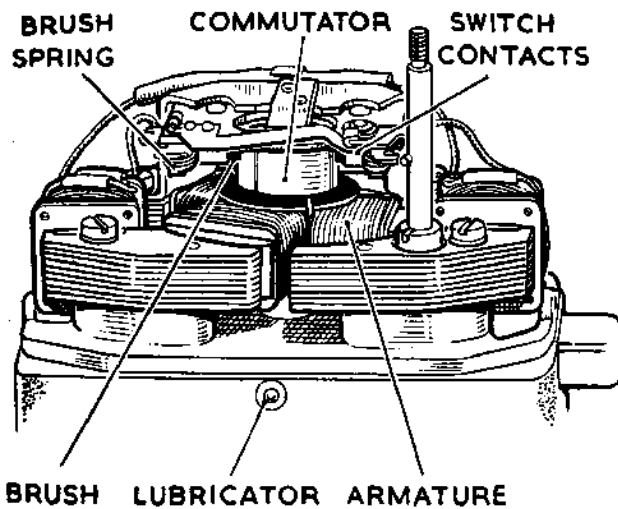


Fig. N.19.

The windscreen wiper with its cover removed, showing its internal construction.

3. Brush worn out or not bearing on commutator

The brushes are carried in small boxes and are pressed against the commutator by means of springs. See that the springs press firmly on the brushes and that they do not foul the sides of the brush boxes. The brushes must be clean and move freely in their holders. To remove the brushes for examination, hold back the springs by means of a bent piece of wire and gently lever the brushes from their holders.

If the brushes are dirty or greasy, causing them to stick in their holders, clean them with a cloth moistened with petrol.

When refitting the brushes, replace them in the same boxes and in the same positions as originally fitted, in order to preserve the brush bedding.

If the brushes have become worn to such an extent that they no longer make good contact with the commutator, they must be renewed. Replacement brushes can be obtained from any Lucas Agent.

4. Armature binding or bearings stiff

Turn armature by hand for several revolutions—if it is consistently tight the wiper probably needs lubrication (see paragraph 8). If the armature is only tight occasionally, the stiffness is probably in the gearbox or is caused by dirt or other foreign matter in the air gap between the armature and the pole shoes. Remove the wiper back plate and examine the gears and links for evidence of stiffness.

5. Commutator dirty

Clean the commutator by means of a cloth moistened with petrol. Carefully remove any carbon dust from between the segments of the commutator.

6. Brush gear short-circuited

This may be caused either by damage to the wiper cover or to a stray conductor making contact with the brush gear. Rectify the damage to the wiper cover or fit a new cover and remedy any other damage.

7. Armature damaged

If, after following the preceding examination, the wiper still does not operate or its performance is unsatisfactory, the fault may be due to the armature being damaged. Fit a replacement armature.

8. Lubrication

If the rotor is consistently stiff when turned by hand, add a few drops of thin machine oil to the lubricator provided. When examining the gearbox, if necessary, lightly pack the gears with a good-quality high-melting-point zinc-oxide grease, such as Duckham's Keenol KG.25.

Section N.14

THE ELECTRIC HORNS MODEL WT614

All horns before being passed out of the Works are adjusted to give their best performance and will give a long period of service without any attention; no subsequent adjustment is required.

If one of the horns fails or becomes uncertain in its action, it does not follow that the horn has broken down. First ascertain that the trouble is not due to some outside source, e.g. a discharged battery, or loose connection or short circuit in the wiring of the horn; a short circuit in the horn wiring will cause the fuse to blow. If both horns fail or become uncertain in action, the trouble is probably due to a discharged battery or blown fuse. If the fuse has blown, examine

the wiring for the fault and replace with the spare fuse provided.

It is also possible that the performance of a horn may be upset by the fixing bolt working loose, or by some component near the horn becoming loose. If after carrying out the above examination the trouble is not rectified, the horn may need adjustment, but this should not be necessary until the horns have been in service for a long period.

Adjustment does not alter the pitch of the note, it merely takes up wear of moving parts. When adjusting the horns, short-circuit the fuse, otherwise it is liable to blow. Again, if the horns do not sound on adjustment, release the push instantly.

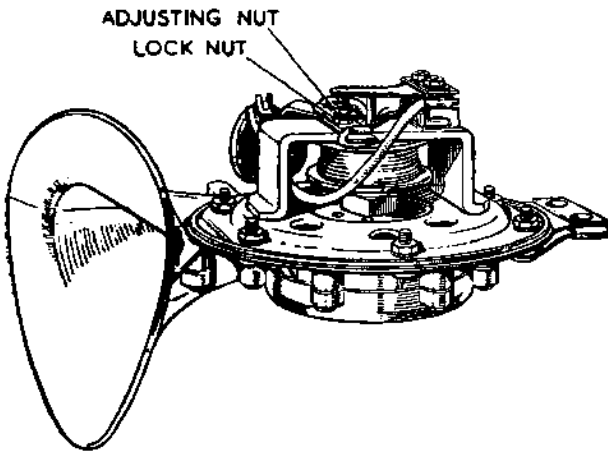


Fig. N.20.

The Lucas model WT614 windtone horn with its cover removed to show the adjustment provided to compensate for wear.

When making adjustments to a horn, always disconnect the supply lead of the other horn, taking care to ensure that it does not come into contact with any part of the chassis and so cause a short circuit.

Adjustment

Remove the horn cover after withdrawing the fixing screw and detach the cover securing bracket by springing it from its fixing.

Slacken the locknut on the fixed contact and rotate the adjusting nut until the contacts are just separated (indicated by horns failing to sound). Turn the adjusting nut half a turn in the opposite direction and secure in this position by tightening the locknut. Finally, if the note is still unsatisfactory, do not dismantle the horn but return it to a Lucas Service Depot or Service Agent for examination.

Section N.15

THE FUSES

The fuses are accessible without removing the cover over the cut-out and regulator. The cover is therefore sealed.

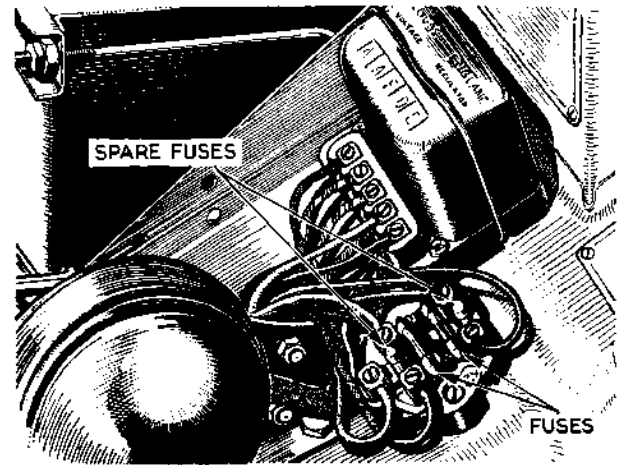


Fig. N.21.

Two spare fuses are carried in recesses on the later separate fuse box.

Fuse marked "AUX" (early models)

Fuse connecting A.1 and A.2 (later models)

This fuse protects the accessories which are connected so that they operate irrespective of whether the ignition switch is on or off.

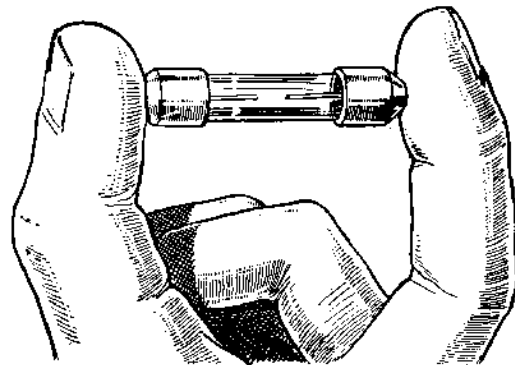


Fig. N.22.

The appearance of a burnt-out fuse.

Fuse marked "AUX IGN" (early models)

Fuse connecting A.3 and A.4 (later models)

This fuse protects the accessories which are connected so that they operate only when the ignition is switched on.

Units protected

The units which are protected by each fuse can readily be identified by referring to the wiring diagrams on pages N.21 to N.23.

N ELECTRICAL EQUIPMENT

Blown fuses

A blown fuse is indicated by the failure of all the units protected by it, and is confirmed by examination of the fuse, which can easily be withdrawn from the spring clips in which it fits. If it has blown, the fused state of the wire will be visible inside the glass tube. Before renewing a blown fuse, inspect the wiring of the units that have failed for evidence of a short circuit or other faults which may have caused the fuse to blow, and remedy the cause of the trouble. This is essential or the fuse is liable to blow again on replacement.

Always use a fuse of the correct fusing value when fitting a new one. The value is clearly marked on the paper strip inside the fuse.

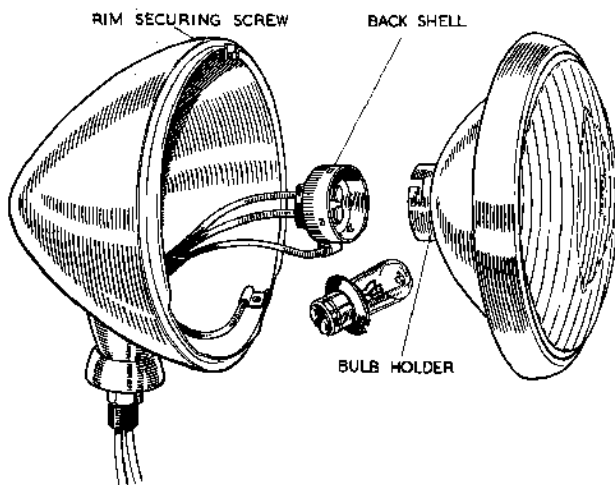


Fig. N.23.

The headlamp separated to show its component parts.

Section N.16

THE HEADLAMPS

Each headlamp incorporates a Lucas light unit, which consists essentially of a reflector and front glass assembly. The bulb, which is a Lucas pre-focus type, is located accurately in the reflector and is secured by a bayonet-fixed back shell which also provides the contact to the bulb. The design of the bulb and of its holder is such that the bulb is correctly positioned in relation to the reflector and no focusing is required when a replacement bulb is fitted.

It is to be noted that the block-type lenses fitted to later models are different on LHD models from those on RHD models and that it is essential to fit correct replacement glasses if the beam formation is to be retained.

The anti-dazzle device

Early Home models are equipped with a double-filament bulb in the left-hand headlamp, controlled by

the dipping switch. Operation of the dip switch extinguishes the right-hand lamp and simultaneously deflects the left-hand headlamp beam downwards and to the left to provide good illumination of the left-hand kerb.

On Export models and later Home models both headlamps are fitted with double-filament bulbs.

Operation of the dip-switch extinguishes the main driving beam in each headlamp and brings the dipping beams into action.

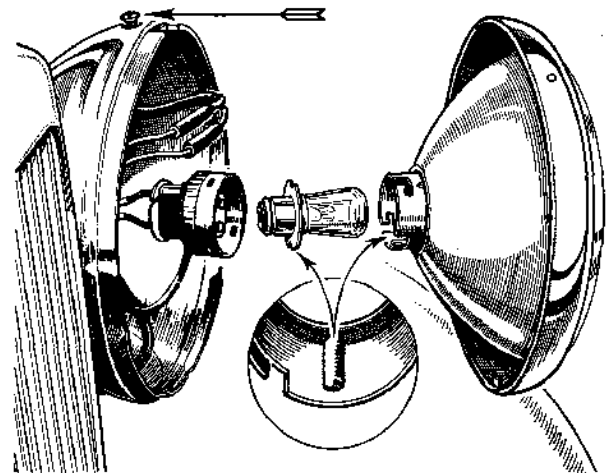


Fig. N.24.

The headlamp with the light unit removed, showing the attachment screw for the light unit and the keyway for the pre-focus bulb.

Bulb replacement

To gain access to the bulb, slacken the screw at the top of the lamp and remove the front rim and light unit assembly. Twist the back shell in an anti-clockwise direction and pull it off. The bulb can now be removed from the rear of the reflector. Place the replacement bulb in the holder and engage the projections of the back shell with the slots in the bulb holder, press on and secure by twisting to the left.

Section N.17

SETTING THE HEADLAMPS

Lucas beam setter

All Lucas Service Depots and many service agents now include among their special testing facilities an apparatus known as the Lucas Beam Setter. This is a specially designed instrument by means of which headlamps can be set with extreme accuracy, thereby ensuring the maximum efficiency from the lamps.

You are strongly advised to make use of this service. If, however, it is not possible to have the lamps adjusted

by this method, the procedure for setting is as follows:—

Each lamp must be set so that the main driving beam is parallel with the road surface, or in accordance with the local regulations. To make the adjustment,

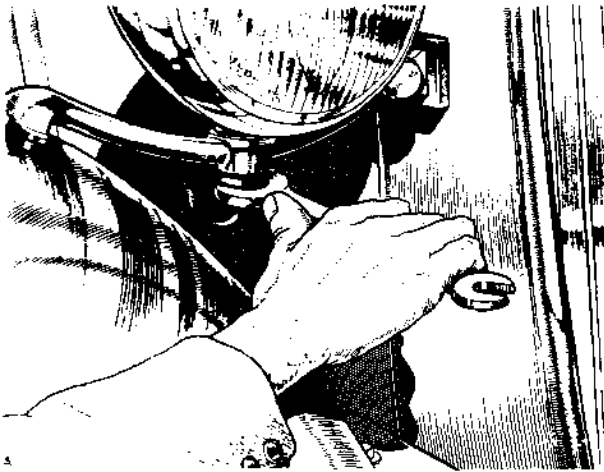


Fig. N.25.

The headlamps are mounted on a spherical seating and can be set accurately when the hexagon attachment nut is slackened.

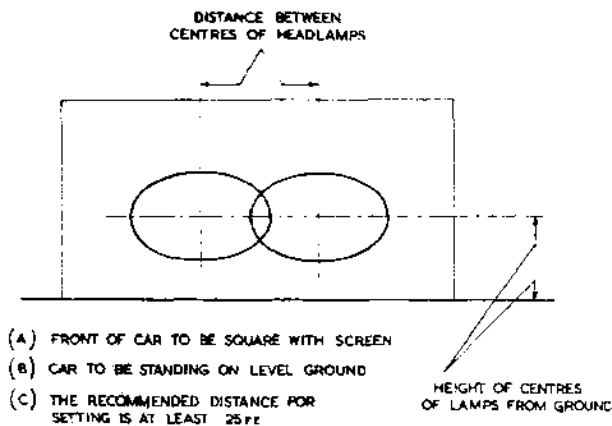


Fig. N.26.

The correct setting for the headlamps is demonstrated in this diagram. On no account should the beams be set higher than this.

slacken the single fixing nut at the base of the lamp and move the lamp on its adjustable mounting to the required position. Finally tighten the locknut.

Section N.18

THE SIDELAMPS

To gain access to the bulb slacken the screw at the top of the lamp and withdraw the front rim and glass assembly.

Section N.19

THE TAIL- AND STOP-LAMPS

Twin lamps are fitted to all models. Each lamp is fitted with a double-filament bulb (6/24 watt). The small-wattage filament is connected to the tail-lamp circuit and the large-wattage filament to the stop-lamp circuit.

Two types of tail-lamp bulb holder have been employed, the normal symmetrical type and, more recently, holders with offset bayonet slots.

The latter type have been introduced to ensure that the bulbs cannot be fitted the wrong way round, thus causing the high-wattage filament to be in circuit when the tail-lamp switch is on, and the low-wattage filament to be operated by the stop switch.

When fitting replacement bulbs no difficulty should be experienced in fitting them correctly, as Lucas No. 189 bulbs (symmetrical type) are marked with the word

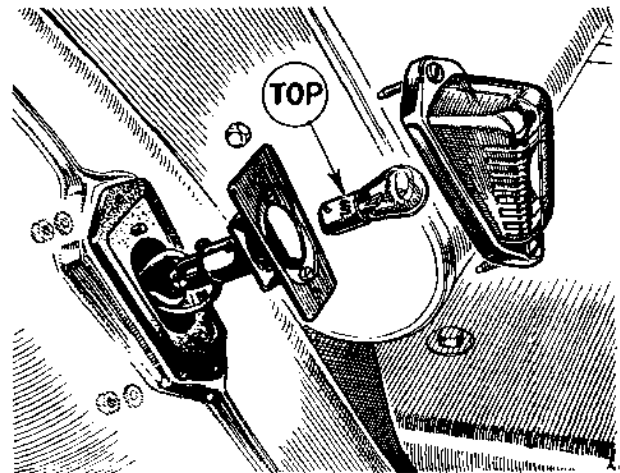


Fig. N.27.

The tail-lamp dismantled to show its component parts and how access is obtained to the bulb. A later type is described and illustrated in Section N.28.

“TOP” on the cap and Lucas No. 361 bulbs (non-reversible type) are designed so that the locating pegs are offset and therefore can only be fitted into the bulb holder in the correct position.

To gain access to the bulb on early models, slacken the two screws held by nuts and spring washers under the wing and withdraw the rim and glass assembly. (For later models see Section N.28.)

Section N.20

THE NUMBER-PLATE ILLUMINATION LAMP

To gain access to the bulb, slacken the single central securing screw for the plated cover and withdraw the cover and glass assembly.

N ELECTRICAL EQUIPMENT

The 12-volt lamp bulb is of the miniature bayonet type and bears the Lucas Part No. 989. Early models were fitted with two bulbs.

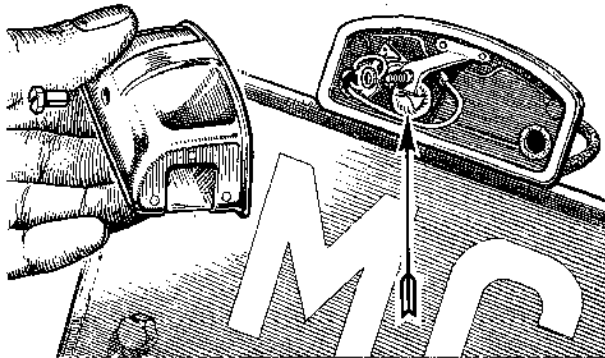


Fig. N.28.

The cover of the number-plate lamp removed to show the mounting of the bulbs on later models. On early models two bulbs were employed.

Section N.21

THE PANEL LAMPS

The instruments are illuminated by small screw-in type bulbs located behind the instrument panel and access to them can be obtained through a hand-hole cut in the inner panel close to the steering column.

More comfortable access can be achieved by removing the fascia board undershield panel. Early models were fitted with four bulbs, but on later models only three are employed.

Section N.22

REMOVAL OF THE INSTRUMENT PANEL

Release the large fascia panel undershield and lower the steering column. This will give access to the rear of the instrument panel, which is held by six nuts.

Disconnect the starter and mixture controls, remove the panel attachment nuts and withdraw the panel.

Section N.23

THE IGNITION AND FUEL WARNING LAMPS

Access to the bulbs of the ignition and fuel warning lamps is obtained by unscrewing the slotted plated rims surrounding the lights. Removal of the rims

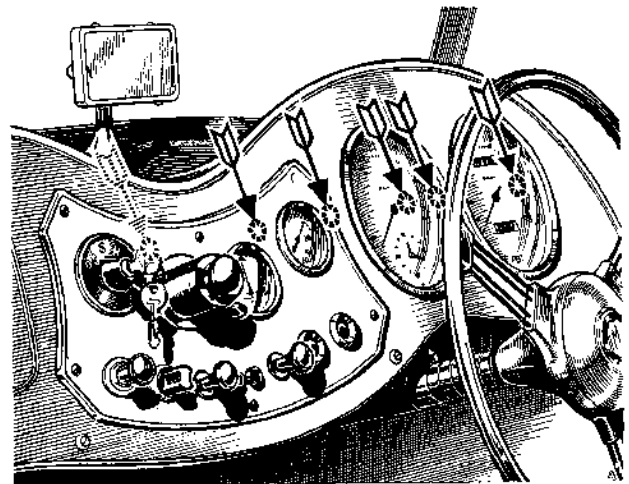


Fig. N.29.

Access to the panel lamps is obtained by removing the instrument panel cover.

releases the bulbs from their spring holders and no difficulty arises in replacement.

The ignition and fuel warning bulbs are Lucas No. 987 12-volt, 2.2-watt.

Section N.24

LOCATION AND REMEDY OF FAULTS

Although every precaution is taken to eliminate possible causes of trouble, failure may occasionally

REPLACEMENT BULBS

	Lucas No.	Volts	Watts
Headlamps (Main), Home (L/H)—early models ...	300 (dip left) ...	12	36/36
Headlamps (Main), Home (R/H)—early models ...	162 ...	12	36
Headlamps, Export (R.H.D.) and Home later models	354 (dip left) ...	12	42/36
Headlamps, Export (L.H.D.) ...	301 (dip right) ...	12	36/36
Headlamps, Export (Europe [except France] and N. Africa)	360 ...	12	45/35
Sidelamps ...	207 ...	12	6
Stop/tail-lamps (reversible) ...	189 ...	12	6/24
Stop/tail-lamps (non-reversible) ...	361 ...	12	6/18
Number-plate illumination lamp ...	989 ...	12	6
Ignition, fuel and headlamp beam warning light ...	987 ...	12	2.2
Fog-lamp ...	323 ...	12	48
Flashing direction indicators ...	221 ...	12	18

develop through lack of attention to the equipment, or damage to the wiring. The following pages set out the recommended procedure for a systematic examination to locate and remedy the causes of some of the more usual faults encountered.

The sources of trouble are by no means always obvious, and in some cases a considerable amount of deduction from the symptoms is needed before the cause is disclosed.

For instance, the engine might not respond to the starter switch; a hasty inference would be that the starter motor is at fault. However, as the motor is dependent on the battery, it may be that the battery is exhausted.

This, in turn, may be due to the dynamo failing to charge the battery, and the final cause of the trouble may be, perhaps, a loose connection in some part of the charging circuit.

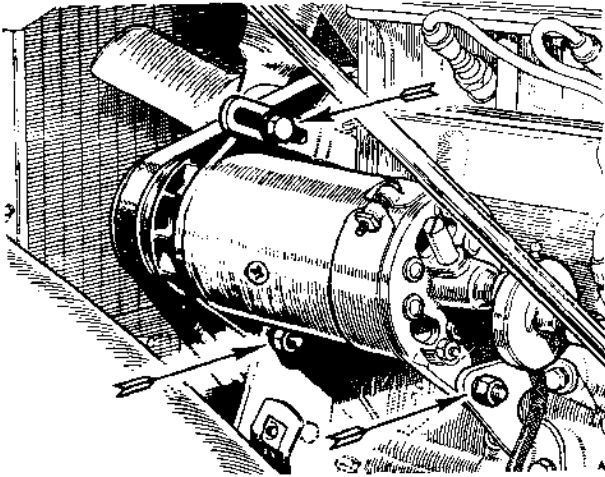


Fig. N.30.

The dynamo drive belt is adjusted by slackening the three dynamo attachment bolts and swinging the dynamo on the two lower ones into the desired position. All three must then be tightened carefully.

If, after carrying out an examination, the cause of the trouble is not found, the equipment should be checked by the nearest Lucas Service Depot or Agent.

Much needless damage can be done to items of the equipment by attempting to correct faults without the necessary equipment and experience.

THE CHARGING CIRCUIT

1. Battery in low state of charge

- (a) This state will be shown by lack of power when starting, poor light from the lamps, and hydrometer readings below 1.200. It may be due to the dynamo not charging or

giving low or intermittent output. The ignition warning light will not go out if the dynamo fails to charge, or will flicker on and off in the event of intermittent output.

- (b) Examine the charging and field circuit wiring, tightening any loose connections or renewing broken cables. Pay particular attention to the battery connections.
- (c) Examine the dynamo driving belt; take up any undue slackness by swinging the

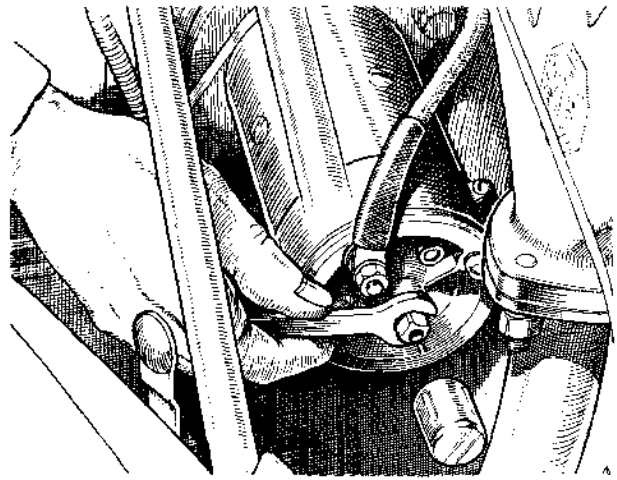


Fig. N.31.

Should the starter motor pinion become jammed with the flywheel it may be freed by rotating the spindle by the square provided on the end.

dynamo outwards on its mounting after slackening the attachment bolts.

- (d) Check the regulator setting and adjust if necessary.
- (e) If, after carrying out the above, the trouble is still not cured, have the equipment examined by a Lucas Service Depot or Agent.

2. Battery overcharged

- (a) This will be indicated by burnt-out bulbs, very frequent need for topping up the battery, and high hydrometer readings. Check the charging current when the engine is running steadily with a fully charged battery and no lights or accessories in use; the charge reading should be of the order of only 3-4 amperes.

If the charge reading is in excess of this value, it is advisable to check the regulator setting and adjust if necessary.

THE STARTER MOTOR

1. *Starter motor lacks power or fails to turn engine*
 - (a) See if the engine can be turned over by hand. If not, the cause of the stiffness in the engine must be located and remedied.
 - (b) If the engine can be turned by hand, first check that the trouble is not due to a discharged battery.
 - (c) Examine the connections to the battery, starter and starter switch, making sure that they are tight and that the cables connecting these units are not damaged.
 - (d) It is also possible that the starter pinion may have jammed in mesh with the flywheel, although this is by no means a common occurrence. To disengage the pinion, rotate the squared end of the starter shaft by means of a spanner.

2. *Starter operates but does not crank engine*

This fault will occur if the pinion of the starter drive is not allowed to move along the screwed sleeve into engagement with the flywheel, due to dirt having collected on the screwed sleeve. Remove the starter and clean the sleeve carefully with paraffin.

3. *Starter pinion will not disengage from flywheel when engine is running*

Stop the engine and see if the starter pinion is jammed in mesh with the flywheel, releasing it if necessary by rotation of the squared end of the starter shaft. If the pinion persists in sticking in mesh, have the equipment examined at a Service Depot. Serious damage may result to the starter if it is driven by the flywheel.

THE LIGHTING CIRCUITS

1. *Lamps give insufficient illumination*
 - (a) Test the state of charge of the battery, recharging it if necessary from an independent electrical supply.
 - (b) Check the setting of the lamps.
 - (c) If the bulbs are discoloured as the result of long service, they should be renewed.
2. *Lamps light when switched on but gradually fade out*
As paragraph 1 (a).
3. *Brilliance varies with speed of car*
 - (a) As paragraph 1 (a).
 - (b) Examine the battery connections, making sure that they are tight, and renew any faulty cables.

Section N.25

THE HEADLAMP BEAM WARNING LIGHT

In order to give the driver visual warning to dip his headlamp beams on approaching other vehicles, later M.G. Midget cars have a warning light in the speedometer which glows when the headlamp beams are in the raised position and is extinguished when the beams are dipped.

Section N.26

MODIFIED DIPPING SWITCH

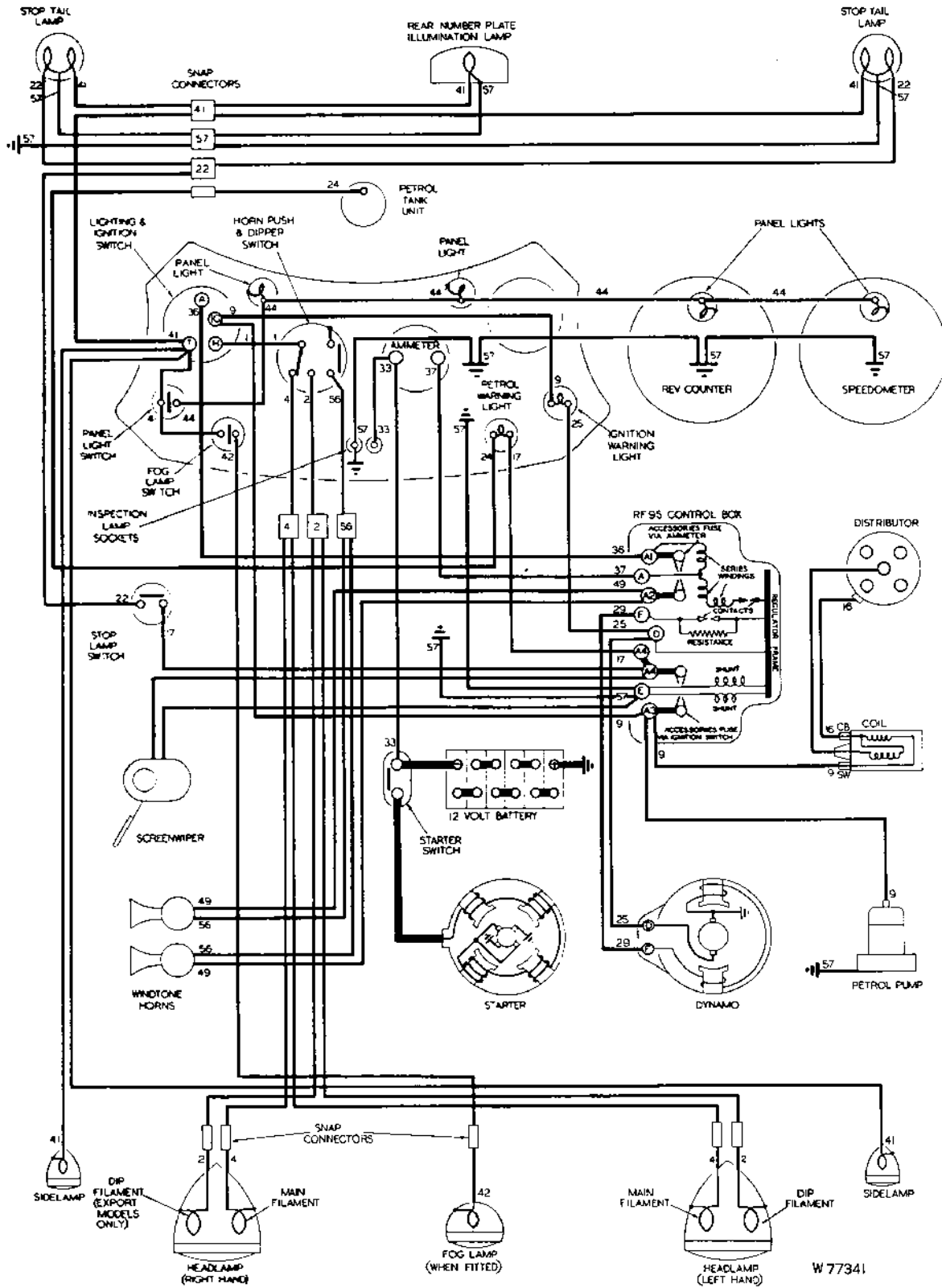
Later M.G. Midget Series "TD" cars are provided with a foot-operated headlamp beam dipping switch, replacing the hand switch on the fascia panel which was originally fitted.

The new wiring diagram covering this equipment is given on page N.23.

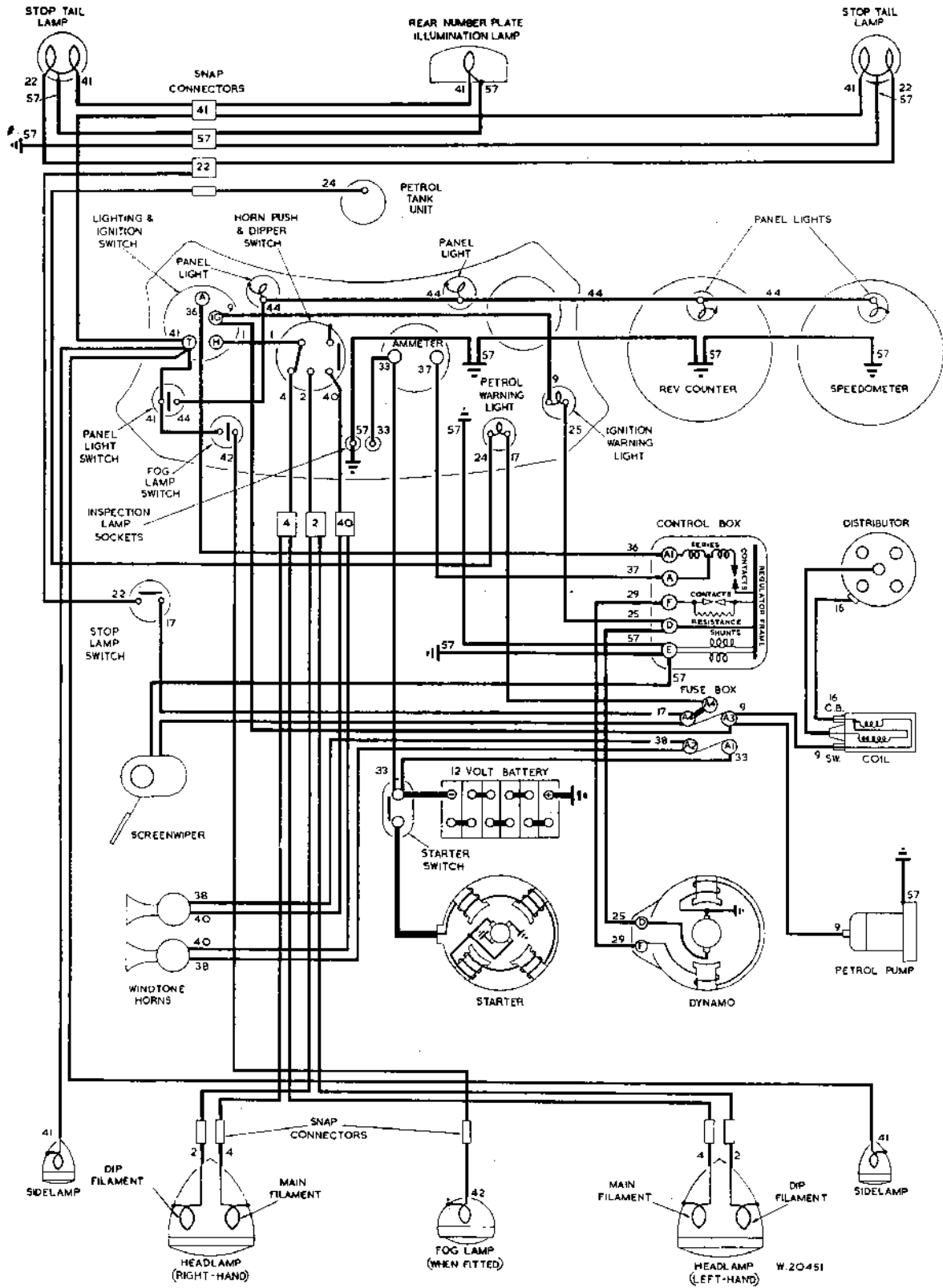
KEY TO CABLE COLOURS

1 Blue	15 White with Brown	28 Yellow with White	41 Red	54 Purple with Green
2 Blue with Red	16 White with Black	29 Yellow with Green	42 Red with Yellow	55 Purple with Brown
3 Blue with Yellow	17 Green	30 Yellow with Purple	43 Red with Blue	56 Purple with Black
4 Blue with White	18 Green with Red	31 Yellow with Brown	44 Red with White	57 Black
5 Blue with Green	19 Green with Yellow	32 Yellow with Black	45 Red with Green	58 Black with Red
6 Blue with Purple	20 Green with Blue	33 Brown	46 Red with Purple	59 Black with Yellow
7 Blue with Brown	21 Green with White	34 Brown with Red	47 Red with Brown	60 Black with Blue
8 Blue with Black	22 Green with Purple	35 Brown with Yellow	48 Red with Black	61 Black with White
9 White	23 Green with Brown	36 Brown with Blue	49 Purple	62 Black with Green
10 White with Red	24 Green with Black	37 Brown with White	50 Purple with Red	63 Black with Purple
11 White with Yellow	25 Yellow	38 Brown with Green	51 Purple with Yellow	64 Black with Brown
12 White with Blue	26 Yellow with Red	39 Brown with Purple	52 Purple with Blue	65 Dark Green
13 White with Green	27 Yellow with Blue	40 Brown with Black	53 Purple with White	66 Light Green

WIRING DIAGRAM

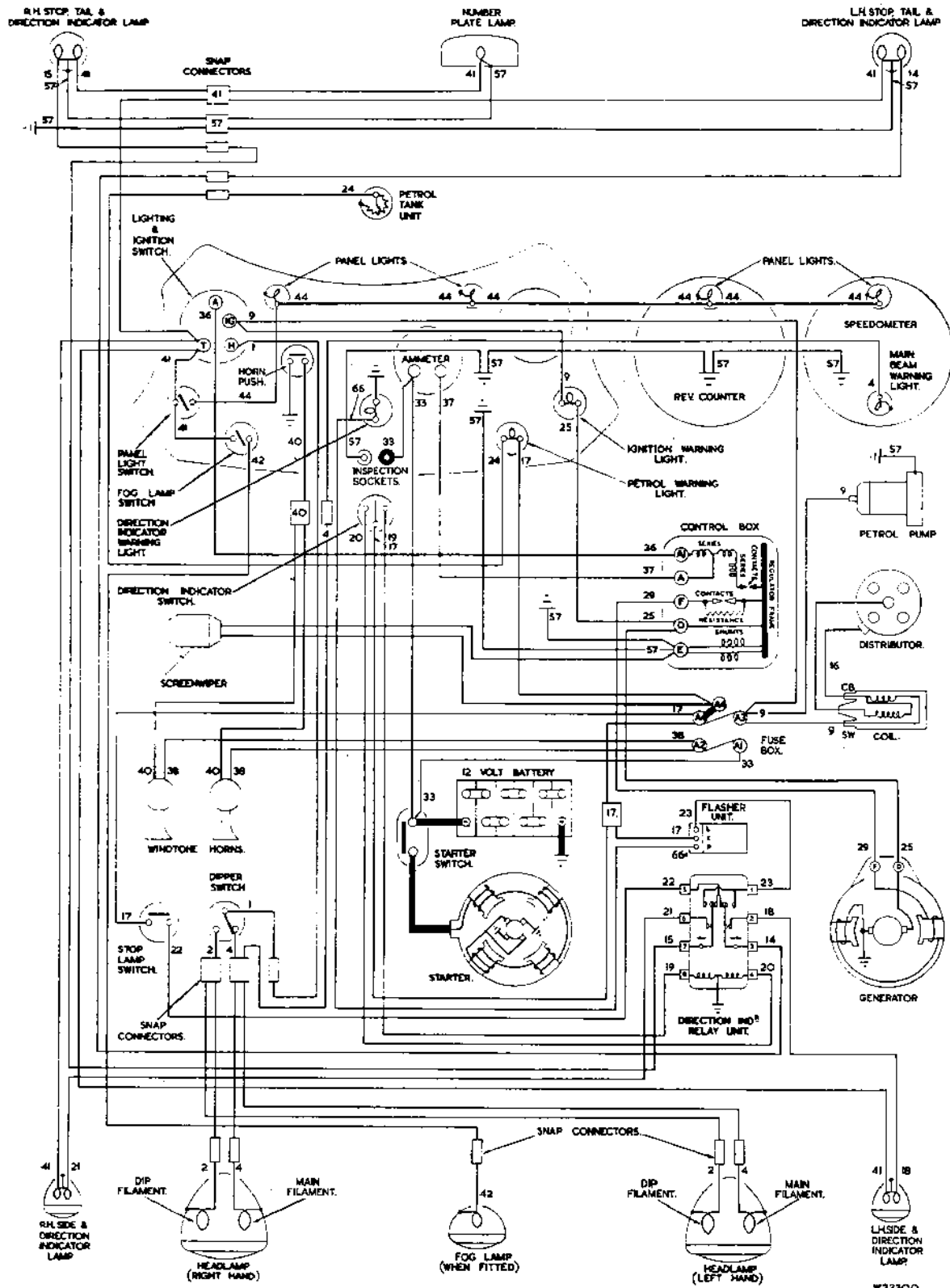


WIRING DIAGRAM FOR CARS WITH SEPARATE CONTROL AND FUSE BOXES



Key to cable colours as on page N.20.

WIRING DIAGRAM FOR CARS WITH SEPARATE CONTROL AND FUSE BOXES, HEADLAMP BEAM WARNING LIGHT, FOOT-OPERATED DIP SWITCH, AND PROVISION FOR FLASHING TRAFFIC INDICATOR LIGHTS



W23300.

Key to cable colours as on page N.20.

Section N.27

THE "CORRECT-ACID-LEVEL" DEVICE

Correct-acid-level devices have been fitted as standard to the batteries in a number of models, one of these devices being located in each cell filler hole. The method of topping up a battery fitted with these is shown in Fig. N.32. It will be seen that the well-known "air-trap" is the principle underlying their operation.

The device consists of a central tube with a perforated flange which rests on a ledge in the filling orifice. When topping up, pour distilled water into the flange until no more drains through into the cell and the water begins to rise in the flange. This will happen when the electrolyte level reaches the

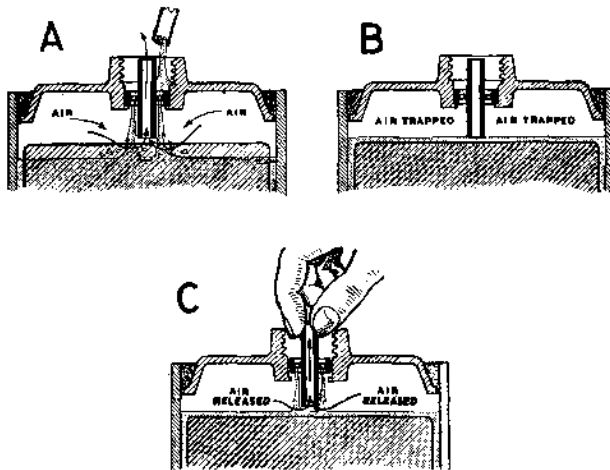


Fig. N.32.

The operation of the "correct-acid-level" device.

bottom of the central tube, thereby preventing further escape of air displaced by the topping up water introduced. By lifting the tube slightly the small amount of water held in the flange will drain into the cell and the electrolyte level will then be correct.

The illustration (Fig. N.32) shows :—

- (a) Electrolyte level below normal. Pour distilled water into the flange around the central tube.
- (b) Cease pouring when the water ceases to flow through the flange and begins to rise above it. The electrolyte level is now controlled by the air lock.

- (c) Release the water which has collected in the flange by lifting the tube slightly.

The electrolyte level is then correct.

Section N.28

MODIFIED TAIL- AND STOP-LAMPS

Later models are fitted with circular tail- and stop-lamps in place of the moulded type previously used. They are mounted on chromium-plated plinths, which are attached to the rear wings by Phillips screws.

The plated rim and glass are held in grooves in the rubber surround. Move aside the rubber ring and remove the plated rim and then, in a similar manner, remove the glass. The bulb, which is then accessible, is of the double-filament type (6/18 watts). The smaller wattage filament is connected to the tail-lamp circuit and the larger wattage filament to the stop-lamp circuit. When fitting replacement bulbs no difficulty should be experienced in fitting them correctly as the bulbs are designed so that the locating pegs are offset and therefore can only be fitted into the bulb holder in the correct position.

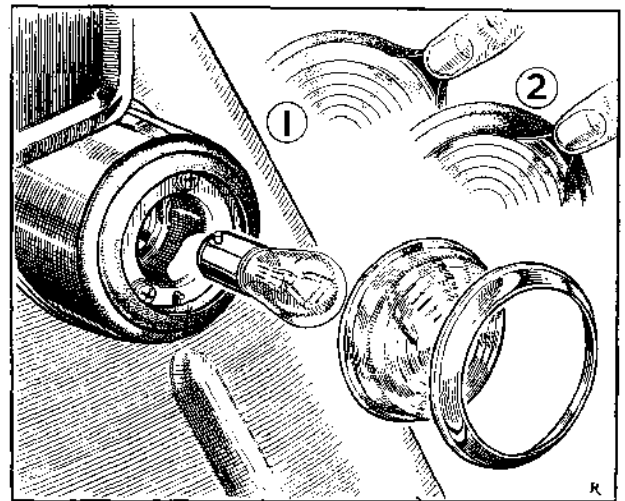


Fig. N.33.

The tail- and stop-lamps fitted to later models. To gain access to the bulb turn back the rubber flange and extract the plate rim (1); next turn back the inner lip and pull out the glass (2).

Section N.29

THE HEADLAMPS (Series "TF")

The headlamps are built into the wings and are fitted with double-filament bulbs.

The design of the headlamp and its holder is such that the bulb is correctly positioned in relation to the reflector, and no special attention to focusing is required when a replacement bulb is fitted.

In short, the lamps are of the pre-focused type, with replaceable bulbs.

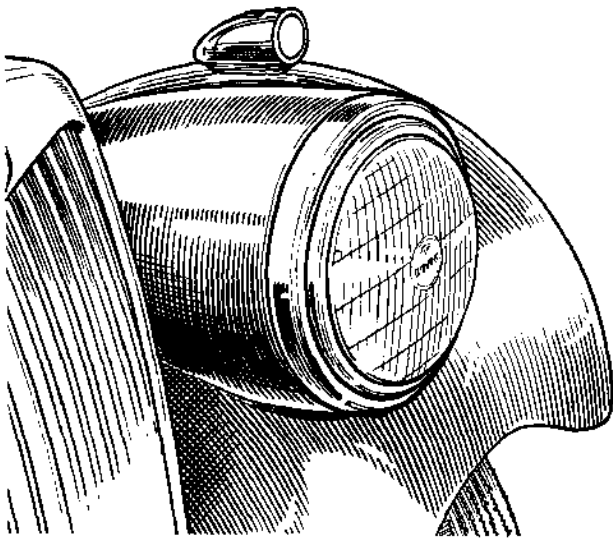


Fig. N.34.

The headlamp mounting on the Midget (Series "TF").

The anti-dazzle device

All models are equipped with double-filament bulbs controlled by the foot-operated dipping switch.

Operation of the dip switch deflects both headlamp beams downwards to avoid dazzle.

Certain countries have lighting regulations to which the foregoing arrangements do not conform, and cars exported to such countries have lighting equipment modified to suit the regulations existing in the countries concerned.

Section N.30

THE LIGHT UNITS (Series "TF")

The light units consist of a lamp glass, reflector, and a back shell. The light unit is located to the front wing by three spring-loaded attachment screws in a domed shield attached to the wing. The back of the lamp is therefore sealed to give complete protection.

A dust- and weather-excluding rubber is fitted in the recess of the rim of the light unit and a plated rim is fitted over this to complete the weather sealing.

Section N.31

REMOVING THE LIGHT UNITS (Series "TF")

To remove the light unit for bulb replacement, unscrew the retaining screw at the bottom of the plated lamp rim and lift the rim away from the dust-excluding rubber.

Remove the dust-excluding rubber, which will reveal the three spring-loaded screws. Press the light unit inwards against the tension of the springs and turn it in an anti-clockwise direction until the heads of the screws can pass through the enlarged ends of the keyhole slots in the lamp rim.

This will enable you to withdraw the light unit sufficiently to give attention to the wiring and bulbs.

Section N.32

REPLACING HEADLAMP BULBS (Series "TF")

Twist the back shell anti-clockwise and pull it off. Withdraw the bulb from the holder.

Insert the replacement bulb in the holder, making sure that the slot in the periphery of the bulb flange engages the projection in the holder.

Engage the projections on the back shell with the slots of the holder, press it on and twist it clockwise until it engages with its catch.

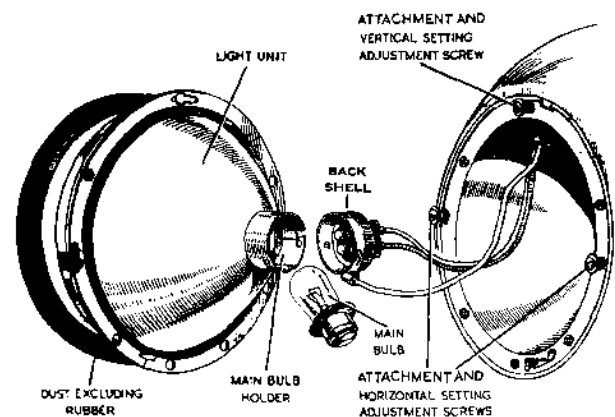


Fig. N.35.

The lamp holder and back shell is exposed when the lamp unit is removed.

Section N.33

REPLACING THE LIGHT UNITS (Series "TF")

Position the light unit so that the heads of the adjusting screws coincide with the enlarged ends of the attachment slots. Push the light unit towards the wing to compress the springs and turn the unit

N ELECTRICAL EQUIPMENT

to the right as far as it will go, that is, approximately $\frac{1}{2}$ in. (13 mm.).

Replace the dust-excluding rubber on the light rim with its flanged face forward and refit the plated rim.

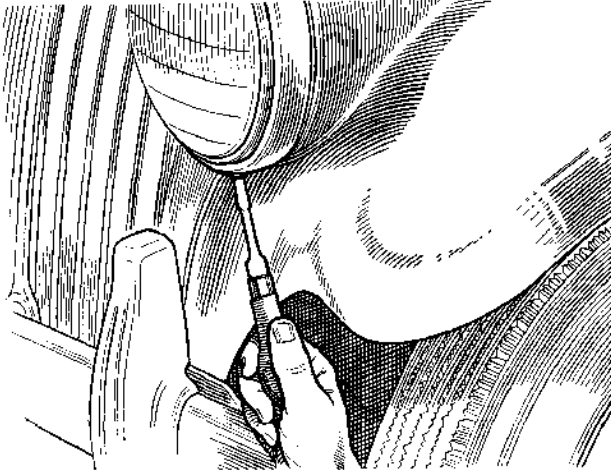


Fig. N.36.

The headlamp rim retaining screw.

Section N.34

SETTING THE HEADLAMPS (Series "TF")

The lamps should be set so that the main driving beams are parallel with the road surface or in accordance with your local regulations.

If adjustment is required, this is achieved by removing the plated rim and dust-excluding rubber as indicated in Section N.17.

Vertical adjustment can then be made by turning the screws at the top of the lamp in the necessary direction.

Horizontal adjustment can be effected by using the adjustment screws on each side of the light unit.

Section N.35

CLEANING THE LAMPS (Series "TF")

Care must be taken when handling headlamp reflectors to prevent them from becoming finger-marked. A transparent and colourless protective covering enables any finger-marks to be removed by polishing with a chamois leather or a very soft dry cloth if they do become marked. **Do not use metal polish on reflectors.**

Chromium-plated surfaces such as lamp rims should be washed with plenty of water, and when the dirt is completely removed they may be polished with a chamois leather or soft dry cloth. **Do not use metal polishes on chromium plating.**

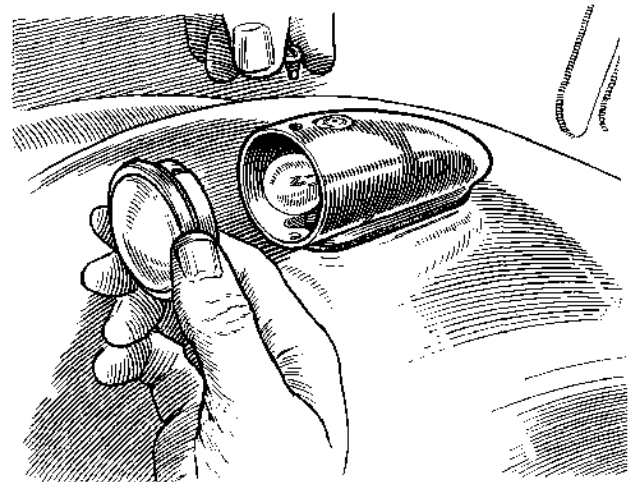


Fig. N.37.

Removal of the securing screw enables the glass and rim to be withdrawn to give access to the bulb.

Section N.36

SIDELAMPS

To reach the bulb in a sidelamp, take out the screw in the top of the lamp and withdraw the glass and rim forward.

The bulb has a bayonet fitting.

Section N.37

THE TAIL-LAMPS AND STOP-LIGHTS (Series "TF")

The tail-lamps are of the double-filament type, the second filament giving a marked increase in brilliance when the brakes are applied.

To obtain access to the bulbs, withdraw the rims

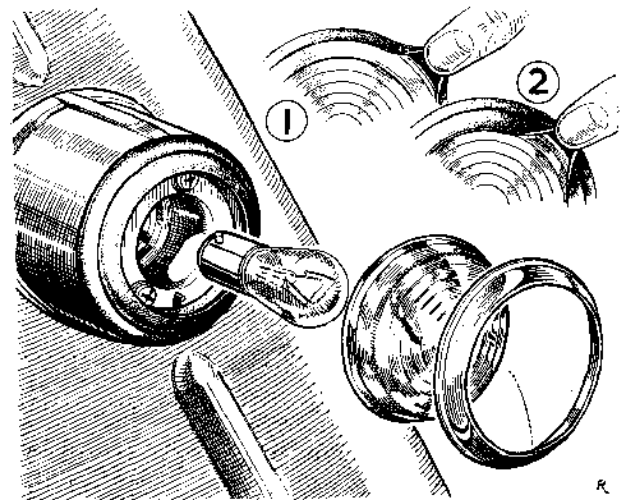


Fig. N.38.

Illustrating the rim and glass removal from a tail-lamp.

and glasses from the rubber flanges by folding the flange back with the fingers. The bulbs are held in bayonet-type holders with offset pins and are easily removed for replacement.

Note.—Twin-filament bulbs can normally be fitted in their bayonet holders in either of the two positions. If they are fitted the wrong way round the action of the lamp will be reversed, and a bright light will be emitted under normal conditions while a dim light will appear when the stop switch comes into operation.

It is therefore essential to make sure that the bulbs have been fitted the right way round, and they are marked "top" to facilitate their correct replacement in addition to possessing offset pins to prevent their incorrect replacement.

Section N.38

NUMBER-PLATE LAMP (Series "TF")

A single bulb with bayonet fixing is fitted and the cover may be removed after slackening the small retaining screw.

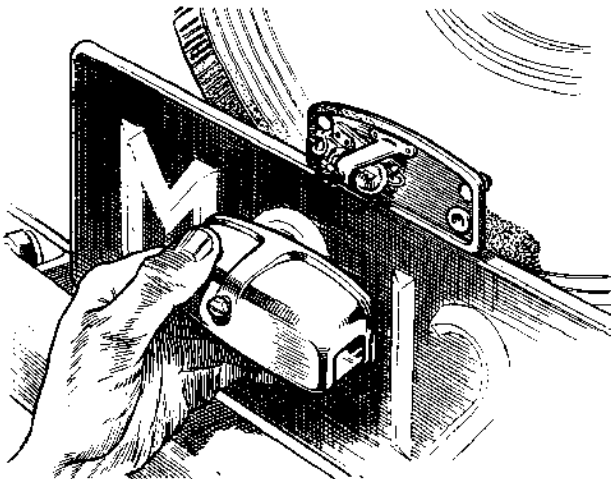


Fig. N.39.

Illustrating the removal of the number-plate lamp cover.

Section N.39

THE PANEL AND MAP LIGHTS (Series "TF")

There are three bulbs illuminating the instruments and their locations are shown in the accompanying illustration.

To obtain access to them it is necessary to remove the protective panel under the facia board. There is one in each of the casings for the revolution indicator and speedometer, and one above the ammeter and oil pressure gauge. The map lamp above each glove pocket may be withdrawn from its bracket to facilitate bulb replacement.

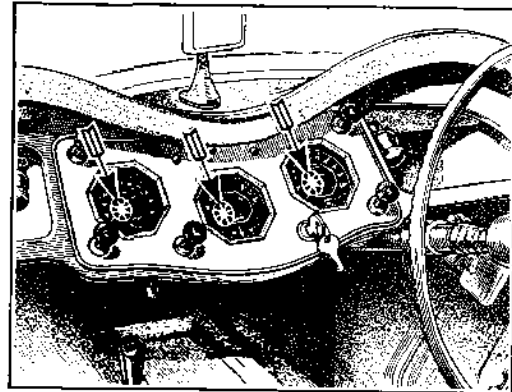


Fig. N.40.

Showing the location of the panel lamp bulbs.

Section N.40

WARNING LIGHTS (Series "TF")

The four warning lights are accessible after removal of the protective panel under the facia board. The bulbs are the same as those used for panel illumination.

Section N.41

REPLACEMENT BULBS (12 VOLT) (Series "TF")

	Watts		Lucas No.
Headlamps, Home and Export (RHD) (dip left) ...	42/36	(pre-focus)	354
Headlamps, Export and U.S.A. (LHD) (dip right) ...	36/36	(pre-focus)	301
Headlamps, Export (Europe except France) ...	45/35	(pre-focus)	360
Sidelamp ...	6/18	(S.C.C.)	369
Stop tail-lamp (irreversible) ...	6/18	(S.B.C.)	361
Number-plate lamp ...	4	(M.C.C.)	222
Panel light ...	2.2	(M.E.S.)	987
Ignition warning light ...	2.2	(M.E.S.)	985
Fuel warning light ...	2.2	(M.E.S.)	987
Flasher warning light ...	2.2	(M.E.S.)	987

N ELECTRICAL EQUIPMENT

Section N.42

WINDSCREEN WIPER (Series "TF")

Normally the windscreen wiper will not require any servicing apart from the occasional renewal of the rubber blades.

Should any trouble be experienced, first check for loose connections, worn insulation, etc., before dismantling the motor.

1. *To detach the cable rack from the motor and gearbox*
Remove the gearbox cover.

Remove the split pin and washer from the crank pin and final gear wheel.

Lift off the connecting link.

2. *Commutator dirty*

Remove the connecting leads to the terminals, withdraw the three screws securing the cover at the commutator end. Lift off the cover. Clean the commutator with a cloth moistened with petrol and carefully remove any carbon dust from between the commutator segments.

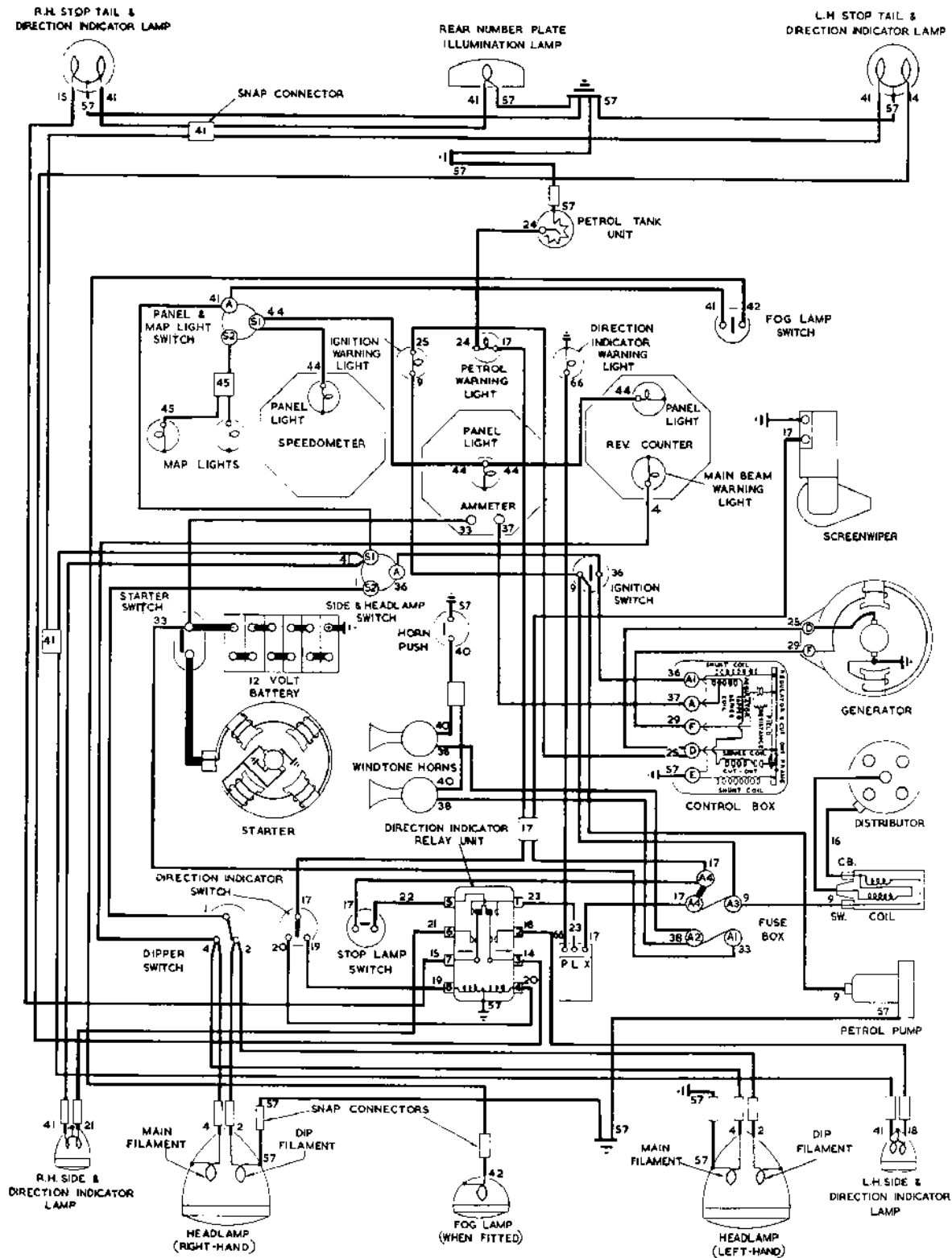
3. *Brush lever stiff or brushes not bearing on commutator*

Check that the brushes bear freely on the commutator. If they are loose, and do not make contact, a replacement tension spring is necessary. The brush levers must be free on their pivots. If they are stiff they should be freed by working them backwards and forwards by hand and by applying a trace of thin machine oil. Packing shims are fitted beneath the legs of the brush levers to ensure that the brushes are central and that there is no possibility of the brush boxes fouling the commutator. If the brushes are considerably worn they must be replaced.

4. *Motor operates but does not transmit motion to spindles*

Remove the cover of the gearbox. A push-pull motion should be transmitted to the inner cable of the flexible rack. If the cross-head moves sluggishly between the guides, lightly smear a small amount of medium grade engine oil in the groove formed in the die-cast housing. When overhauling, the gear must be lubricated by lightly packing the gearbox with a grease to Ref. D (page P.2).

WIRING DIAGRAM FOR M.G. MIDGET (Series "TF")



W.25080

Key to cable colours as on page N.20.

SECTION 0

THE WHEELS AND TYRES

- Section No. O.1 General.
 Section No. O.2 Tyre removal.
 Section No. O.3 The importance of balance.
 Section No. O.4 Fitting tyres and tubes.
 Section No. O.5 Maintenance of wire wheels.

Section O.1

GENERAL

Tyre pressures

It is of the utmost importance that the tyres be carefully maintained at a constant pressure of 18 lb. per sq. in. (1.27 kg./cm.²). The tyre size is 5.50—15.

Spare wheel

This is stowed on the back of the car. Remove the disc from the pressed-type wheel and unscrew the three standard wheel nuts securing it to the bracket.

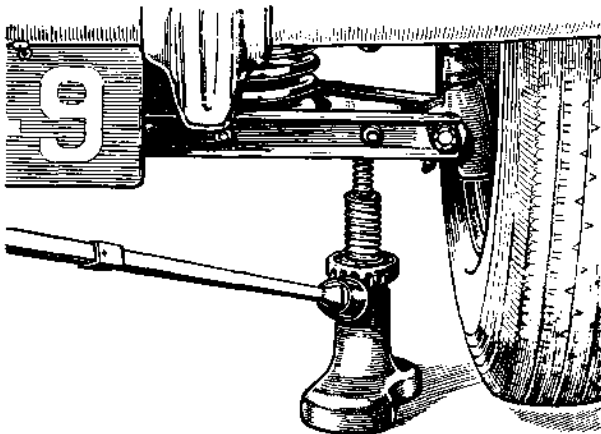


Fig. O.1.

The correct location of the jack when raising the front wheel.

To release a wire wheel (optional fitment on the "TF"), unscrew the retaining wing nut with a copper hammer.

Keep the tyre inflated to the correct pressure.

The Jack

The jack is stowed in the tool locker under the bonnet. To raise the car see Figs. O.1 and O.2.

To take off a road wheel remove the hub cover by inserting the flattened end of the wheel nut spanner between the plate and the wheel adjacent to a retaining stud. Give the spanner a sideways twist and the hub cover will come off.

Road wheels removal and replacement

Remove the hub cover by inserting the flattened end of the wheel nut spanner in the recess provided, adjacent to the retaining studs, and giving it a sideways twist.

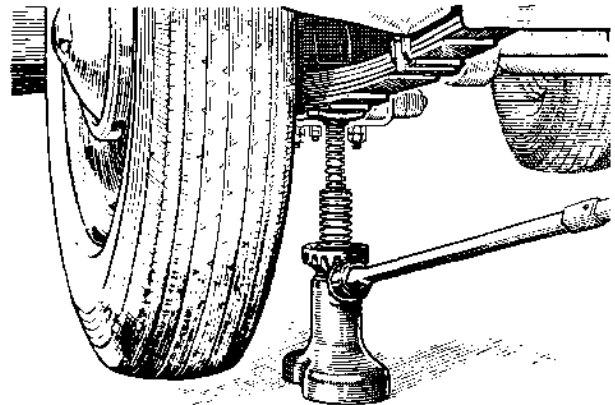


Fig. O.2.

When raising the rear wheel it is best to locate the jack under the springs near the axle.

Remove the five nuts securing the road wheels to the hub. The wheel nuts have right-hand threads, i.e. turn clockwise to tighten and anti-clockwise to remove. Lift the road wheel from the studs.

0 THE WHEELS AND TYRES

Reverse this procedure when replacing the road wheel and ensure that the wheel stud nuts are tight. **This is important.**

To refit the hub disc, the rim should be placed over two of the buttons on the wheel centre and the outer face given a sharp blow of the fist over the third button.

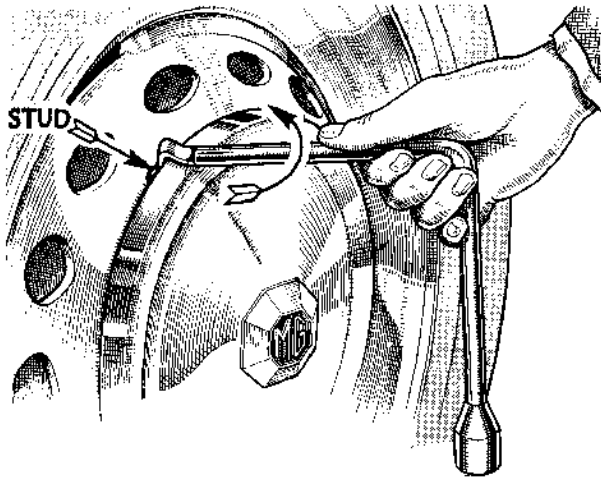


Fig. O.3.

The wheel hub disc is removed by using the flattened end of the wheel nut brace and giving it a sideways motion.

The valves

Valve caps, in addition to preventing dirt from entering the valve, form a secondary air seal and should always be fitted. The valves may be tested for airtightness by rotating the wheel until the valve is at the top and inserting its end in an eggcup full of water. If bubbles appear the seating is faulty and should be removed and replaced by a new one. It is advisable to change the valve interiors every twelve months.

Tyre wear

Even tyre wear is promoted by changing the positions of the tyres on the car at intervals of about 2,000 miles (3200 km.).

Attention should be paid to the following points, with a view to obtaining the maximum mileage from the tyre equipment of the vehicle :—

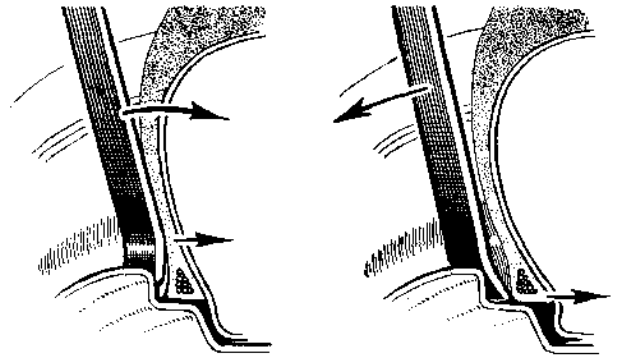
Test pressures of the tyres daily by means of a suitable gauge, and restore any air lost. It is not sufficient to make a visual examination of the tyre for correct inflation. Inflate the spare wheel to the correct rear wheel pressure at the same time.

Should any tyre appear to lose an appreciable amount of air between short intervals, have it removed and checked for air leaks.

Regularly remove and examine both covers and tubes. Keep the tread free from grit and stones, and arrange for any repairs to be carried out. Clean the wheel rims and keep them free from rust.

Paint the wheels if required, and replace the tyres and tubes. Keep the brakes and clutch adjusted correctly and in good order. Fierceness or uneven action in either of these units has a destructive effect on the tyres.

Misalignment is a very costly error. Suspect it if rapid wear of the front tyres is noticed, and correct the fault at once. See Section K.1 for details of front wheel alignment.



1. Insert lever between bead and rim, with curved end against tyre. Press lever towards tyre.
2. Insert second lever in space between bead and rim, with curved end outwards, and pull lever away from tyre. Repeat at intervals round tyre until bead is free. Several circuits of tyre may be necessary.

Fig. O.4.

The Dunlop tyres fitted as standard to the M.G. "TD" have wired edges and no attempt must be made to stretch them. If the cover edge fits tightly on the rim seating it should be freed by using the tyre levers as indicated.

Keep oil and grease off the tyres. Should the tyres get oily, petrol should be applied sparingly and wiped off at once.

Note.—Inextensible wires are incorporated in the edges of wired-type tyres. Do not, therefore, attempt to stretch the edges of the tyre cover over the rim edge.

Force is entirely unnecessary and detrimental, as it tends to damage the wire edges and serves no useful purpose. Fitting or removing is quite easy if the wire edges are carefully adjusted into the rim base; if it is found to be difficult the operation is not being performed correctly (see Fig. O.4).

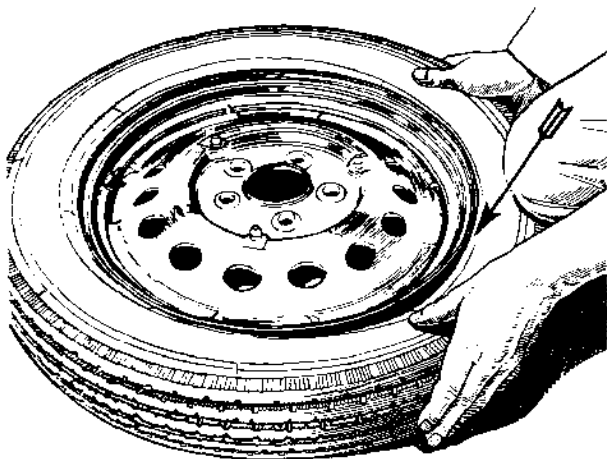


Fig. O.5.

The first step in tyre removal is the pushing of the bead into the well of the rim opposite the tyre valve.

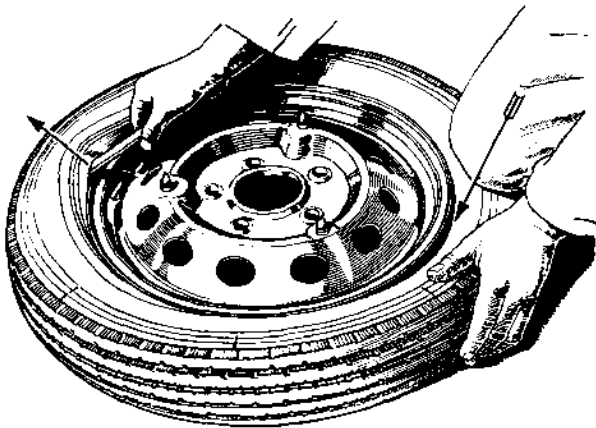


Fig. O.6.

Tyre levers can then be inserted close to the tyre valve and the tyre lifted over the rim without difficulty.

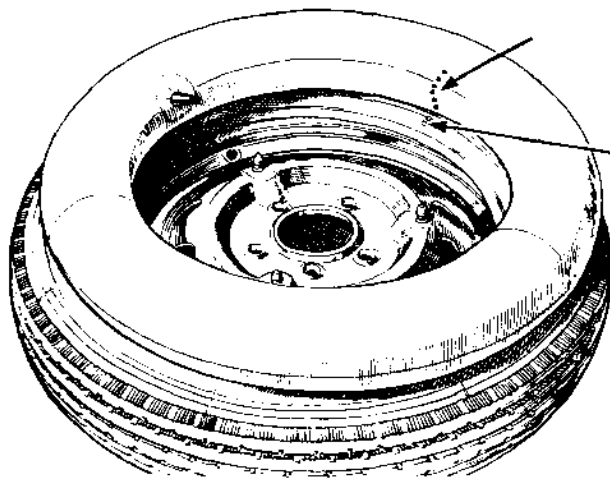


Fig. O.7.

When replacing a cover and tube make sure the balance marks on the tube and cover coincide.

Section 0.2

TYRE REMOVAL

Remove all valve parts to completely deflate the tyre and push both edges into the base of the rim at a point diametrically opposite the valve, then lever the cover edge near the valve over the rim of the wheel (see "A," Fig. O.6), using two levers at intervals of 6 in. (15 cm.) apart. Remove the tube carefully; do not pull on the valve. Stand the tyre and wheel upright, keeping the bead on the base of the rim. Lever the bead over the rim flange, and at the same time push the wheel away from the cover with the other hand.

Section 0.3

THE IMPORTANCE OF BALANCE

In order to obtain good steering it is of importance to ensure that the wheels, with tyres fitted, are in good balance. To assist this, the tyre manufacturers are now marking their tyres with a white spot or spots in the neighbourhood of the bead at the lightest point of the cover; similarly, they are marking the inner tubes with a group of coloured spots to indicate their heaviest point. When tyres are assembled care must therefore be taken to see that they are assembled with the white spots on the cover coinciding with the coloured spots on the tube, and not opposite to the valve as recommended hitherto.

It must be noted, in addition, that special balancing discs are fitted to the inside of the cover casing in some cases and that these should on no account be removed, as the tyre balance will be upset if this is done. These balance discs are not repair patches and do not indicate any fault in the tyre.

Special balance weights are supplied by the Dunlop Rubber Co. for attachment to the wheel rim under Part Nos. WBW/1 to 7, which cover a range of weights weighing from $\frac{1}{2}$ oz. to $3\frac{1}{2}$ oz. in steps of $\frac{1}{4}$ oz.

Their use is advised to obtain the best possible balance for the front wheels.

Section 0.4

FITTING THE TYRES AND TUBES

The following procedure is recommended when fitting tyres and tubes to well-base rims:—

1. Inspect the inside of the cover carefully and remove all dirt. The wheel rim must be clean, free from rust and undamaged.

0 THE WHEELS AND TYRES

2. Dust the inside of the cover evenly with french chalk.
3. Inflate the tube until it begins to round out, then insert it in the cover.
4. Apply a frothy solution of soap and water generously around the entire base of the tube, extending upwards between the tyre beads and the tube itself for at least 2 in. on both sides. Also apply the solution to the bottom and outside of the tyre beads. Do not allow the solution to run into the crown of the tyre. The solution must be strong enough to feel slippery when the fingers are wetted with the solution and rubbed together.
5. Mount the tyre on the rim immediately, whilst the soap solution is still wet.

Push one edge of the cover over the edge of the rim. It will go quite easily if the part first put on is fitted on the opposite side of the valve and is pushed right down into the rim base. Move it round so that its balance spots coincide with those of the inner tube when it is inserted with the valve passing through the hole in the rim. (Take care that the valve, which is fitted in the side of the tube, is on the correct side of the rim.)

6. Before inflating, be sure that the tyre beads are clear of the well of the rim all the way round and **push the valve into the tyre as far as possible in order to ensure the tube is not trapped between the bead and the rim, then pull it out again into its correct position.**
7. Inflate slowly until the beads are fully seated.
8. Remove the valve core to **deflate the tube completely.**
9. Reinflate to the correct working pressure (see page O.1). This procedure must be followed whenever a tube is fitted.

The object of the double inflation is to permit any stretched portions of the tube to readjust themselves in the cover and relieve any local strains in the tube.

In an emergency french chalk may be used as a substitute for the soap solution, provided it is evenly and generously applied. This practice, however, is not recommended.

Repairing tubes

Punctures or injuries must be vulcanised. Ordinary patches should only be used for emergencies and cannot be relied upon.

Patches are quite useless in the case of synthetic tubes. These must be vulcanised if punctured or otherwise damaged.

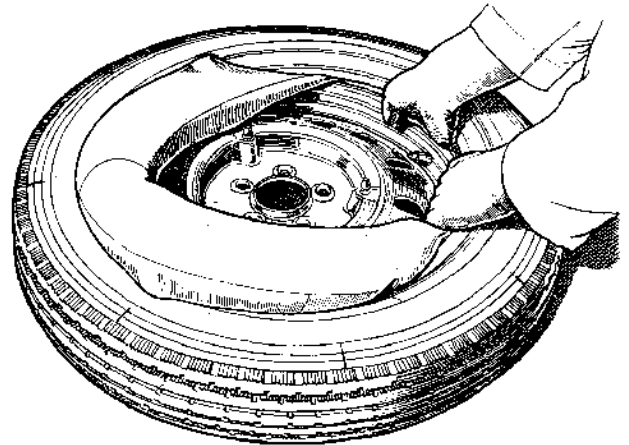


Fig. O.8.

After slight inflation the tube is introduced into the cover, fitting the valve in position first.

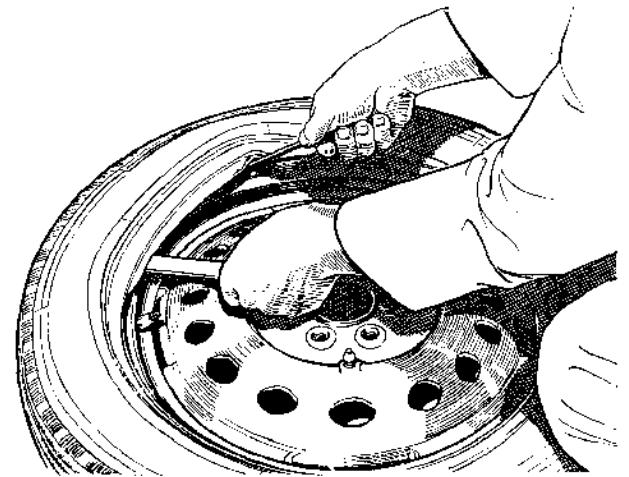


Fig. O.9.

When refitting the cover, start at a point diametrically opposite to the valve and finish at the valve.

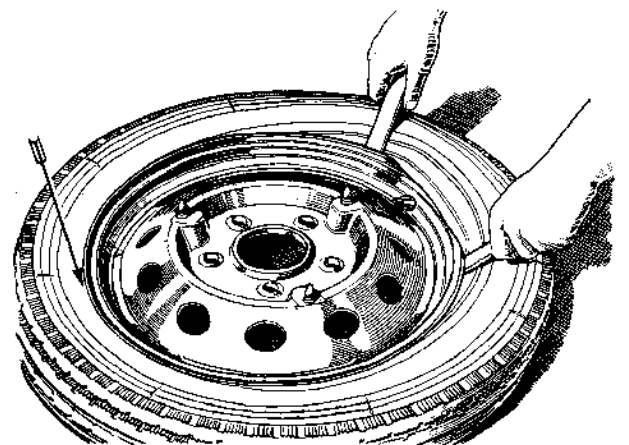


Fig. O.10.

If the portion of the cover first fitted is kept well into the well of the rim no difficulty will be encountered in replacing the last portion of the cover.

Section O.5

MAINTENANCE OF WIRE WHEELS

In wheel building, the rim, hub shell, spokes and nipples should be loosely assembled to bring the rim into as true a running position with the hub as practicable,

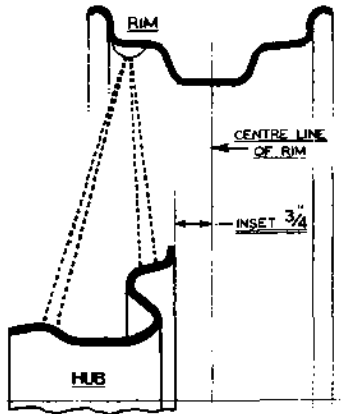


Fig. O.11.

The outside dish referred to in Section O.5.

able, while ensuring that the outside dish is maintained. (Outside dish is the distance from the edge of the rear rim flange to the flange of the hub shell.)

When this condition is reached, and not before, the wheel should be mounted on a running hub.

Each pair of spokes should then be tensioned carefully a small amount at a time, working from one pair of spokes and thence to the diametrically opposite pair of spokes ; afterwards repeating the process on the opposed pairs, which are located at right-angles to the original pair of spokes tensioned, and so on.

At each stage of the tensioning the truth of the wheel should be checked carefully both for lateral and up-and-down movement, checking any tendency to out of truth by giving a slight additional tension to the appropriate spoke or sets of spokes.

It is important that as little additional tension as possible should be given when pulling the rim true in this manner, the desirable condition to aim at being that all spokes are as nearly as possible at the same tension. If excessive tension is required to bring the rim true the opposing spokes must be loosened slightly.

The experienced wheel builder will generally be able to gauge when the correct tension has been reached, either by the general feel of the spokes or by the ringing note which the spoke will give if lightly struck with a small spanner or similar metal object.

When building is completed the wheel should be examined carefully to ensure that no spoke ends protrude into the rim well. Any that do so should have their protruding ends carefully filed away.

SECTION P

LUBRICATION

Section No. P.1	Engine lubrication.	Section No. P.7	Air cleaner lubrication.
Section No. P.2	Gearbox lubrication.	Section No. P.8	Distributor lubrication.
Section No. P.3	Rear axle lubrication.	Section No. P.9	Dynamo lubrication.
Section No. P.4	Grease gun lubrication.	Section No. P.10	Front wheel bearings.
Section No. P.5	Carburettor dashpot lubrication.	Section No. P.11	Engine oil pick-up.
Section No. P.6	Steering gearbox lubrication.	Section No. P.12	Priming the engine oil pump.

USE CORRECT LUBRICANTS

Correct lubrication of any piece of mechanism is of paramount importance, and in no instance is it of greater importance than in the correct choice of lubricant for a motorcar engine. Automobile engines have different characteristics, such as operating temperatures, oiling systems, size of oilways, clearances and similar technicalities, and the use of the correct oil is therefore essential.

Section P.1 ENGINE LUBRICATION A

New engines should have their oil drained after the first 500 miles (800 km.) and then be refilled with fresh oil. Subsequently the oil should be changed at intervals of 3,000 miles (5000 km.).

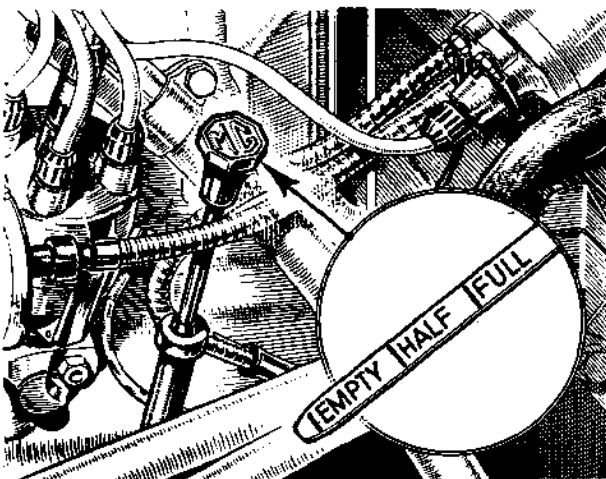


Fig. P.1.

The oil level dipstick for the engine is on the left-hand side of the cylinder block.

The engine should preferably be drained when warm and the oil is relatively fluid.

When draining the engine sump, the oil filter housing plug should also be removed to release any deposit which may have accumulated.

The oil level should be checked by the dipstick every 250 miles (400 km.) and replenished if necessary.

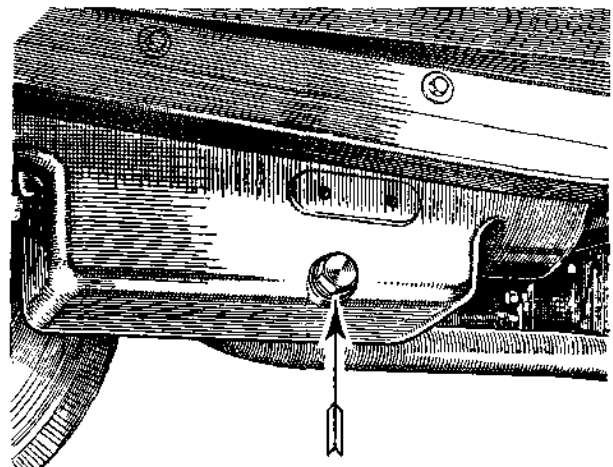


Fig. P.2.

The location of the sump drain plug (Series "TD").

The following is a list of lubricants recommended:—

A ENGINE AND AIR CLEANER								
Climatic Conditions	BP Energol	Filtrate	Sternol	Duckham's	Castrol	Esso	Mobil	Shell
Tropical and Temperate down to 32° F. (0° C.)	Energol S.A.E. 30	Medium Filtrate 30	Sternol W.W. 30	Duckham's NOL. Thirty	Castrol X.L.	Esso Extra Motor Oil 20W/30	Mobiloil A	Shell X—100 30
Cold and extreme cold down to 0° F. (—18° C.)	Energol S.A.E. 20W	Zero Filtrate 20	Sternol W.W. 20	Duckham's NOL. Twenty	Castrolite	Esso Extra Motor Oil 20W/30	Mobiloil Arctic	Shell X—100 20/20W
Arctic—below 0° F. (—18° C.)	Energol S.A.E. 10W	Sub-Zero Filtrate 10	Sternol W.W. 10	Duckham's NOL. Ten	Castrol Z	Essolube 10	Mobiloil 10W	Shell X—100 10W
B GEARBOX, STEERING GEARBOX AND REAR AXLE (HYPOID GEARS)								
Tropical and Temperate down to 10° F. (—12° C.)	Energol E.P. S.A.E. 90	Hypoid Filtrate Gear 90	Ambroleum E.P. 90	Duckham's Hypoid 90	Castrol Hypoy	Esso Expee Compound 90	Mobilube G.X. 90	Shell Spirax 90 E.P.
Extreme cold below 10° F. (—12° C.)	Energol E.P. S.A.E. 80	Hypoid Filtrate Gear 80	Ambroleum E.P. 80	Duckham's Hypoid 80	Castrol Hypoy 80	Esso Expee Compound 80	Mobilube G.X. 80	Shell Spirax 80 E.P.
C WHEEL HUBS AND FAN BEARINGS								
All conditions	Energol L. 3	Filtrate Super Lithium Grease	Ambrolite L.H.T. Grease	Duckham's L.B. 10 Grease	Castrol L.M.	Esso Multi-purpose Grease H	Mobilgrease M.P.	Shell Retinax A
D STEERING CONNECTIONS, KING-PINS, PROPELLER SHAFT, CLEVIS PINS AND LEVER FULCRUMS								
All conditions	Energol L. 3	Filtrate Super Lithium Grease	Ambrolite L.H.T. Grease	Duckham's L.B. 10 Grease	Castrol L.M.	Esso Multi-purpose Grease H	Mobilgrease M.P.	Shell Retinax A
E CABLES AND VITAL CONTROL JOINTS								
All conditions	Energol L. 3	Filtrate Super Lithium Grease	Ambrolite L.H.T. Grease	Duckham's L.B. 10 Grease	Castrol L.M.	Esso Multi-purpose Grease H	Mobilgrease M.P.	Shell Retinax A
F UTILITY LUBRICANT, S.U. CARBURETTER DASHPOT OILCAN POINTS, ETC.								
All conditions	Energol S.A.E. 20W	Zero Filtrate 20	Sternol W.W. 20	Duckham's NOL. Twenty	Castrolite	Esso Extra Motor Oil 20W/30	Mobiloil Arctic	Shell X—100 20/20W

EXTREME COLD CONDITIONS

Where a car is operated in temperatures which are consistently below 0° F. (—18° C.) the use of an oil of lower viscosity than that recommended for normal use is desirable, and under such conditions the use of engine oil of the grades indicated in the appropriate temperature range is recommended.

Similar considerations apply in the case of the gearbox, rear axle and steering gearbox.

MIXING LUBRICANTS

Note.—It is a bad practice to mix lubricants, particularly the high-pressure types now in use for rear axles, as they differ considerably in their composition. It is therefore dangerous to replenish the axle with a different make of oil from that in use without first draining off the axle. It is also advisable to carry out a similar procedure in the case of the other components.

The level should never be allowed to fall below the "low" mark.

The sump capacity is 9 pints (5.1 litres) on early models and 10½ pints (5.96 litres) on later models.

Every 6,000 miles (10000 km.) the external filter should be replaced by a new one on early models.

The filter is of the "throw-away" type and its Part No. is MG.862/39. Care must be taken to see that the filter connections are replaced properly, and

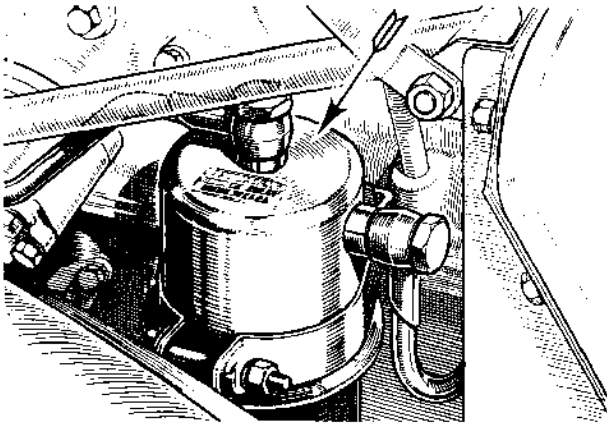


Fig. P.3.

The external filter, showing its supporting strap and oil pipe connections. Later models are fitted with a filter of the renewable element type, attached to the pump body. (See Fig. P.21.)

that there are no oil leaks. On engines previous to No. XPAG/TD/2985 an alternative filter (Part No. 24475) may be used provided that special narrow brackets (Part Nos. MG862/394 and MG862/393) are also used.

On later models, commencing at Engine No. 14224, the filter is of the renewable element type and attached directly to the pump body. In this case the element should be removed and cleaned every 3,000 miles (5000 km.) and renewed every 6,000 miles (10000 km.).

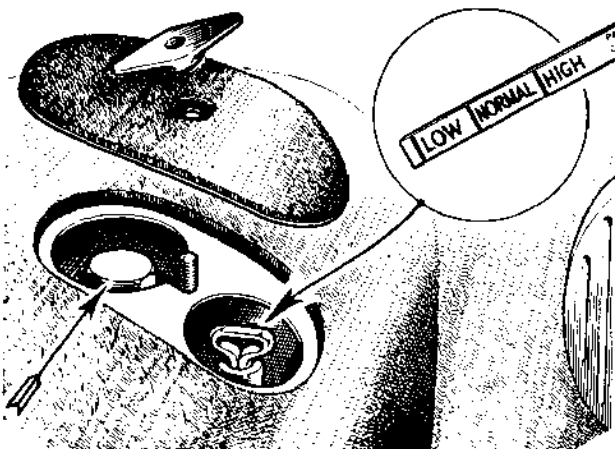


Fig. P.4.

The gearbox oil filler and dipstick are accessible through the aperture in the toeboard.

Section P.2

GEARBOX LUBRICATION B

The gearbox oil level should be checked by the dipstick every 1,000 miles (1600 km.) and replenished if necessary.

Access to the dipstick is obtained through the aperture in the gearbox cover-plate toeboard, closed by a rubber plug and revealed by raising the carpet.

The oil should be maintained at the "normal" mark and should never be allowed to fall below the "low" mark.

The gearbox should be drained and refilled with fresh oil to Ref. B after the first 500 miles (800 km.)

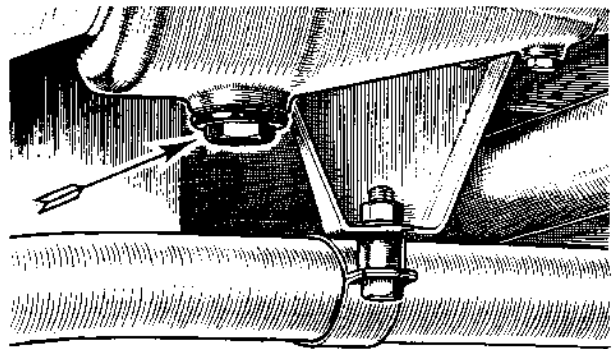


Fig. P.5.

The location of the gearbox drain plug.

with a new car and subsequently every 6,000 miles (10000 km.).

A drain plug is provided in the base of the box.

The capacity of the gearbox is 1½ pints (.71 litre).

Section P.3

REAR AXLE LUBRICATION B

It is important that only Hypoid oils of the approved grades be used in the rear axle if damage to the gears is to be avoided.

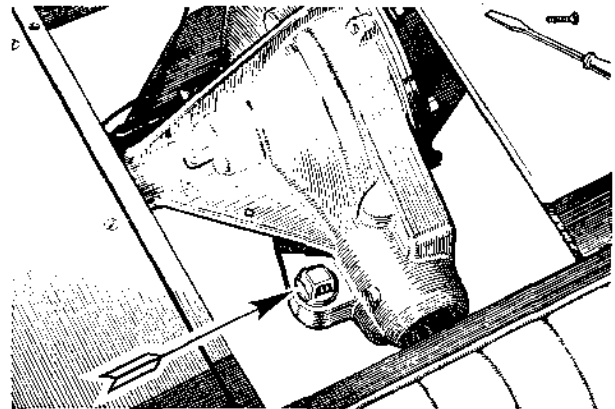


Fig. P.6.

The rear axle oil filler can be reached through the opening in the rear seat pan.

P LUBRICATION

Only the oils recommended on page P.2 should be employed and the mixing of oils of different makes should be avoided as the additives employed by different makers differ considerably.

The rear axle oil level should be checked every 1,000 miles (1600 km.) and replenished if necessary.

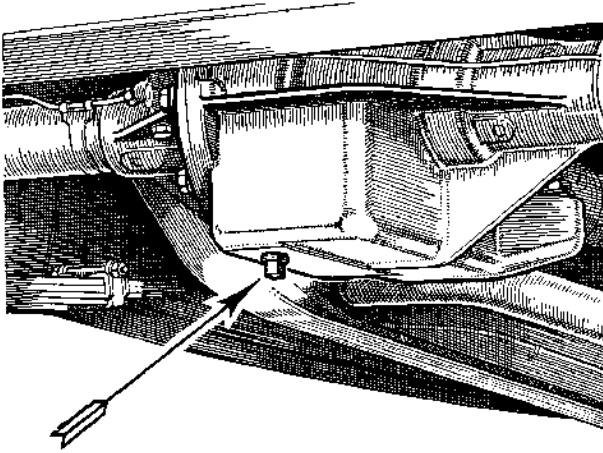


Fig. P.7.
The rear axle oil drain plug.

The surface of the oil should be kept level with the bottom thread of the filler plug opening.

Access to the filler plug is obtained through the panel in the rear floor which can be removed after releasing the series of screws which retain it in position.

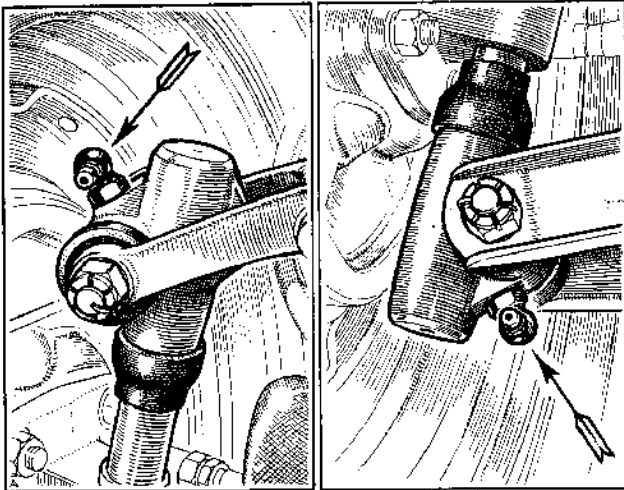


Fig. P.8.
The grease nipples at the top and bottom steering knuckles.

The rear axle should be drained, through the plug provided, after the first 500 miles (800 km.) with a new car and subsequently every 6,000 miles (10000 km.).

The capacity of the axle is 2½ pints (1.3 litres).

Section P.4

GREASE GUN LUBRICATION POINTS

Extensive use of oil-less bearings has reduced the number of points requiring attention with the grease gun to a minimum.

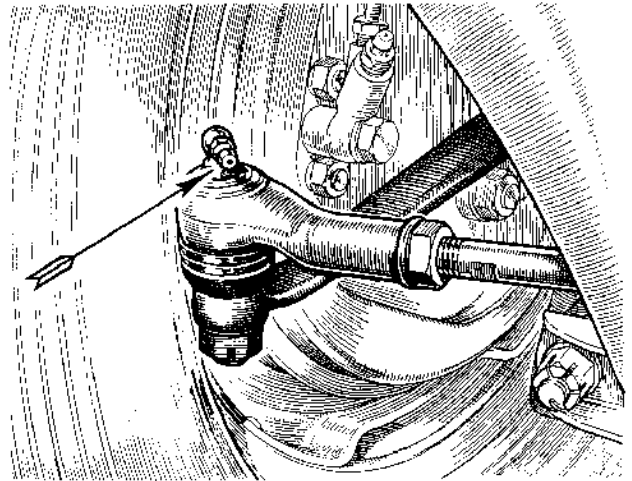


Fig. P.9.
The grease nipple for the steering tie-rod ball joints.

Grease nipples are located at the following points, which should receive attention at the intervals indicated, with the grease gun filled with grease to Ref. D (page P.2) :—

1. Steering knuckles (four nipples), every 500 miles (800 km.) three or four strokes.
2. Steering tie-rod ball ends (two nipples), every 500 miles (800 km.) three or four strokes.
3. Propeller shaft universal joints (two nipples), every 1,000 miles (1600 km.) three or four strokes.

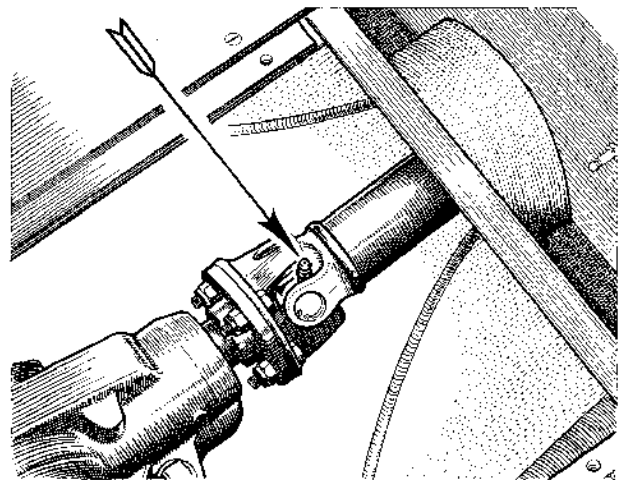


Fig. P.10.
The grease nipple on the rear universal joint spider.

4. Propeller shaft sliding joint (one nipple), every 1,000 miles (1600 km.) three or four strokes.
5. Revolution counter drive gearbox (one nipple), every 6,000 miles (10000 km.) two strokes.

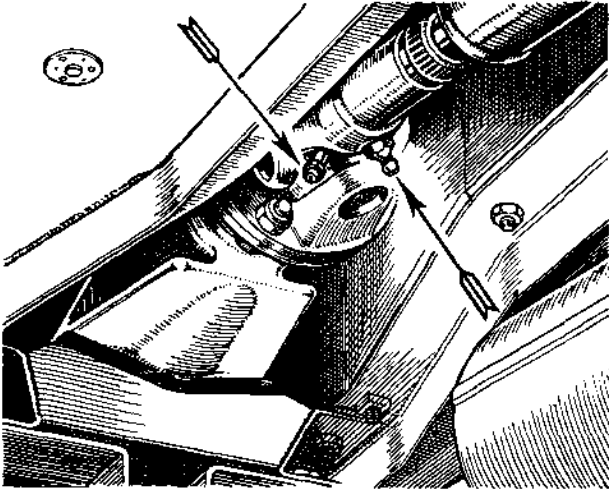


Fig. P.11.

The greasers for the front universal joint and sliding joint of the propeller shaft are indicated by the right-hand and left-hand arrows respectively.

Later models are fitted with grease retaining caps which must carefully be removed, replenished with grease to Ref. C, and replaced. **Be sure to use the correct grease for each purpose (see page P.2).**

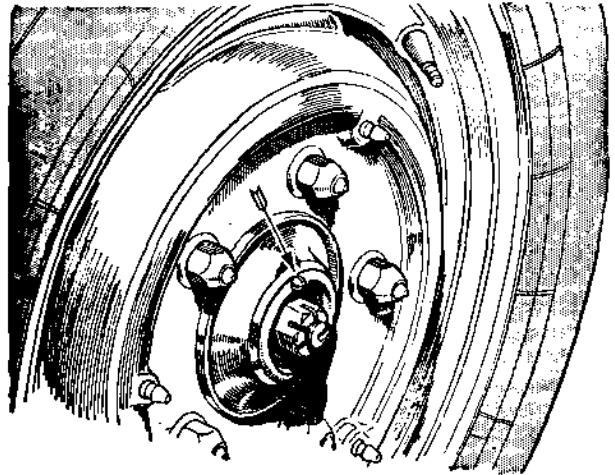


Fig. P.13.

The grease nipple for the front wheel hub is revealed when the wheel disc is removed. The early type is shown. Later hubs are fitted with a grease cap which must be carefully removed, replenished with grease and replaced.

6. Foot control pedal shaft (one nipple), every 500 miles (800 km.) three or four strokes (left-hand-drive models only).

The grease gun should be filled with grease to Ref. C (page P.2) when attending to the following items :—

7. Fan spindle (one nipple), every 1,000 miles (1600 km.) two strokes.
8. Front wheel hubs (two nipples), every 6,000 miles (10000 km.) one stroke (early models).

Section P.5

CARBURETTER DASHPOT (Series "TD")

Every 1,000 miles (1600 km.) the brass caps of the carburetter suction chambers should be unscrewed and withdrawn sufficiently to enable the dashpot chambers to be replenished with engine oil to Ref. F (page P.2). There is no damper in the carburetters of the early Series "TF" models, but later models are fitted with carburetters of this type.

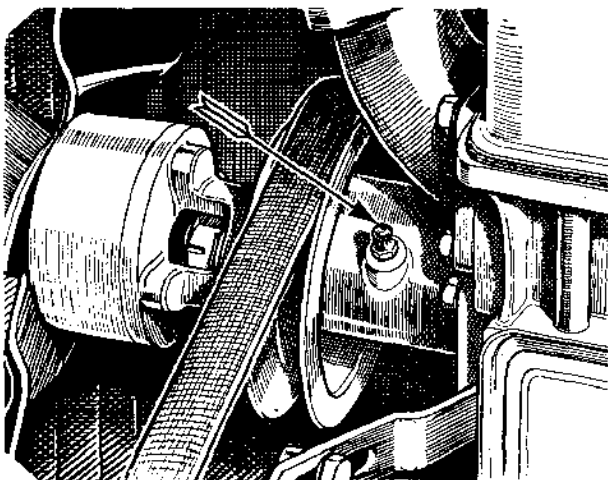


Fig. P.12.

The grease nipple for the fan spindle.

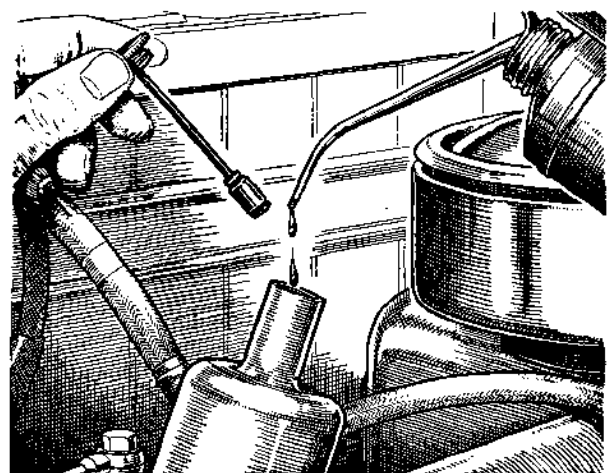


Fig. P.14.

Replenishing the carburetter piston dashpot with oil.

P LUBRICATION

Section P.6

STEERING GEARBOX LUBRICATION

Every 12,000 miles (20000 km.) the grease gun should be applied to the grease nipple on the steering gearbox, giving ten strokes of the gun (hand type). It is imperative to use one of the Hypoid oils indicated on page P.2, Ref. B, in the grease gun for this purpose.

Over-oiling **must** be avoided.

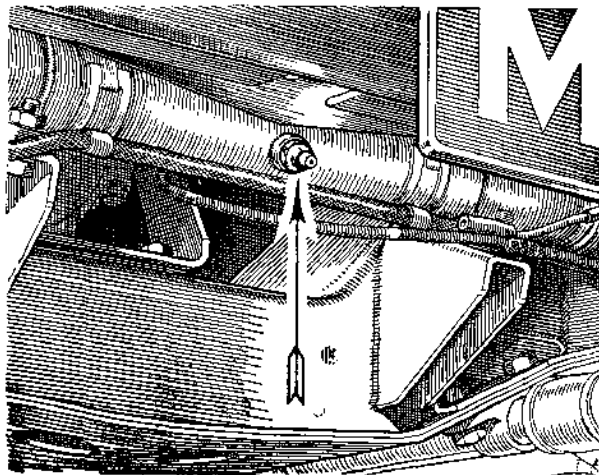


Fig. P.15.

The lubricating nipple for the steering gearbox.

Section P.7

AIR CLEANER LUBRICATION

The air cleaners fitted to "TD" models are of the oil bath type.

Every 3,000 miles (5000 km.) overseas, or 6,000 miles (10000 km.) home, the cover should be removed by unscrewing its central fixing nut. This enables the filtering element to be lifted out and cleaned

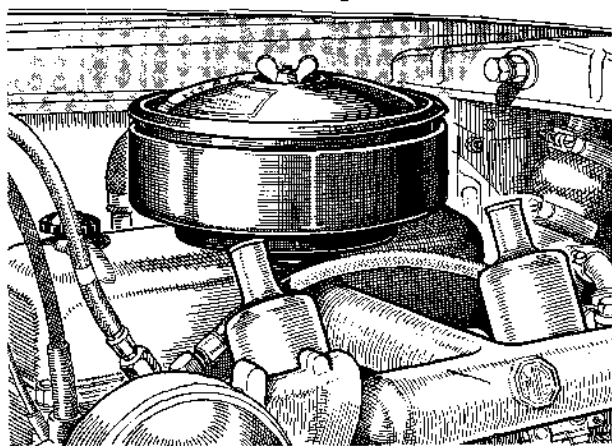


Fig. P.16.

The oil bath air cleaner.

in fuel. Allow the element to drain, and dry off thoroughly.

Examine the oil container for sludge. If sludge is present clean out the base and refill with fresh engine oil to the level indicated.

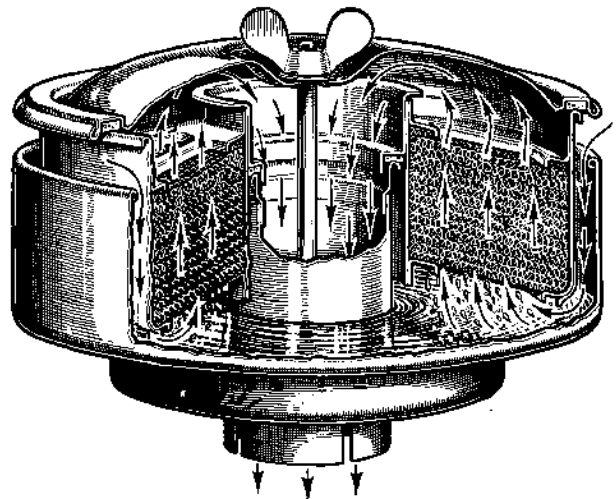


Fig. P.17.

The air cleaner partly sectioned to show its internal construction and the path taken by the incoming air.

If no sludge is present merely replenish the oil to bring it to the correct level.

When reassembling, ensure that the cork gaskets are in good condition. Fit new ones if necessary.

The air cleaners fitted to the "TF" models are of the semi-dry type. (See Fig. P.23.)

Every 3,000 miles (5000 km.) wash the filter element in fuel and allow it to dry. Re-oil the element with S.A.E. 20 engine oil and allow to drain before re-assembling.

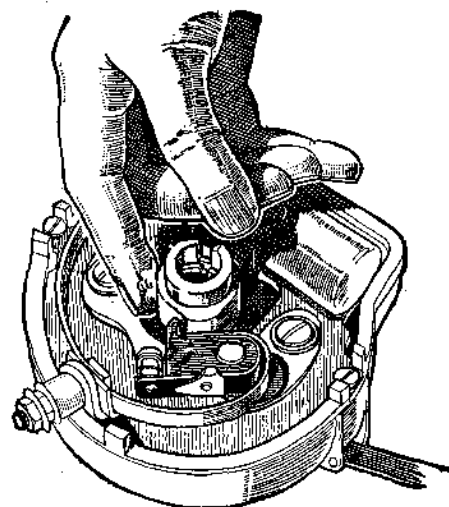


Fig. P.18.

The distributor cam should be given a slight smear of grease or engine oil every 3,000 miles (5000 km.).

Section P.8

DISTRIBUTOR LUBRICATION

Every 3,000 miles (5000 km.) the distributor cam and rocker-arm pivot should be given a slight smear of grease to Ref. D (page P.2) or engine oil.

A few drops of thin engine oil should be added to the spindle centre at the same time after removing the rotor arm.

A few drops of thin engine oil should also be added, through the oil hole provided in the distributor base, to replenish the oil well feeding the spindle and advance mechanism.

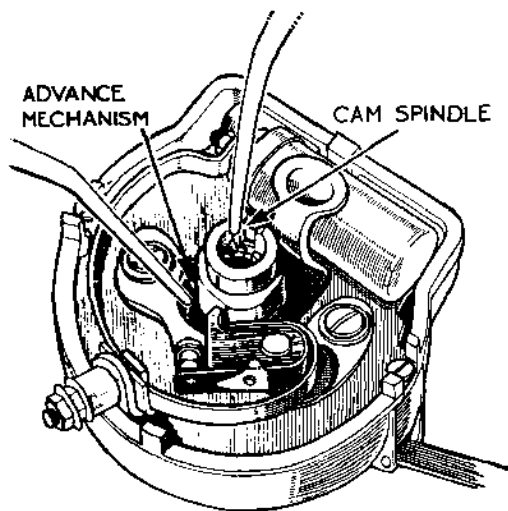


Fig. P.19.

The distributor spindle is lubricated through the special duct provided next to the cam securing screw, and the advance control mechanism through the aperture round the cam spindle.

Section P.9

DYNAMO LUBRICATION

Every 3,000 miles (5000 km.) the dynamo lubricator should be unscrewed, the felt pad withdrawn, and the lubricator replenished with grease to Ref. C.

Section P.10

FRONT WHEEL BEARINGS

Every 6,000 miles (10000 km.) the front wheel hub caps on early models should be removed and the grease gun filled with grease to Ref. C (page P.2) should be applied to the nipple on the wheel hub bearing cap, giving one stroke.

Later models are fitted with grease retaining caps which must carefully be removed, replenished with grease to Ref. C and replaced.

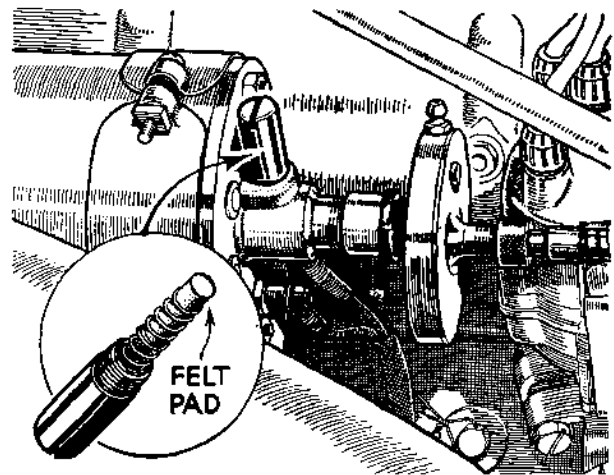


Fig. P.20.

The dynamo bearing lubrication cap must be removed and replenished with grease.

Section P.11

ENGINE OIL PICK-UP

To deal with cases of temporary loss of oil pressure on left-hand turns the oil pick-up has been moved to a central position in the engine sump, commencing at Engine No. XPAG/TD/7576.

This cancels Part No. 22399, oil suction filter assembly, which is replaced by assembly 168008 comprising oil suction pipe assembly 168010 and oil suction gauze assembly 22398 or 24294.

When carrying out the conversion, the new suction pipe assembly 168010 may be fitted, using the existing oil suction gauze 22398, or the complete assembly 168008 may be fitted.

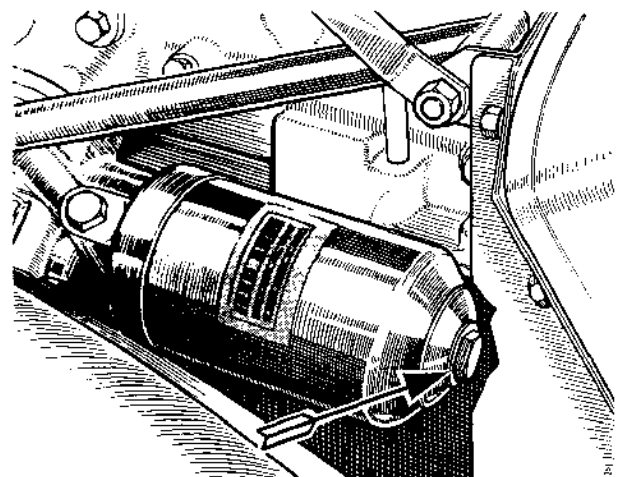


Fig. P.21.

The renewable element filter fitted to later models requires a new element every 6,000 miles (10000 km.). Access to it is obtained by unscrewing the central retaining bolt indicated by the arrow.

P LUBRICATION

Section P.12

PRIMING THE ENGINE OIL PUMP

To facilitate priming of the oil pump, which is necessary after oil drainage, a priming plug was introduced on the oil pump body at Engine No. XPAG/TD2/20972.

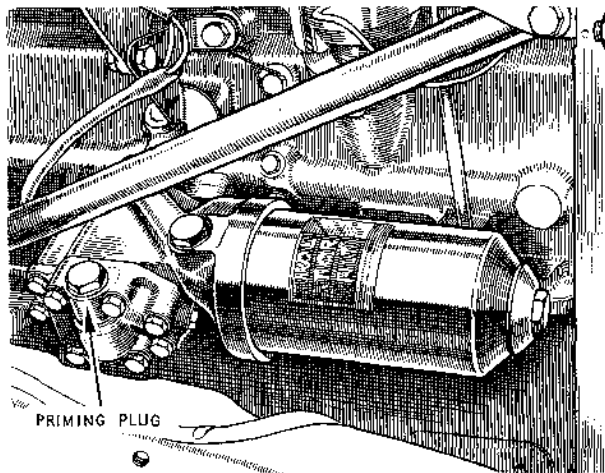


Fig. P.22.

The location of the priming plug on engines subsequent to No. XPAG/TD2/20972.

When engines so equipped are started up after an oil change or after having remained stationary for a long period, this plug should be removed and the engine run at 1,500 to 2,000 r.p.m. without load until oil appears at the plug orifice.

Using this procedure there is no actual need to prime the pump, but it must be understood that

failure to remove the plug may prevent the pump from operating due to the formation of an air lock.

The later pumps fitted from Engine No. XPAG/TF/31263 are provided with an additional air release hole in the pump body which renders the pump self-priming, and these engines require no special priming attention.

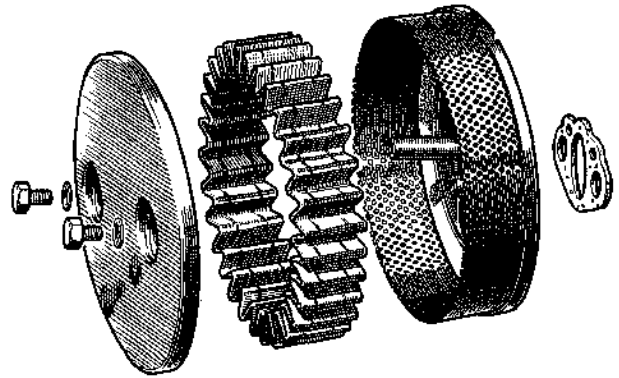


Fig. P.23.

The component parts of the dry-type air cleaners fitted to each individual carburettor of the M.G. Midget (Series "TF") cars.

It is important to remember that proper functioning of the pump is dependent on the air-tightness of the suction circuit, particularly at the joint between the pipe from the internal suction filter and the sump. The pipe is of sturdy construction, and if there is any fault in its alignment it is unlikely that it can be tightened onto its seating evenly by the relatively small retaining nuts. The pipe should carefully be set so that the joint gasket is nipped evenly over the whole area of the joint.

SECTION Q

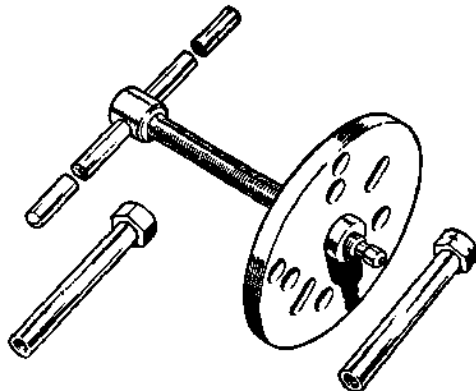
SPECIAL TOOLS

Every Dealer servicing M.G. cars is recommended to maintain the special tools detailed in this list as by their use damage to parts will be obviated and repairs generally will be greatly facilitated. For additional information refer to the Service Tool Catalogue (Part No. AKD659). It is essential to quote the new part numbers of tools when ordering.

Description	Old Part No.	New Part No.
Extractors		
Universal joint flanges	T108	18G371
Ball housing male tie-rod	68965, T122	18G312
Crankshaft and camshaft sprockets .. .. .	.. T123	18G352
Front and rear hub, plate	301587, AJA5019	18G304
Front and rear hub, ½ in. BSF bolts	301583, AJA5024	18G304B
Front and rear hub, ½ in. UNF bolts	301586, AJA5020	18G304A
Axle shaft (BSF) .. .. .	.. 68823	18G374
Axle shaft (UNF) .. .. .	.. 301203	18G284
Steering wheel .. .. .	.. 68827	18G310
Front hub inner bearing and crankshaft gear .. .. .	.. —	68895
Bevel pinion bearing outer race remover .. .. .	.. —	18G264
Bevel pinion bearing outer race remover adaptor .. .. .	.. —	18G264E
Bevel pinion bearing outer race remover adaptor .. .. .	.. —	18G264F
Rear axle pinion inner race fitting and withdrawing tool .. .. .	.. 301224	18G285
Pinion checking fixture .. .. .	.. 68829	18G281
Wire wheel hub extractor .. .. .	.. —	AJG5031
Assembly tools		
Piston ring clamp .. .. .	.. —	18G55
Clutch plate aligning tool .. .. .	.. 67833, T124	18G279
Synchromesh units .. .. .	.. T109	18G325
Axle preload check tool .. .. .	.. 68839	18G283
Rear axle pinion positioning fixture (with mandrel) .. .. .	.. 68829	18G281
Clutch dummy gauge plate .. .. .	.. { —	68885
	.. —	68886
Spanners		
Steering tie-rod ball housing .. .. .	.. T113	18G315
Steering ball housing (female) 'C' spanner .. .. .	.. 68833, T114	18G311
Lockheed bleeder screw wrench .. .. .	.. 46746	18G353
Cylinder head nut .. .. .	.. 68830	18G330
Gudgeon pin clamp screw .. .. .	.. 68832	18G327
Propeller shaft flange .. .. .	.. AJA5062	18G34A
Bleeder screw wrench .. .. .	.. 46746	18G353
Reamers		
Front camshaft bearing .. .. .	.. T111	18G351
Steering gearbox tail bearing .. .. .	.. T112	18G314
Oil pump bush .. .. .	.. 68828	18G329
Miscellaneous		
Front cross-member checking bars .. .. .	.. T125	18G367
Valve grinder (suction) .. .. .	.. 66893	18G328
Bench-type valve spring compressor .. .. .	.. 67456	18G273
Valve seat cutter set .. .. .	.. —	301075

SPECIAL TOOLS

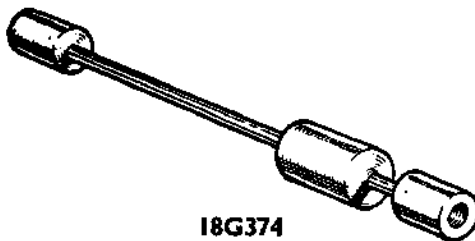
NOTES ON THE USE OF SPECIAL TOOLS



**18G304 and 18G304B
or 18G304A**

18G304. Front and Rear Hub Extractor Plate
18G304B. Set No. 1. $\frac{1}{2}$ in. BSF Bolts for above
18G304A. Set No. 2. $\frac{1}{2}$ in. UNF Bolts for above

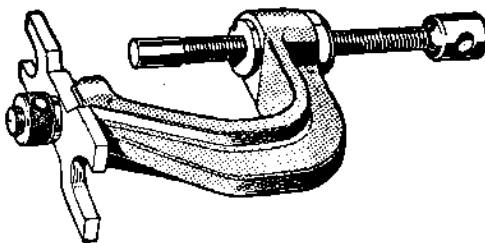
The plate 18G304, in combination with the appropriate set of bolts, is designed to remove front and rear drums from Series **TD** and **TF** models except those fitted with wire wheels.



**18G374
18G284**

18G374. Axle Shaft Extractor (BSF threads)
18G284. Axle Shaft Extractor (UNF threads)

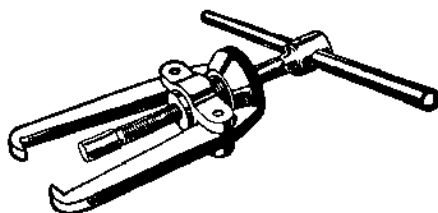
The use of this impact-type extractor is essential when withdrawing one of the rear axle shafts. It is attached to the threaded end of the axle shaft and withdraws the shaft complete with its bearing, oil seal and brake plate support.



18G310

18G310. Steering Wheel

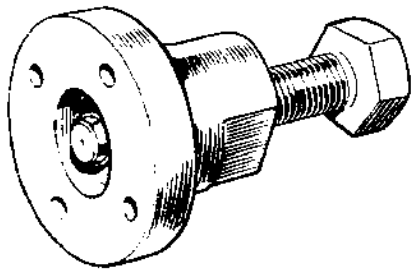
This extractor has been specially designed to remove the M.G. steering wheel without damage. Dealers who already possess tool 55418 and the attachment (Part No. 56052) will find that this may also be used to withdraw the steering wheel. It can also be used to extract Wolseley and Morris steering wheels.



68895

**68895. Front Hub Inner Bearing and Crankshaft
Gear Extractor**

Should the inner bearing remain on the stub axle after removing the front hub and brake-drum assembly from the new M.G. Midget (Series **TD** and **TF**) models, this specially designed extractor must be used to remove the bearing without damage to the oil seal behind it. The same tool may also be used to withdraw the crankshaft gear and hub sleeve.

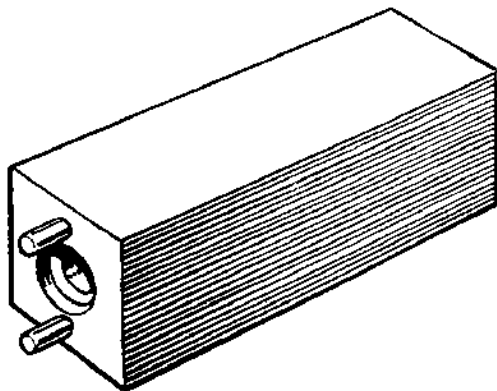


18G371

18G371. Gearbox and Rear Axle Universal Joint Extractor

This tool is designed to remove the propeller shaft drive flanges from the gearbox and rear axle without damage.

In use the central flange attachment nut is removed and the tool bolted to the flange with four suitable bolts. The central extractor screw is then turned until the flange is withdrawn from the gearbox or rear axle.

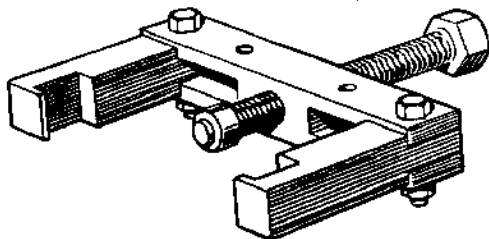


18G312

18G312. Extractor for Ball Housing (Male) Tie-rod

This tool is designed for use in conjunction with the special spanner 18G311 for dismantling the tie-rod ball housing without damage.

In use it is clamped securely in a vice and the two holes of the ball housing are engaged with the two pins of the extractor, pushing the ball housing into the tool as far as it will go. Using the special spanner 18G311, engage the claws with the ball housing cap and unscrew it from the housing.



18G352

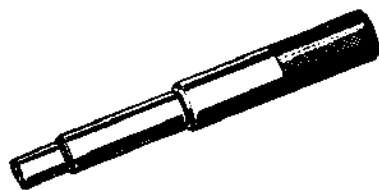
18G352. Extractor for Camshaft and Crankshaft Sprockets

As the timing chain is of the endless type it is essential to withdraw both the camshaft and crankshaft sprockets together with the chain in position.

To do this effectively the use of two extractors is recommended and an even pull should be applied with each to prevent one or the other of the sprockets from sticking or straining the chain by bending.

For the camshaft sprocket the two extractor arms should be attached to the two outer holes of the extractor beam, and for the crankshaft to the two inner holes.

Engage the slots in the extractor arms with the outer rims of the sprocket so as to embrace them, and screw down the extractor screws evenly, a few turns at a time, until sprockets and chain are clear from the shafts.

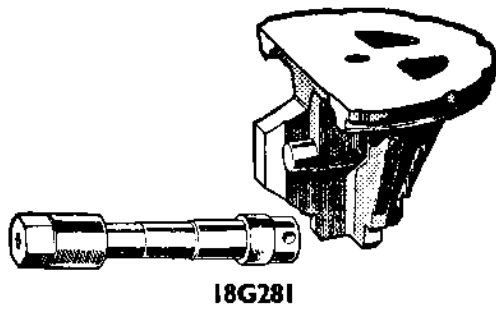


18G279

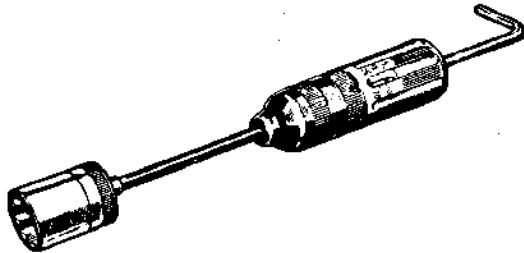
18G279. Clutch Plate Aligning Tool

When reassembling the single-plate clutch it is essential to use this tool to ensure that the clutch plate is concentric with the spligot bearing in the fly-wheel centre, otherwise it is impossible to assemble the gearbox to the engine. This tool will also fit the Wolseley Four-Fifty and Morris Oxford and Morris Six models.

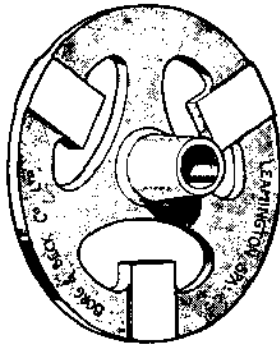
SPECIAL TOOLS



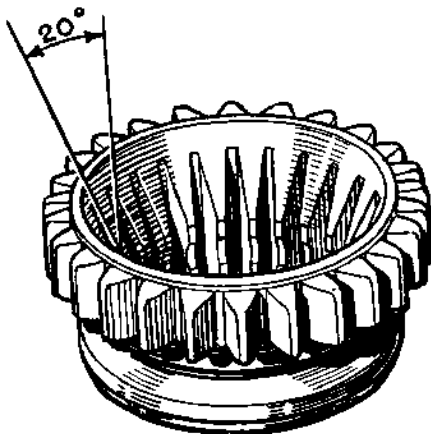
18G281



18G283



68885



18G325

18G281. Rear Axle Pinion Positioning Fixture

This fixture is designed to enable the correct pinion spacing washer to be selected when fitting a rear axle pinion. Full instructions for its use are given in Section H.11 of this Manual.

18G283. Axle Preload Check Tool

This torque spanner is almost essential for measuring the rear axle pinion bearing preload.

It has a clearly marked indicator which can be set to read accurately between 5 and 25 lb. in. (.058 and .288 kg. m.) with the key provided. It will also operate with the new Wolseley and Morris cars.

68885 (7½ in.). Clutch Gauge Plate

68886 (8 in.)

This tool is essential when adjusting the release levers of the Borg & Beck clutch.

In use the dummy gauge plate takes the place of the clutch driven plate when the cover-plate assembly is attached to the flywheel, and is positioned so that each release lever coincides with the ground surfaces of the plate lugs. The release lever adjusting nuts are then tightened or slackened until the end of each arm lies dead flush with the edge of a straight-edge placed across the ground end face of the gauge plate centre boss. This ensures an equal throw to each release lever and that the pressure plate is exactly parallel to the flywheel face.

18G325. Sychromesh Assembly Tool

This tool assists the speedy assembly of the sychromesh units and is extremely simple and effective. It consists of a standard striking dog, Part No. M.G. 900/189, which has its internal splines released at an angle of 20° at one end to guide the balls into their housings against the pressure of their springs.

In use, place the sliding hub to be assembled in the tool and hold it with the ball housings just above the relieved end of the tool. Insert the six springs and balls into their housings and press the sliding hub into the tool until it projects slightly at the other end.

Engage the projecting portion of the sliding hub with the striking dog and, keeping the special tool and dog in tight contact, push the sliding hub into position in the striking dog until the balls engage the internal groove.

The special tool can then be removed and the sychromesh unit is now assembled.

67456

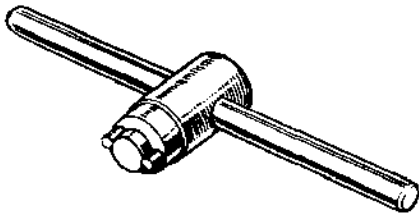
For illustration of this tool
see Fig. A.22



18G328

67456. Bench-type Valve Spring Compressor

This tool is clamped to the bench and is used in conjunction with a wood base fitted with wood blocks to fit into the combustion spaces and hold the valves on their seatings while the springs are compressed. It greatly facilitates the quick removal and replacement of the springs and cotters.



18G315

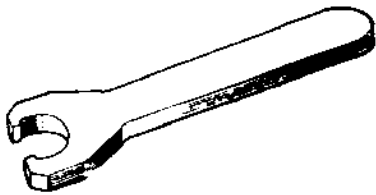
18G328. Suction Valve Grinder

As the valves on the M.G. Midget (Series TD) are not provided with a screwdriver grinding slot it is necessary to use this universal rubber suction tool when grinding in the valves. As it is exceptionally modestly priced, Dealers should purchase in quantities for resale to the Trade and Owners.

18G315. Peg Spanner for Steering Rod Ball Housing (Male)

This peg spanner is for the purpose of removing or refitting the ball housing to the end of the steering rack.

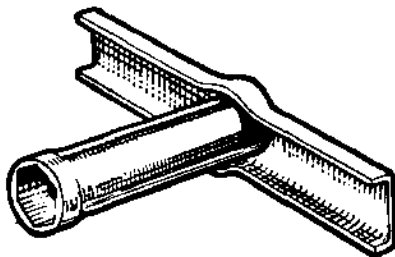
The two projecting pegs engage the two holes in the ball housing and ensure that the ball housing is firmly tightened.



18G311

18G311. Spanner for Steering Rod Ball Housing Cap

A tool with jaws designed to engage the shallow splines of the steering rack ball housing cap and remove it without damage.



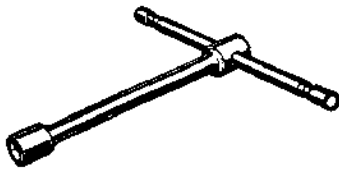
18G353

18G353. Lockheed Bleeder Screw Wrench

This specially designed tube spanner and integral tommy bar greatly assists the brake-bleeding operation. The bleed tube passes through the hollow centre of the spanner and the spanner remains square on the bleeder screw throughout the operation.



SPECIAL TOOLS



18G330

18G330. Cylinder Head Nut Spanner

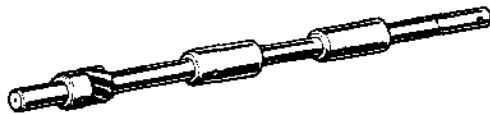
A strong socket spanner with a tommy bar designed to give the recommended maximum torque to the cylinder head stud nuts with normal hand pressure.



18G327

18G327. Gudgeon Pin Clamp Screw Spanner

Owing to the restricted space inside the pistons of most engines, an ordinary box spanner is unsuitable for removing or replacing the gudgeon pin clamp screw. This spanner is specially shaped to suit most models of the new Wolseley and Morris ranges, and is long enough to clear the connecting rod big-end.



18G351

18G351. Front Camshaft Bearing Reamer



18G314

18G314. Steering Gearbox Pinion Tail Bearing Reamer

This reamer is essential to ensure the correct alignment of steering pinion bearings as explained in Section J.

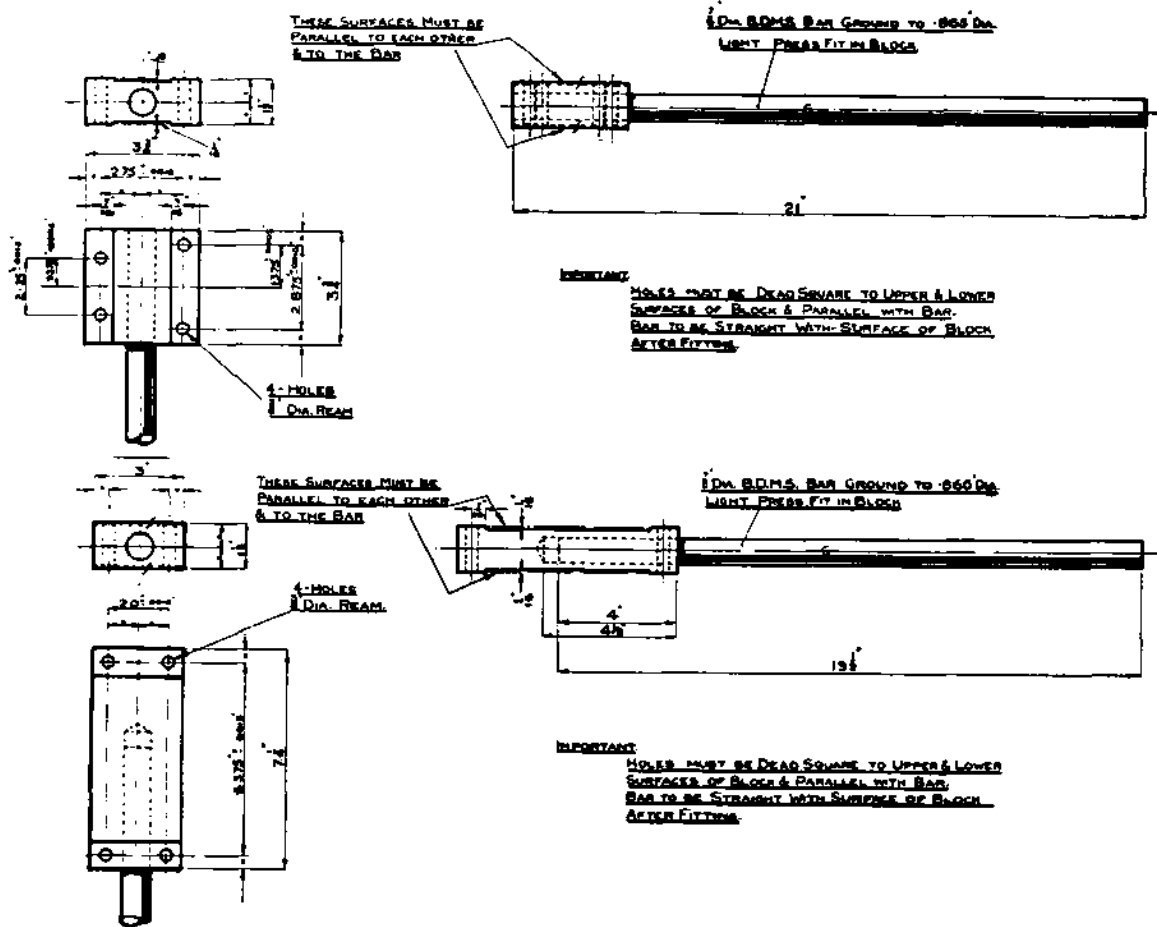


18G329

18G329. Oil Pump Bush Reamer

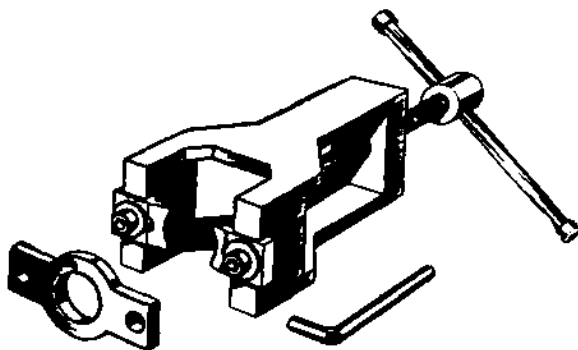
This reamer has been designed to ream the oil pump bushes of the M.G. Midget (Series TD) in line. Its use is straightforward.

18G367. Bars for Checking Front Cross-member Alignment



The top bars are fitted to the four location holes for the front dampers and the bottom bars to the four location holes for the bottom wishbone pivots, using suitable $\frac{3}{8}$ in. dia. bolts to ensure that there is a plain portion of the bolts locating the blocks and frame together.

Full details of the use of these bars for checking are given in Section S.



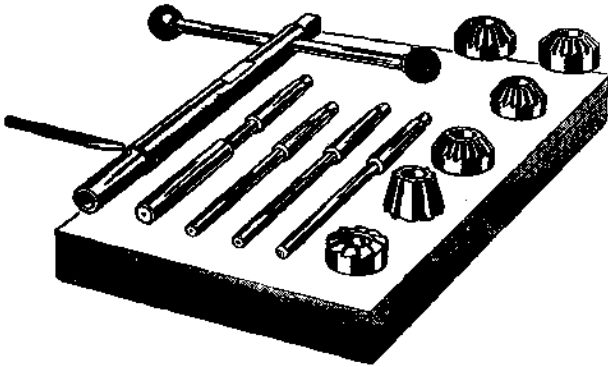
18G285

18G285. Rear Axle Pinion Inner Race Fitting and Withdrawing Tool

This tool is necessary for withdrawing the inner bearing race from the pinion shaft. It can also be used to replace the race on the shaft without damage.

This is a universal tool for use with all hypoid-type axles.

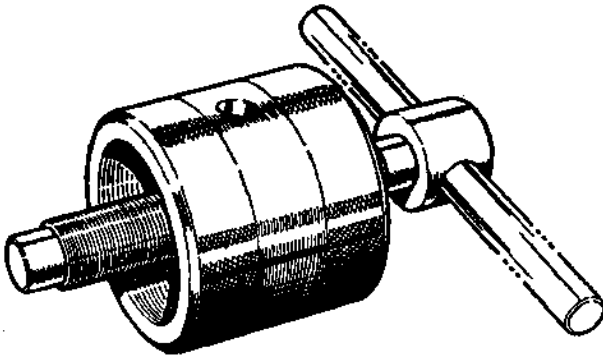
SPECIAL TOOLS



301075

301075. Valve Seat Cutter Set

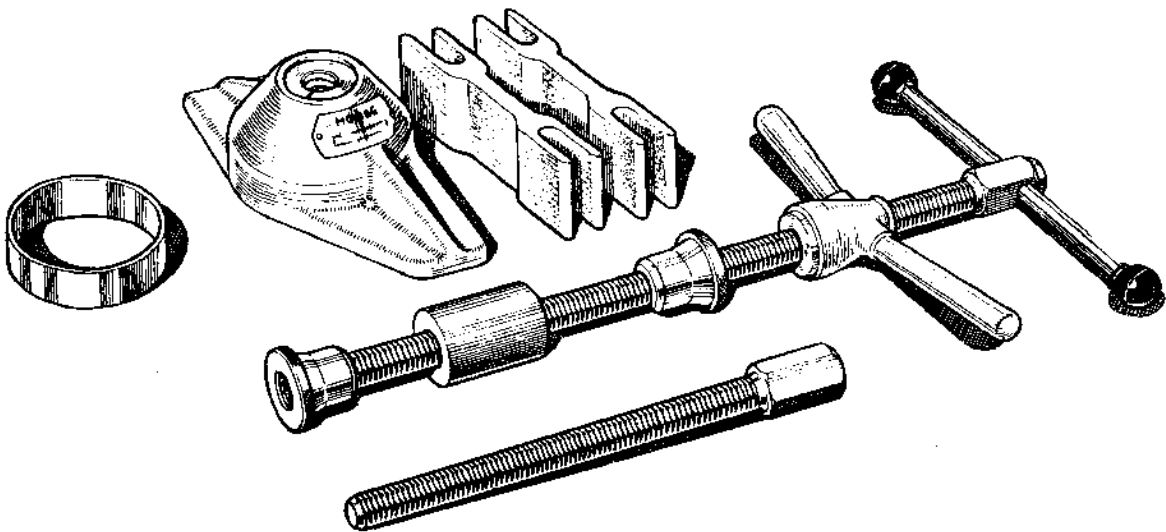
This is a universal tool for dealing with the recutting of valve seats on the M.G. Midget (Series TD) and all other models of the Nuffield range. The set is supplied complete in a metal retaining box.



AJG5031

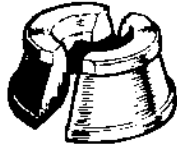
AJG5031. Wire Wheel Hub Extractor

This tool is designed to withdraw left-hand and right-hand 'knock-on' hubs which are optional fittings on the M.G. Midget (Series TF).



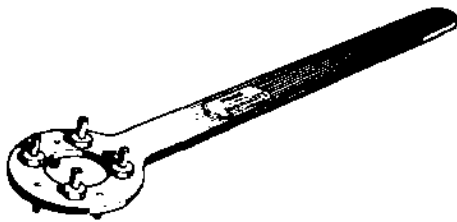
18G264

18G264. Bevel Pinion Bearing Outer Race Remover (basic tool)



18G264D

**18G264D. Bevel Pinion Outer Race Remover
Adaptor**
For use with basic tool 18G264.



18G34A

18G34A. Bevel Pinion Flange Wrench

SECTION R

THE BODY

Description.

Section No. R.1	The sidescreens.
Section No. R.2	The hood : maintenance and cleaning.
Section No. R.3	Cleaning upholstery.
Section No. R.4	Lubrication.
Section No. R.5	Removing and replacing front wings.
Section No. R.6	Removing and replacing rear wings.
Section No. R.7	Removing and replacing running-boards.
Section No. R.8	Removing and replacing body.
Section No. R.9	Removing and replacing facia board and instrument panel.
Section No. R.10	Body finish.
Section No. R.11	Removing "TF" front wings.
Section No. R.12	Removing "TF" rear wings.
Section No. R.13	Removing "TF" running-boards.
Section No. R.14	Removing and replacing "TF" body.
Section No. R.15	Removing "TF" facia board and instrument panel.

DESCRIPTION

The open body is of normal coachbuilt construction with metal panels on a wood framework and is equipped with detachable sidescreens and a folding hood for complete weather protection when required.

The body is attached to the chassis frame by a series of bolts, and it is removed without difficulty by following out the directions given.

screens must be packed together in the manner indicated on pages 10 and 11 of this Manual for early models or page 17 for later models before attempting to insert them in their storage compartment. Otherwise it will be found impossible to insert them successfully in the space provided. For this reason the instructions on this point have been given in the early pages of this Manual.

Section R.1

THE SIDESCREENS

The sidescreens are fitted to the doors by socket fittings and slotted brackets which engage locking screws. Their fitting and removal from the doors is straightforward and presents no difficulty.

When not in use they are stored in the special compartment in the back of the body, behind the seat. As this compartment has been kept to minimum dimensions it is most important that the sidescreens are inserted correctly to obviate damage. *The side-*

Section R.2

THE HOOD : MAINTENANCE AND CLEANING

Much unnecessary damage is done to the hood by incorrect and careless folding when stowing.

The hood should never be folded when wet. Always wait for the hood to be thoroughly dry before folding it.

The correct method of folding the hood is given in the early portion of this Manual (page 11) in view of its importance.

R THE BODY

The hood may be cleaned when required with water and a brush—such as a clothes-brush.

No soaps of any sort should be used.

The hood must subsequently be well washed with clean water and left erected until quite dry.

Section R.3

CLEANING UPHOLSTERY

The upholstery of the M.G. Midget "TD" may be cleaned by wiping it with a damp cloth and polishing it with a clean soft cloth when it is dry.

In cases of badly soiled upholstery it may be cleaned by the additional use of a little pure soap, but caustic soaps must on no account be used.

Section R.4

LUBRICATION

An oilcan filled with oil to Ref. F (page P.2) should be used sparingly on the door hinges, door stop hinge, bonnet hinge, bonnet locks and door locks every 1,000 miles (1600 km.).

Coat the door lock slam plates lightly with grease to Ref. D (page P.2) at the same time.

Section R.5

THE FRONT WINGS (REMOVAL AND REPLACEMENT)

Disconnect the battery. Remove the headlamp and sidelamp fronts and disconnect and withdraw the cables through the wing clips and valance.

Remove the nuts, bolts and spring washers attaching the headlamp tie-rod bracket to the radiator case, and the nuts, locknuts and flat washers securing the headlamp tie-rod bracket to the wing.

Remove the two bolts and spring washers securing the sidelamp and sidelamp cable clip to the wing.

Withdraw the two Phillips screws and flat washers securing each side of the front valance to the wings and the bolt securing the leading edge of the valance below each bumper attachment bolt.

Remove the two nuts, bolts, and spring and flat washers forward of the suspension unit and the four bolts with spring and flat washers to the rear of it, which secure the wing to the chassis frame.

Extract the two Phillips screws securing the wing to the body and the three nuts, bolts, and spring and flat

washers securing the wing to the running-board and lift the wing clear of the car.

Replacement is carried out in the reverse order to that detailed for removal.

Section R.6

THE REAR WINGS (REMOVAL AND REPLACEMENT)

Remove the nuts, screws and flat washers on early models and Phillips screws and flat and spring washers on later models, securing the tail- and stop-lamp to the wing, and disconnect the cables, noting the respective location of each to ensure correct operation of the stop-lamp on reassembly.

Remove the nut, bolt and two washers securing the wing to the chassis frame and the five bolts with flat washers securing the wing to the body.

Remove the nut, bolt, flat washers and rubber packing securing the wing to the running-board and lift off the wing.

Replacement is carried out in the reverse order to that detailed for removal.

Section R.7

THE RUNNING-BOARDS (REMOVAL AND REPLACEMENT)

Remove the three nuts, bolts, and spring and flat washers securing the running-board to the front wing.

Remove the nut, bolt, flat washers and rubber packing securing the running-board to the rear wing.

Remove the three bolts and flat washers securing the running-board to the body and lift the running-board clear of the car.

Replacement is carried out in the reverse order to that detailed for removal.

Section R.8

THE BODY (REMOVAL AND REPLACEMENT)

Extract the two round-headed screws securing the rear bonnet support to the dash and lift the bonnet clear of the car.

Disconnect the positive and negative leads from the battery.

Release the battery clamps and lift the battery from the battery box.

Remove the front wings as detailed in Section R.5.

Remove the running-boards as detailed in Section R.7.

The rear wings may be left in position but it is advisable to remove them as detailed in Section R.6 to prevent damage.

Remove the bolts and spring and plain washers securing the rear bumper to the chassis frame and withdraw the bumper bar assembly and distance tubes.

Remove the spare wheel and extract the bolts and two Phillips screws with spring and flat washers to release the rear valance.

Drain the fuel tank, disconnect the delivery pipe and fuel gauge tank attachment cable.

Slacken the nut and locknut on the lower end of each fuel tank strap and the bolts clamping the spare wheel carrier to the chassis frame rear cross-tube.



Fig. R.1.

Removing the fuel tank from the car after releasing the retaining straps which form the spare wheel carrier.

Remove the four dome nuts and flat washers securing the spare wheel carrier and fuel tank straps to the rear of the body.

Swing the spare wheel carrier to the rear and lift the fuel tank clear. To remove the wheel carrier completely, remove the number-plate lamp cover, disconnect the cables, withdraw the rubber sleeve and thread the cables through the carrier tube. By removing the clamp bolts the carrier is rendered free for lifting clear.

Withdraw the sidescreens from their stowage. Undo the wing nut locating each side of the seat backrest and lift it clear of the car. Slide the seat cushions from their runners.

Remove the carpets and underfelt.

Remove the steering wheel adjustment clamp bolt and slide back the clamp to expose the locking key. Lift the key out of the keyway by inserting a strip of thin metal down the keyway, underneath it, and withdraw the steering wheel and splined shaft from

the column. Release the steering column from the support bracket.

Extract the screws from the brackets and rubber stop securing the instrument panel undershield to the lower edge of the facia panel and remove the shield.

Disconnect the starter pull cable from the switch and the mixture control cable from the carburetter.

Disconnect the throttle pedal control and return spring from the carburetter and detach the revolution counter drive cable clip from the dash.

Disconnect the oil gauge pipe, engine revolution counter and speedometer drive cables from the instruments.

Withdraw the innermost screw from each glove box lid hinge and the eight screws with cup washers securing the facia panel, and draw the panel forward.

Disconnect the main wiring loom from the rear of the instrument panel and remove the facia board complete with Instruments and starter and mixture control cables.

Remove the gearbox cover, foot pedal draught excluder retaining plate and floorboards.

Extract the panel pins and screws and remove the trim panel from beneath the scuttle.

Slacken the draught excluder clip at the foot of the steering column and extract the three bolts securing the retainer plate to the toe-plate.

Remove the bolts, nuts, and spring and flat washers securing the toe-plate to the body, noting the position of the long bolt below the ignition coil.

Disconnect the horn leads and all cables from the starter motor switch and petrol pump. Detach the control box and coil from the dash. Draw all instrument panel wiring through the dash and coil it over the engine, together with the control box and ignition coil.

Disconnect the flexible oil pipe from the engine and the engine revolution counter drive from the dynamo.

Withdraw the speedometer drive cable from the dash and coil it over the engine.

Disconnect the flexible pipe and feed pipe from the petrol pump. Slacken off and remove the hand brake cable adjusting nuts and springs. Release the outer cables from the abutment bracket and thread them through the propeller shaft tunnel flange.

Extract the five bolts securing the propeller shaft tunnel to the body and chassis frame.

Extract the two nuts and bolts from the attachment plates securing each side of the body to the stiffener tube below the dash.

The body is secured to the chassis frame by eight bolts. The two rear are located in the rear corners of the sidescreen stowage compartment and the two front are inserted through the dash panel flanges into

R THE BODY

the "A" brackets on the chassis frame. The remaining four are inserted through the body floor.

Place a suitable sling around the body and hoist it clear of the chassis.



Fig. R.2.

Removal and replacement of the body requires a hoist and a suitable sling. A rope sling is quite satisfactory.

Section R.9

FACIA BOARD AND INSTRUMENT PANEL (REMOVAL AND REPLACEMENT)

Disconnect the battery.

Extract the screws from the brackets and the rubber stop securing the instrument panel undershield to the lower edge of the fascia panel.

Insert a hand through the aperture provided in the undershield and disconnect the drive to the revolution counter and speedometer.

Withdraw the innermost screw from each glove box lid hinge and the eight Phillips screws with cup washers securing the fascia panel.

Draw the panel forward and disconnect the oil gauge pipe and instrument panel wiring.

Replacement is carried out in the reverse order to that detailed for removal.

R.4

Section R.10

BODY FINISH

The body finish of the M.G. Midget is in cellulose enamel and its repair presents no difficulty provided the usual methods are employed.

To facilitate the matching of colours for retouching and respraying minor body repairs, small tins of the correct shade of cellulose enamel are available from the Service Parts Department in $\frac{1}{2}$ -pint, pint and gallon sizes.

The Part No. for each colour is indicated below to facilitate ordering.

CELLULOSE ENAMELS	
Colour	Part No.
Black	S4/145
Autumn Red	S4/146
Ivory	S4/147
Almond Green	S4/148
Sun Bronze	S4/149
M.G. Red	S4/150
Clipper Blue	S4/151
Silver Streak Grey	S4/163
Woodland Green	S4/164

When ordering do not forget to state the quantity of enamel required in addition to quoting the Part No.

Section R.11

REMOVING FRONT WINGS (Series "TF")

Remove the bolt securing each front bumper bracket.

Disconnect the side- and head-lamp wires at the snap connectors on the engine side of the valances; pull the wires through the clips on the valances.

Unscrew the line of bolts under the wing securing it to the valance, and the bolts at the end flange securing the running-board.

Unscrew the nuts below the running-board and release the tread strips.

The wing can now be removed.

Section R.12

REMOVING REAR WINGS (Series "TF")

Disconnect the tail-lamp wires.

Unscrew the bolts securing the wing to the running-

board and the line of bolts and screws securing the wing to the body.

The wing can now be removed.

Section R.13

REMOVING RUNNING-BOARDS (Series "TF")

Unscrew the nuts securing the tread strips to running-board and front wing.

Unscrew the bolts securing the running-board to the wings and to the body.

The running-board can now be removed.

Section R.14

REMOVING AND REPLACING THE BODY (Series "TF")

Remove the following components as detailed in their respective sections :—

Bonnet ; battery ; wings and valances ; rear bumper ; spare wheel and carrier ; fuel tank ; seats, steering wheel and column support bracket ; wind-screen wiper motor and drive cable.

Disconnect :—

The starter cable from the switch ; mixture control cable at the carburetter ; oil pressure gauge pipe, revolution counter and speedometer cables from the instruments ; throttle pedal return spring and control, and the revolution counter drive from the dash, and the main wiring loom from the instrument panel.

Unscrew the bolt at each end of the facia panel and remove it complete with instruments and starter mixture control cables.

Remove :

Carpets, gearbox cover ; pedal draught excluder retaining plate and floorboards ; scuttle trim panels ; toe-plates.

Disconnect the horn leads and all cables from the starter switch and fuel pump.

Remove the control box, flasher units and coil from the dash. Draw all instrument wiring through the

dash and coil it over the engine, together with the control box, ignition coil and flasher unit.

Disconnect the flexible oil pipe from the engine and the engine revolution counter drive from the dynamo.

Withdraw the speedometer drive cable from the dash and coil it over the engine.

Disconnect the flexible pipe and feed pipe from the fuel pump. Slacken off and remove the hand brake cable adjusting nuts and springs. Release the outer cables from the abutment bracket and thread them through the propeller shaft tunnel flange.

Extract the five bolts securing the propeller shaft tunnel to the body and chassis frame.

Extract the two nuts and bolts from the attachment plates securing each side of the body to the stiffener tube below the dash.

The body is secured to the chassis frame by eight bolts. The two rear are located in the rear corners of the sidescreen stowage compartment and the two front are inserted through the dash panel flanges into the "A" brackets on the chassis frame. The remaining four are inserted through the body floor.

Place a suitable sling around the body and hoist it clear of the chassis.

Replacement is a reversal of the above sequence of operations.

Section R.15

REMOVING AND REPLACING THE FACIA BOARD AND INSTRUMENT PANEL (Series "TF")

Disconnect the battery.

Remove the eight Phillips screws securing the panel undershield ; withdraw the shield.

Disconnect the speedometer and revolution counter drives and all controls and wiring.

Unscrew six nuts securing the instrument panel to the facia, and remove.

Unscrew the securing bolt at each end underneath the facia and remove.

Replacement is carried out in the reverse order to that detailed for removal.

SECTION S

CHASSIS FRAME REPAIRS

General Description.

- Section No. S.1 Checking chassis frame alignment.
- Section No. S.2 Straightening with heat.
- Section No. S.3 Checking the front cross-member.
- Section No. S.4 Straightening a damaged front end.
- Section No. S.5 Correcting a twisted frame.
- Section No. S.6 Fitting a new front cross-member.

GENERAL DESCRIPTION

This section deals with the repair of the M.G. type box-sectioned chassis frame, damaged in accident, where the facilities used by the frame manufacturers are not available. The manufacturers, naturally, have the benefit of their production equipment, but the methods adopted by them, particularly where the use of assembly jigs and welding equipment is concerned, are outside the scope of the average repair organization.

These Instructions will therefore deal mainly with methods of repairing damage to chassis frames without dismantling the component parts, i.e. breaking down welds, more than is absolutely necessary to eliminate torn or badly buckled metal or deformed cross-members which are damaged beyond economic repair.

Repairs carried out in this manner fall into two categories :—

- (a) Repair of the frame in position in the vehicle, which may be regarded as an emergency repair, and
- (b) Repair of the frame out of the vehicle, in which complete rectification of the chassis frame is undertaken.

In general, chassis frames with considerable damage may be restored into serviceable units, but the skill and experience of the repairer and the extent of the equipment available will naturally determine whether any particular frame is repairable, bearing in mind that certain fundamental accuracies must be restored, also that the cost of labour and material involved in effecting a complete repair is not economically justified if

it exceeds the cost to the user of replacing the entire frame assembly.

Section S.1

CHECKING CHASSIS FRAME ALIGNMENT

Although in most cases of accident the resulting primary damage to the frame is readily apparent, there are cases where the damage may only be slight and is masked by the wings and body structure. In such cases it may be necessary to carry out a complete check of the chassis alignment, including the front suspension and the rear axle, to determine the full extent of the damage.

When checking cars damaged in accident, it is most essential to do the checking on a flat surface large enough to receive the complete car. It is preferable to use a large iron slab, but a concrete slab carefully prepared and hand-surfaced will be suitable. The car may then be checked directly by comparative measurements or the chassis may be suitably blocked up as shown in Fig. K.2, and a centre line dropped down from the front and rear centre of the frame and parallel track lines laid out as in Fig. S.1. From these lines the squareness of the car may easily be checked.

In a further check for distortion, diagonal measurements as shown in Fig. S.2 may be taken without removing the body from the chassis by using a plumb-bob as follows :—

Place the car on a level surface and block up the car equally at each wheel approx. 12 in. (30 cm.) high with all tyres properly inflated.

S CHASSIS FRAME REPAIRS

Perform the measuring with accuracy and care.

Suspend the plumb-bob from various corresponding points on the frame, such as indicated by the diagonal lines in Fig. S.2. The plumb-bob should be suspended slightly above the floor. When the plumb-bob comes to rest, mark the floor directly underneath it. The marks made on the floor will represent the various points of the frame to be checked diagonally.

Measure the diagonal distance between the points ; this distance should agree within $\frac{1}{4}$ in. or $\frac{3}{8}$ in. (6.5 mm. or 10 mm.), as shown in Fig. S.2.

cross-checked at the centre line on which the diagonals should also cross, as detailed in the chassis dimensional drawing, Fig. S.2. The angle of the front cross-member should be 2° but may be given an allowance of $\pm \frac{1}{2}^\circ$. Diagonal measurements quickly determine which section of the frame is bent.

The accuracy of side-members is usually checked with suitable straight-edges, and squareness of side rails is checked with straight-edge and square. Twist is checked visually against straight-edges laid transversely across the frame at suitable points.

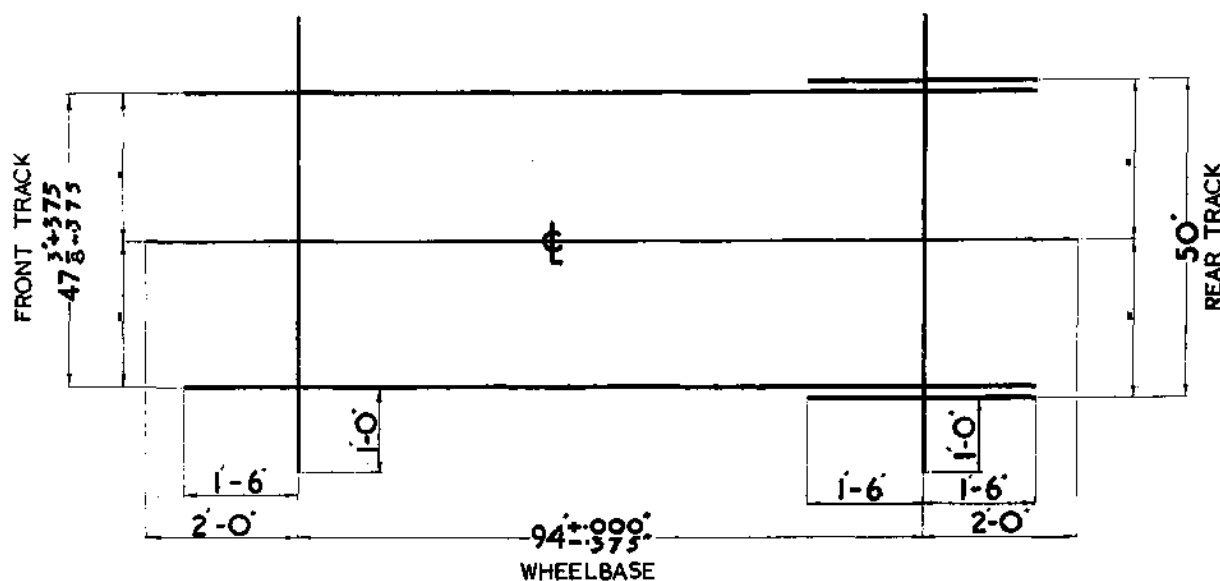


Fig. S.1.

Layout for track and wheelbase lines.

Care must be taken to see that any two diagonals compared represent exactly corresponding points on each side of the frame.

Upon the result of this preliminary investigation a decision can be taken whether the frame can be repaired in position or whether the frame must be stripped out completely. When repairs are undertaken with the frame in position, the damage should be confined to forward of the front engine bulkhead plate.

Damage rearwards of the engine bulkhead plate involves the stripping out of the frame. This also applies to any damage to the rear end of the frame.

Alignment

Checking the alignment of the bare frame is a relatively simple matter, especially if the frame can be set up on a large flat surface or face plate. It involves establishing a datum or centre line, from which all measurements can be taken. Diagonals are checked from suitable fixed locating points, which can be

Section S.2

STRAIGHTENING WITH HEAT

When the frame is heated for straightening, the area affected should be maintained at a cherry-red throughout the entire straightening operation.

When an acetylene torch is used for heating, a "neutral" flame should be employed and played over the entire area to be heated until the metal has reached a uniform cherry-red. Never heat the metal beyond a cherry-red as it will seriously weaken the steel. It is good practice to check the temperature of the heated metal frequently with a dry pine-stick, while it is being worked, to maintain it at the proper state of ductility and avoid burning. Touching a dry pine-stick to metal that has been heated to a cherry-red will cause the stick to glow and char, but not to ignite. The heated area of the frame should be protected from draughts to prevent sudden cooling of the metal.

Section S.3

CHECKING THE FRONT CROSS-MEMBER

When a car has sustained damage to the front suspension, necessitating the dismantling of the assemblies, it is essential that the chassis frame should be checked for correct alignment, especially at the front cross-member. This will avoid excessive tyre wear and steering wander, etc.

A method of making an approximate check is shown in Fig. S.3.

Place the car on a flat surface.

The bars should be parallel to each other at the points "E" and "F" within a tolerance of $\frac{3}{16}$ in. (4.76 mm.).

Between the points "G" and "H," or "J" and "K," the bars should also be parallel with a tolerance of $\frac{3}{16}$ in. (4.76 mm.).

If a fore and aft plumb-bob centre line is dropped down from the front and rear centre of the frame and points also dropped down from the bars at each end, the points "L," "M," "N," "P" may be checked to the centre line to ensure the alignment of the bars fore and aft.

If misalignment is found in the top bars only, it may be that this can be corrected by removing the top bar

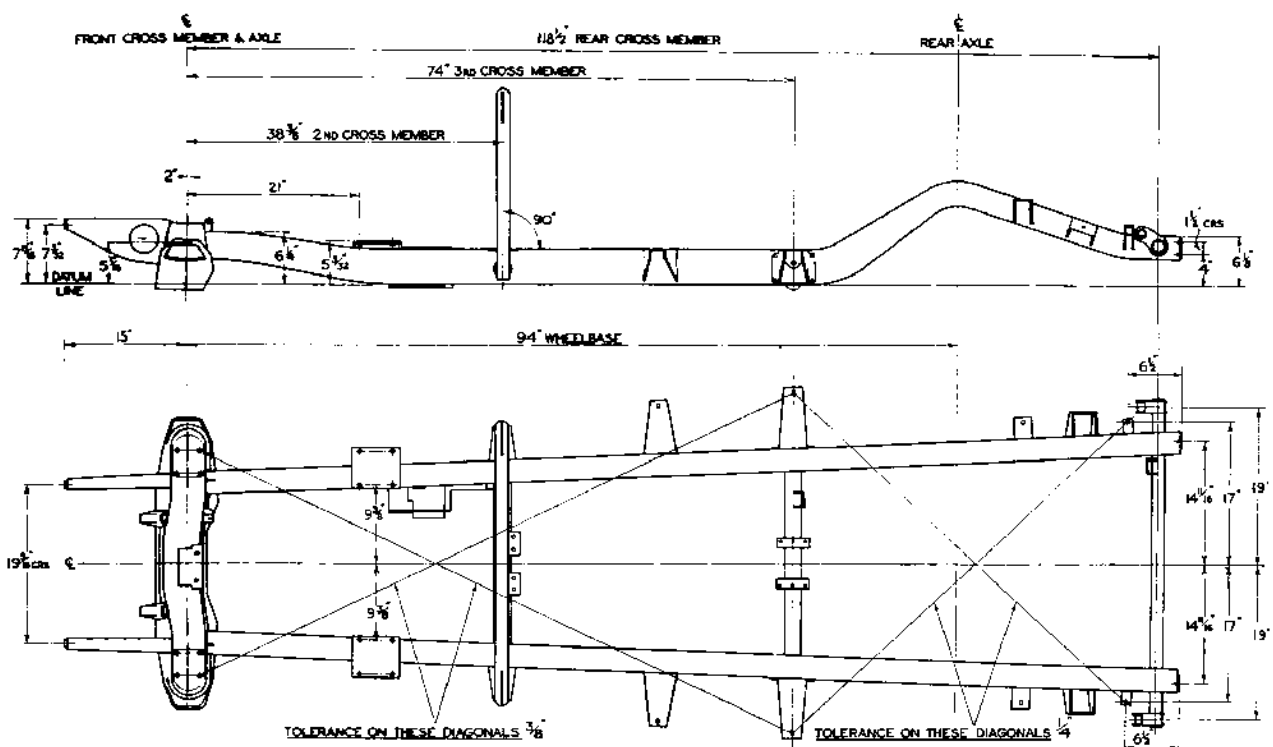


Fig. S.2.
Chassis dimensional diagram.

Remove the front suspension and the rear wheels.

Lower the frame on the three blocks having the dimensions shown in Fig. S.3. These locate the frame in such a position that the front cross-member should run parallel to the ground if not distorted.

Bolt on to the front cross-member the four bars, Tool No. T.125. (See Section Q.)

Parallelism and alignment of these bars can then be checked by measurement and by sighting one rod to the other.

When measured at the points "A," "B," "C," "D" from the flat surface on which the car or frame is placed, all the bars should run parallel to it within a tolerance of $\frac{3}{16}$ in. (4.76 mm.).

and bolting a similar but stiffer bar to the cross-member, which can be used as a lever to twist slightly the outer end of the cross-member into its correct alignment with the lower bars.

Section S.4

STRAIGHTENING A DAMAGED FRONT END

Correct alignment of the front suspension is of such vital importance that if there is appreciable distortion of this member, it should be renewed, due to the fact

S CHASSIS FRAME REPAIRS

that it is a very difficult operation to re-form it exactly to its original shape.

Note.—We do not recommend that this operation be carried out by the Distributor or Dealer unless adequate assembly fixtures are available.

The majority of frames are damaged as a result of oblique frontal impacts, and straightening of the front end section of the frame is carried out as follows. (See Fig. S.4) :—

The first step is to recover the original dimension "AB," by applying a diagonal force between "A" and "B," using a screw or hydraulic jack, at the same time applying heat to the frame side-members at "X" and "Y." Apply the heat evenly over a reasonable

areas. Use a large wood block between the hammer and the frame to avoid local damage.

Further straightening at "Z" will probably be required by using a screw jack, abutting on suitable wood packing blocks, at right angles to the frame. (See Fig. S.5.) Similar methods of recovery can be used at any point along the frame.

It is necessary, when using the jacks, to apply sufficient force slightly to over-straighten the side-members, for the frame will spring back when the jack is released.

It is better to make a recovery in stages rather than to apply too great a force at one effort, and consequently have to rectify the results of over-straightening. It

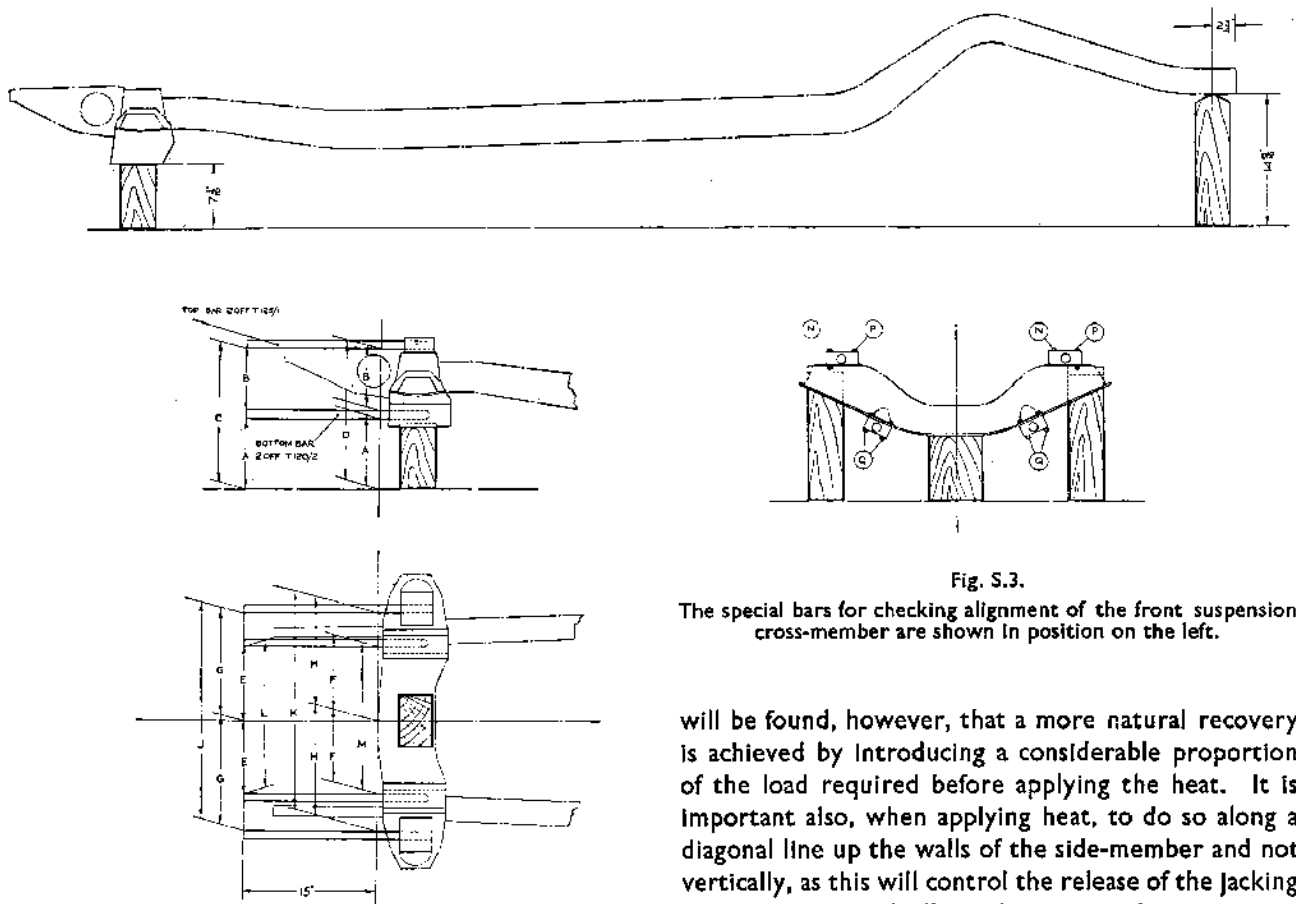


Fig. S.3.

The special bars for checking alignment of the front suspension cross-member are shown in position on the left.

area and **do not burn**. The side-members are of light gauge, i.e. 14G (.080 in.) (2.03 mm.) thick. The frame at "X" and "Y" will tend to straighten out as additional force is applied, and care must be taken that excess pressure is not applied, otherwise there may be further distortion set up at the junction of the frame side-members and the front suspension cross-member.

Recovery at "X" and "Y" will be assisted by hammering the metal, which is already heated, in these

will be found, however, that a more natural recovery is achieved by introducing a considerable proportion of the load required before applying the heat. It is important also, when applying heat, to do so along a diagonal line up the walls of the side-member and not vertically, as this will control the release of the jacking strains more gradually and prevent the correction from being too localised.

If the frame has lifted or dropped at the front end, it will be necessary to correct this by trussing with the aid of a straining member and screw jack. (See Fig. S.6.)

The chassis frame front extensions are easily renewed by sawing through the weld securing the front extension to the front suspension cross-member, and welding replacement components in position. Ensure that the front extensions are correctly located before re-welding. See chassis dimensional diagram, Fig. S.2.

When the front end is rectified, final checking is then directed to ensure that the side-members are in the correct plane and that the front suspension cross-member is set to the correct angle from the datum line. Reference to Fig. S.2 and Fig. S.3 will give all the required information.

points "A," "B" or "C" (Fig. S.7) to a fixed trestle, and by using a suitable lever, or a stout beam of timber, the frame can then be sprung back with sufficient effort applied at the end of the lever.

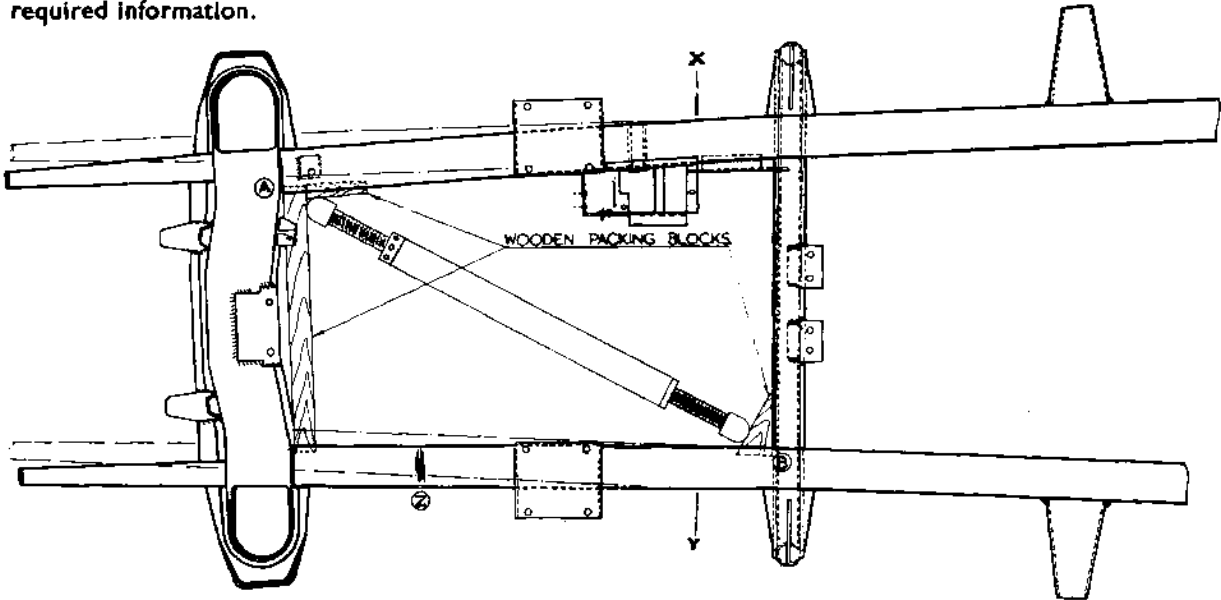


Fig. S.4.

A screw-type jack in position to correct front end misalignment.

Section S.5

CORRECTING A TWISTED FRAME

In the event of the frame being twisted, this condition can be corrected by anchoring the frame at

If necessary apply well-spread heat at the twisted section.

As the frame is completely dismantled, it is possible to remove all signs of damage by cutting out holes for access, with the welding torch, in the inner liner plates,

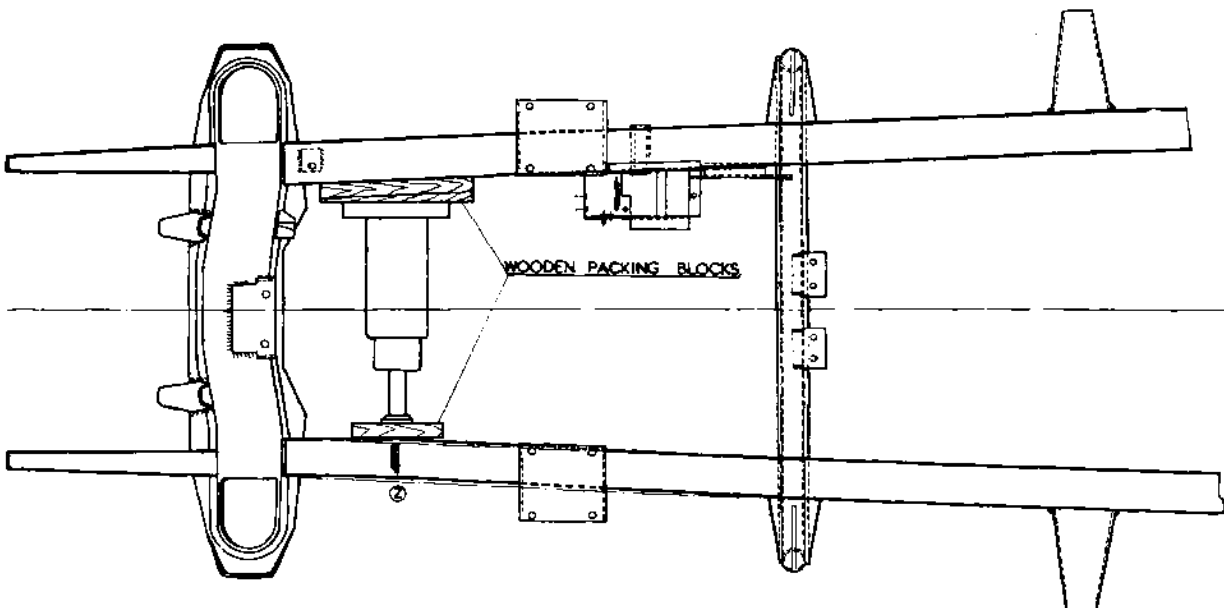


Fig. S.5.

A jack in use to straighten a damaged frame side-member.

S CHASSIS FRAME REPAIRS

hammering out bulges, dents or buckled areas, and closing the holes by welding in the pieces previously removed. The holes should be cut on the centre line of the inner liner plate and be kept as small as possible.

Final checking of the frame should be carried out as indicated in Figs. S.2 and S.3.

Comparative vertical measurements should reveal any frame twist.

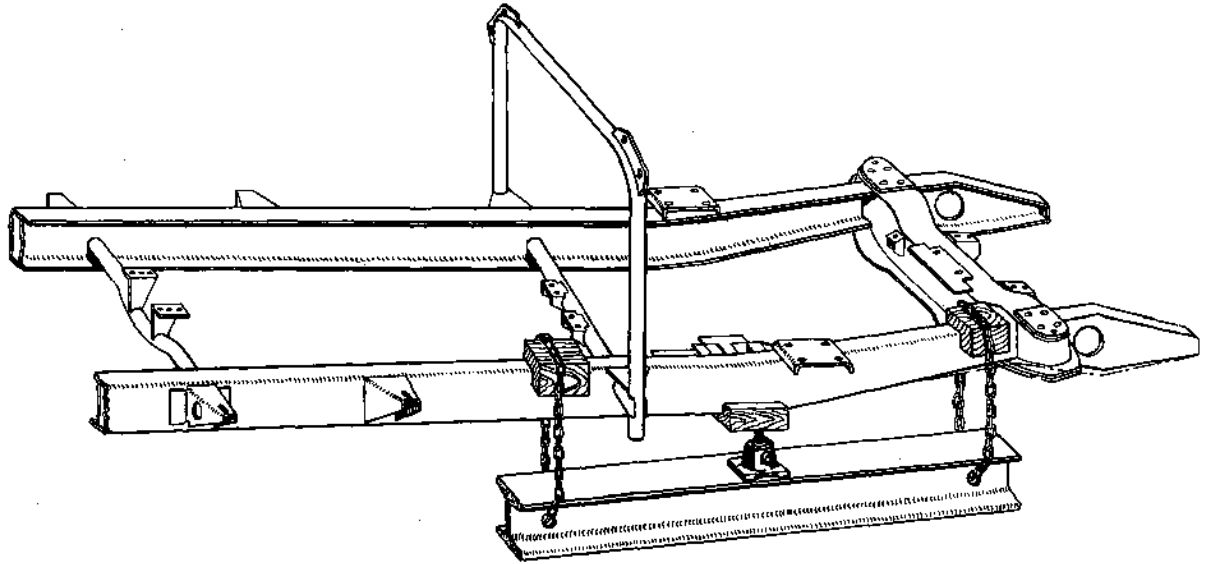


Fig. S.6.

A beam and jack may be used for the correction of lift or fall in a frame side-member.

The welds can be cleaned up and the repair is then invisible.

When any adjustment to the frame is carried out do not forget the light gauge of the material and treat it accordingly.

Check the wheel camber, castor angle, king-pin angle and front wheel alignment as detailed on pages K.2 and K.3.

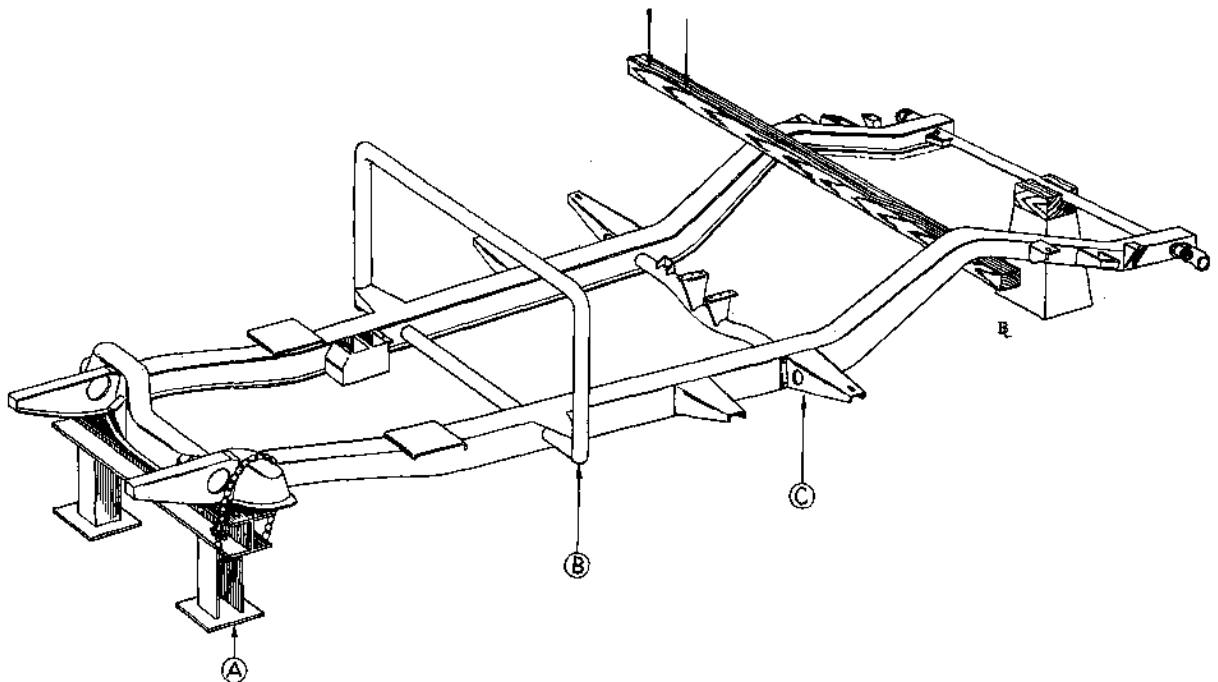
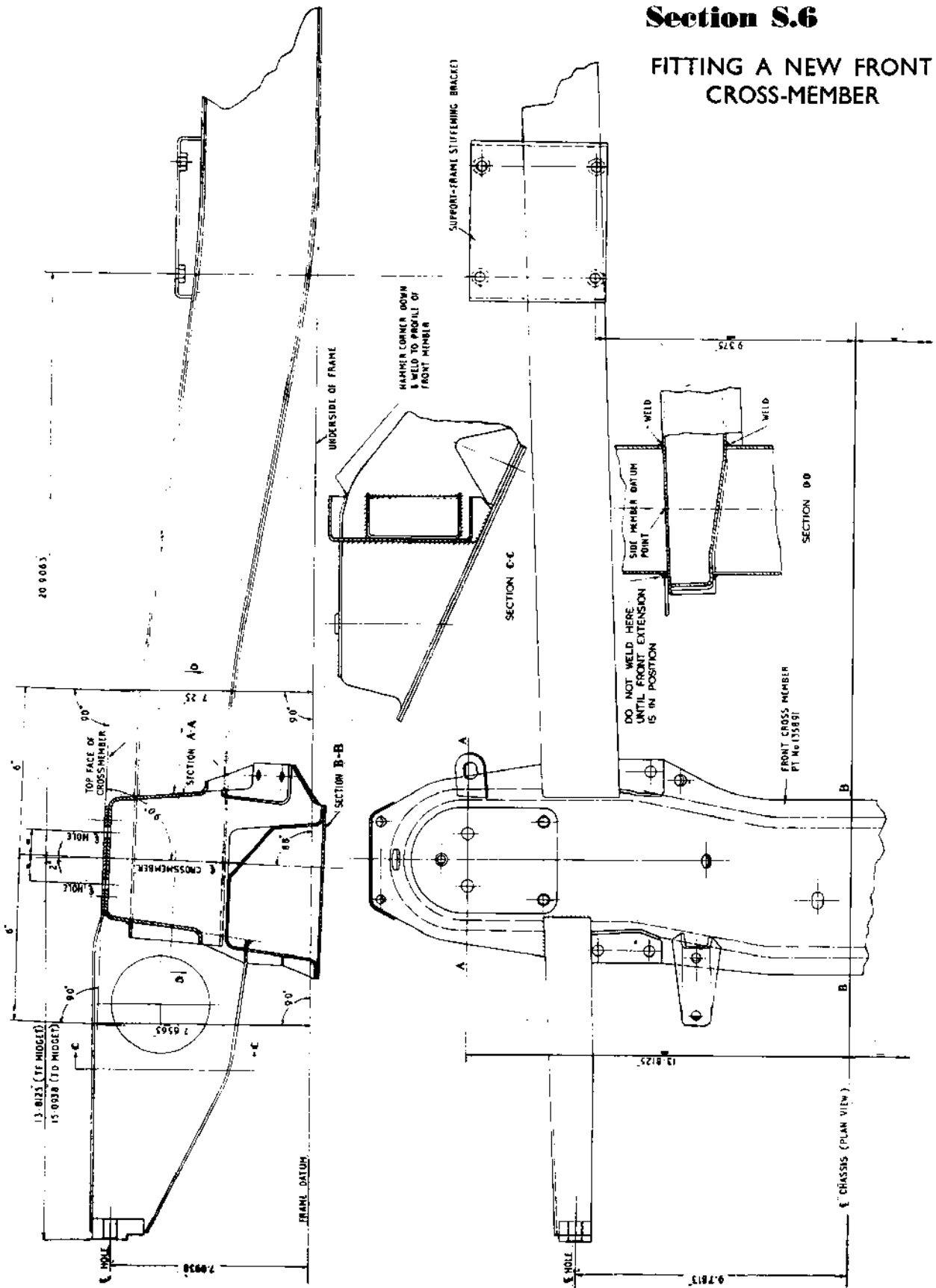


Fig. S.7.

The method of employing a stout beam to spring a twisted frame while it is held on a suitable stand.

Section S.6

FITTING A NEW FRONT CROSS-MEMBER



KEY TO RECOMMENDED LUBRICANTS

A ENGINE AND AIR CLEANER								
Climatic Conditions	BP Energol	Filtrate	Sternol	Duckham's	Castrol	Esso	Mobil	Shell
Tropical and Temperate down to 32° F. (0° C.)	Energol S.A.E. 30	Medium Filtrate 30	Sternol W.W. 30	Duckham's NOL. Thirty	Castrol X.L.	Esso Extra Motor Oil 20W/30	Mobiloil A	Shell X-100 30
Cold and extreme cold down to 0° F. (-18° C.)	Energol S.A.E. 20W	Zero Filtrate 20	Sternol W.W. 20	Duckham's NOL. Twenty	Castrolite	Esso Extra Motor Oil 20W/30	Mobiloil Arctic	Shell X-100 20/20W
Arctic—below 0° F. (-18° C.)	Energol S.A.E. 10W	Sub-Zero Filtrate 10	Sternol W.W. 10	Duckham's NOL. Ten	Castrol Z	Essolube 10	Mobiloil 10W	Shell X-100 10W
B GEARBOX, STEERING GEARBOX AND REAR AXLE (HYPOID GEARS)								
Tropical and Temperate down to 10° F. (-12° C.)	Energol E.P. S.A.E. 90	Hypoid Filtrate Gear 90	Ambroline E.P. 90	Duckham's Hypoid 90	Castrol Hypoy	Esso Expee Compound 90	Mobilube G.X. 90	Shell Spirax 90 E.P.
Extreme cold below 10° F. (-12° C.)	Energol E.P. S.A.E. 80	Hypoid Filtrate Gear 80	Ambroline E.P. 80	Duckham's Hypoid 80	Castrol Hypoy 80	Esso Expee Compound 80	Mobilube G.X. 80	Shell Spirax 80 E.P.
C WHEEL HUBS AND FAN BEARINGS								
All conditions	Energol L. 3	Filtrate Super Lithium Grease	Ambroline L.H.T. Grease	Duckham's L.B. 10 Grease	Castrol L.M.	Esso Multi-purpose Grease H	Mobilgrease M.P.	Shell Retinax A
D STEERING CONNECTIONS, KING-PINS, PROPELLER SHAFT, CLEVIS PINS AND LEVER FULCRUMS								
All conditions	Energol L. 3	Filtrate Super Lithium Grease	Ambroline L.H.T. Grease	Duckham's L.B. 10 Grease	Castrol L.M.	Esso Multi-purpose Grease H	Mobilgrease M.P.	Shell Retinax A
E CABLES AND VITAL CONTROL JOINTS								
All conditions	Energol L. 3	Filtrate Super Lithium Grease	Ambroline L.H.T. Grease	Duckham's L.B. 10 Grease	Castrol L.M.	Esso Multi-purpose Grease H	Mobilgrease M.P.	Shell Retinax A
F UTILITY LUBRICANT, S.U. CARBURETTER DASHPOT OILCAN POINTS, ETC.								
All conditions	Energol S.A.E. 20W	Zero Filtrate 20	Sternol W.W. 20	Duckham's NOL. Twenty	Castrolite	Esso Extra Motor Oil 20W/30	Mobiloil Arctic	Shell X-100 20/20W

EVERY 1,000 MILES (1600 Km.). Use oilcan on all control joints, door locks, hinges.

SPECIAL NOTE. Only Hypoid oils must be used in the rear axle.

LUBRICATION (SERIES TD)

EVERY 250 MILES (400 Km.)

ENGINE. Check the oil level with the dipstick, and top up if necessary with oil to Ref. A.

EVERY 500 MILES (800 Km.)

STEERING JOINT NIPPLES. Give three or four strokes of the grease gun filled with oil to Ref. D.

AFTER THE FIRST 500 MILES (800 Km.)

ENGINE. Drain off the old oil and refill with fresh oil to Ref. A.

GEARBOX. Drain off the old oil and refill with fresh oil to Ref. B.

REAR AXLE. Drain off the old oil and refill with fresh oil to Ref. B.

EVERY 1,000 MILES (1600 Km.)

GEARBOX. Inspect the oil level with the dipstick, and top up as necessary with oil to Ref. B.

REAR AXLE. Inspect the oil level through the filler, and top up as necessary with oil to Ref. B.

PROPELLER SHAFT NIPPLES. Give three or four strokes of the grease gun filled with grease to Ref. D.

CARBURETTERS. Remove the brass caps from the tops of the suction chambers and add a teaspoonful of engine oil to Ref. A.

WATER PUMP. Give two strokes of the grease gun filled with grease to Ref. C.

MASTER CYLINDER. Inspect the fluid level and top up with Lockheed Genuine Brake Fluid.

DOOR LOCKS, CONTROL JOINTS, Etc. Lubricate with oil to Ref. F.

EVERY 3,000 MILES (5000 Km.)

ENGINE. Drain off the old oil and refill with oil to Ref. A.

DISTRIBUTOR. Withdraw the rotor arm and add a few drops of thin oil to Ref. F to the advance mechanism through the gap around the cam spindle and to the spindle through the cam securing screw duct.

DYNAMO. Remove the grease cap and refill with grease to Ref. D.

AIR CLEANER. Clean and re-oil.

EVERY 6,000 MILES (10000 Km.)

EXTERNAL OIL FILTER. Fit a new filter (throw-away type). Fit a new filter element (renewable-element type).

GEARBOX. Drain off the old oil and refill with oil to Ref. B.

REAR AXLE. Drain off the old oil and refill with oil to Ref. B.

FRONT WHEEL BEARINGS. Remove the hub and grease caps and fill the caps with grease to Ref. C. One stroke of gun to nipple on early models.

REVOLUTION INDICATOR G/B. Give two strokes of the grease gun with grease to Ref. D.

EVERY 12,000 MILES (20000 Km.)

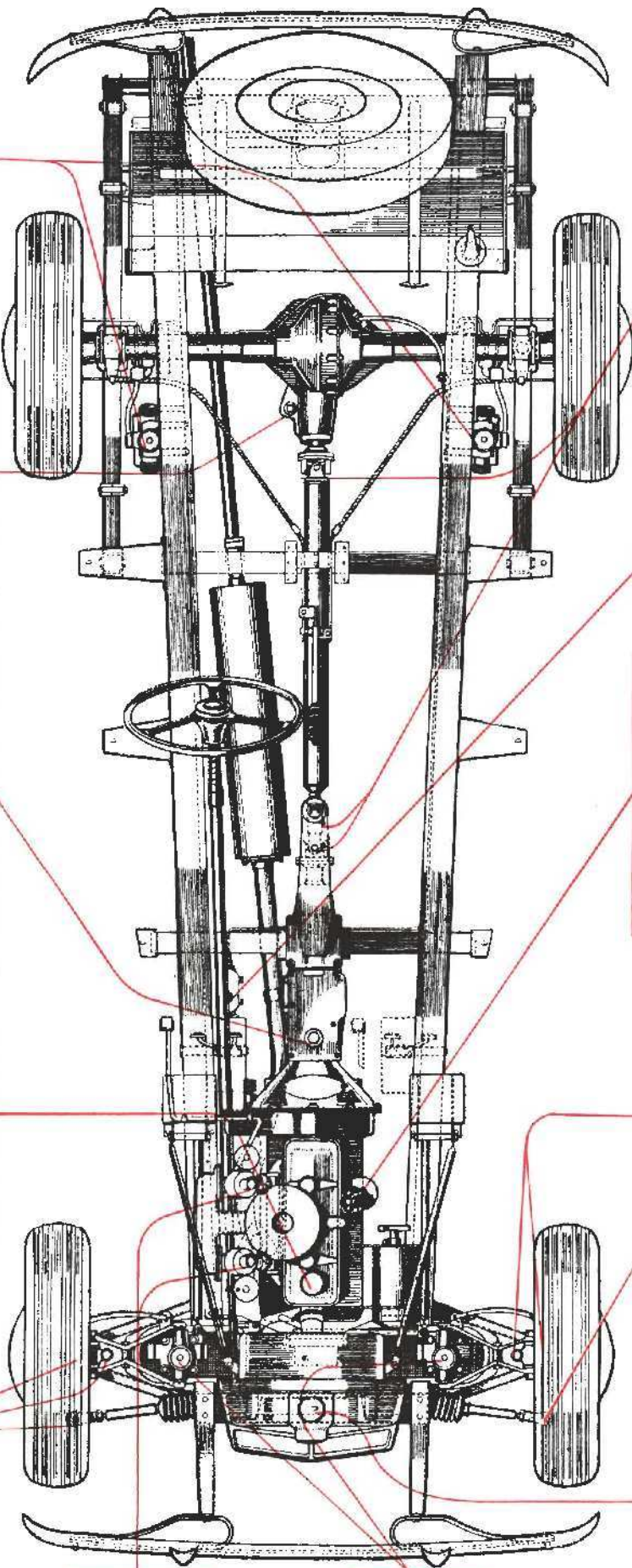
HYDRAULIC DAMPERS. Remove, clean and inspect the fluid level. Top up with the recommended fluid.

STEERING RACK. Give up to 10 strokes (not more) of the grease gun filled with oil to Ref. B to the nipple on the steering rack.

MULTIGRADE MOTOR OILS

In addition to the recommended lubricants listed in the Manual, we approve the use of these new motor oils, as produced by the oil companies shown in our Manuals, for all climatic temperatures unless the engine is old and in poor mechanical condition. Some are more expensive than the recommended motor oils because of their special properties and greater fluidity at low temperatures.

THE M.G. MIDGET (Series "TD") LUBRICATION CHART



D
EVERY 500 MILES
(800 Km.)
GIVE 3 OR 4 STROKES OF GREASE GUN FILLED WITH GREASE TO REF. D.

A
EVERY 250 MILES
(400 Km.)
INSPECT OIL LEVEL IN ENGINE BY DIPSTICK AND REPLENISH IF NECESSARY WITH RECOMMENDED ENGINE OIL TO REF. A.
AFTER FIRST 500 MILES (800 Km.) AND SUBSEQUENTLY
EVERY 3,000 MILES (5000 Km.)
DRAIN OFF OLD OIL AND REFILL WITH FRESH OIL TO REF. A.

B
EVERY 1,000 MILES
(1600 Km.)
INSPECT OIL LEVEL IN GEARBOX BY DIPSTICK AND REPLENISH IF NECESSARY WITH RECOMMENDED HYPOID OIL TO REF. B.
AFTER FIRST 500 MILES (800 Km.) AND SUBSEQUENTLY
EVERY 6,000 MILES (10000 Km.)
DRAIN OFF OLD OIL AND REFILL WITH FRESH OIL TO REF. B.

B
EVERY 1,000 MILES
(1600 Km.)
INSPECT OIL LEVEL IN AXLE THROUGH FILLER AND REPLENISH IF NECESSARY WITH RECOMMENDED HYPOID OIL TO REF. B.
AFTER FIRST 500 MILES (800 Km.) AND SUBSEQUENTLY
EVERY 6,000 MILES (10000 Km.)
DRAIN OFF OLD OIL AND REFILL WITH FRESH OIL TO REF. B.

EVERY 12,000 MILES
(20000 Km.)
REMOVE REAR HYDRAULIC DAMPERS CAREFULLY CLEAN EXTERIOR AND THEN INSPECT FLUID LEVEL REPLENISH WITH CORRECT FLUID IF NECESSARY.

F
EVERY 1,000 MILES
(1600 Km.)
REMOVE MASS CAPTIVE TOP OF CARBURETTOR SUCTION CHAMBER AND ADD A TEASPOONFUL OF ENGINE OIL TO REF. F.

EVERY 12,000 MILES
(20000 Km.)
REMOVE DAMPERS CLEAN CAREFULLY THEN INSPECT FLUID LEVEL AND REFILL WITH CORRECT FLUID IF NECESSARY.

MULTIGRADE MOTOR OILS
In addition to the recommended lubricants listed in the Manual, we approve the use of these new motor oils for all climatic temperatures unless the engine is old and in poor mechanical condition. Some are more expensive than the recommended motor oils because of their special properties and greater fluidity at low temperatures. We also draw your attention to the simpler grease requirements for your vehicle by the use of the multipurpose lithium greases.

EVERY 3,000 MILES
(5000 Km.)
WITHDRAW DISTRIBUTOR ROTATING ARM AND ADD A FEW DROPS OF THIN OIL TO REF. F TO OPENING AND TO ADVANCE MECHANISM THROUGH GAP ROUND CAM SPINDLE.
REMOVE DYNAMIC GREASE CAP AND REFILL WITH GREASE TO REF. C.

D
EVERY 500 MILES
(800 Km.)
GIVE 3 OR 4 STROKES OF GREASE GUN FILLED WITH GREASE TO REF. D.

B
EVERY 12,000 MILES
(20000 Km.)
APPLY GREASE GUN TO NIPPLE ON STEERING GEARBOX AND GIVE UP TO 10 STROKES BUT NOT MORE. USE HYPOID OIL TO REF. B.

EVERY 1,000 MILES
(1600 Km.)
INSPECT FLUID LEVEL IN BRAKE MASTER CYLINDER AND REPLENISH WITH CORRECT GENUINE BRAKE FLUID.

D
EVERY 1,000 MILES
(1600 Km.)
GIVE 3 OR 4 STROKES OF GREASE GUN FILLED WITH GREASE TO REF. D.

D

D F

D

EVERY 1,000 MILES (1600 Km.), APPLY GREASE GUN FILLED WITH GREASE TO REF. C TO FAN BEARING LUBRICATOR AND GIVE TWO STROKES. USE OILCAN ON ALL CONTROL JOINTS, DOOR LOCKS, HINGES TO REF. F.
EVERY 3,000 MILES (5000 Km.), CLEAN AND RE-OIL AIR INTAKE CLEANER (EXPORT).
EVERY 6,000 MILES (10000 Km.), REMOVE FRONT WHEEL HUB DISC FROM HUB. APPLY GREASE GUN FILLED WITH GREASE TO REF. C AND GIVE ONE STROKE ON EARLY MODELS. ON LATER MODELS REMOVE GREASE CAP, REPLENISH WITH GREASE TO REF. C AND REPLACE.
APPLY GREASE GUN FILLED WITH GREASE TO REF. D TO REVOLUTION INDICATOR GEARBOX AND GIVE TWO STROKES.
FIT NEW EXTERNAL OIL FILTER (THROW-AWAY TYPE), OR NEW ELEMENT (RENEWABLE ELEMENT TYPE).
CLEAN AND RE-OIL AIR CLEANER (HOME).

LUBRICATION (SERIES TF)

EVERY 250 MILES (400 Km.)

ENGINE. Check the oil level with the dipstick, and top up if necessary with oil to Ref. A.

EVERY 500 MILES (800 Km.)

STEERING JOINT NIPPLES. Give three or four strokes of the grease gun filled with oil to Ref. D.

AFTER THE FIRST 500 MILES (800 Km.)

ENGINE. Drain off the old oil and refill with fresh oil to Ref. A.

GEARBOX. Drain off the old oil and refill with fresh oil to Ref. B.

REAR AXLE. Drain off the old oil and refill with fresh oil to Ref. B.

EVERY 1,000 MILES (1600 Km.)

GEARBOX. Inspect the oil level with the dipstick, and top up as necessary with oil to Ref. B.

REAR AXLE. Inspect the oil level through the filler, and top up as necessary with oil to Ref. B.

PROPELLER SHAFT NIPPLES. Give three or four strokes of the grease gun filled with grease to Ref. D.

CARBURETTERS. Remove the brass caps from the tops of the suction chambers and add a teaspoonful of engine oil to Ref. A.

WATER PUMP. Give two strokes of the grease gun filled with grease to Ref. C.

MASTER CYLINDER. Inspect the fluid level and top up with Lockheed Genuine Brake Fluid.

DOOR LOCKS, CONTROL JOINTS, Etc. Lubricate with oil to Ref. F.

EVERY 3,000 MILES (5000 Km.)

ENGINE. Drain off the old oil and refill with oil to Ref. A.

DISTRIBUTOR. Withdraw the rotor arm and add a few drops of thin oil to Ref. F to the advance mechanism through the gap around the cam spindle and to the spindle through the cam securing screw duct.

DYNAMO. Remove the grease cap and refill with grease to Ref. D.

AIR CLEANER. Clean and re-oil.

EVERY 6,000 MILES (10000 Km.)

EXTERNAL OIL FILTER. Fit a new filter (throw-away type). Fit a new filter element (renewable-element type).

GEARBOX. Drain off the old oil and refill with oil to Ref. B.

REAR AXLE. Drain off the old oil and refill with oil to Ref. B.

FRONT WHEEL BEARINGS. Remove the hub and grease caps and fill the caps with grease to Ref. C.

REVOLUTION INDICATOR G.B. Give two strokes of the grease gun with grease to Ref. D.

EVERY 12,000 MILES (20000 Km.)

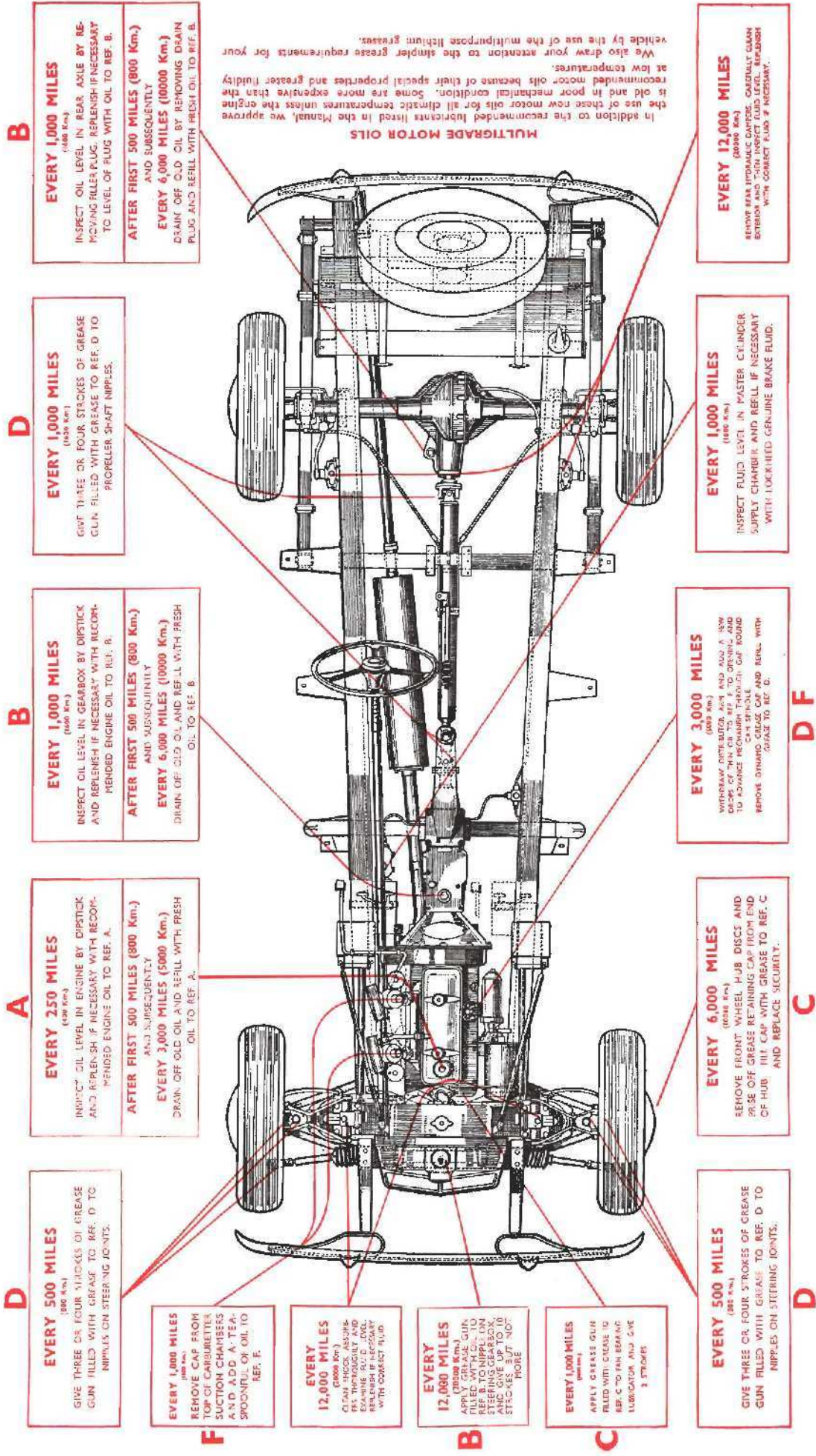
HYDRAULIC DAMPERS. Remove, clean and inspect the fluid level. Top up with the recommended fluid.

STEERING RACK. Give up to 10 strokes (not more) of the grease gun filled with oil to Ref. B to the nipple on the steering rack.

MULTIGRADE MOTOR OILS

In addition to the recommended lubricants listed in the Manual, we approve the use of these new motor oils, as produced by the oil companies shown in our Manuals, for all climatic temperatures unless the engine is old and in poor mechanical condition. Some are more expensive than the recommended motor oils because of their special properties and greater fluidity at low temperatures.

THE M.G. MIDGET (Series "TF") LUBRICATION CHART



D
EVERY 500 MILES
(800 Km.)
GIVE THREE OR FOUR STROKES OF GREASE GUN FILLED WITH GREASE TO REF. D TO NIPPLES ON STEERING JOINTS.

A
EVERY 250 MILES
(400 Km.)
INDICATE OIL LEVEL IN ENGINE BY DIPSTICK AND REPLENISH IF NECESSARY WITH RECOMMENDED ENGINE OIL TO REF. A.

B
EVERY 1,000 MILES
(1600 Km.)
INSPECT OIL LEVEL IN GEARBOX BY DIPSTICK AND REPLENISH IF NECESSARY WITH RECOMMENDED ENGINE OIL TO REF. B.

D
EVERY 1,000 MILES
(1600 Km.)
GIVE THREE OR FOUR STROKES OF GREASE GUN FILLED WITH GREASE TO REF. D TO PROPELLER SHAFT NIPPLES.

B
EVERY 1,000 MILES
(1600 Km.)
INSPECT OIL LEVEL IN REAR AXLE BY REMOVING FILLER PLUG. REPLENISH IF NECESSARY TO LEVEL OF PLUG WITH OIL TO REF. B.

F
EVERY 1,000 MILES
(1600 Km.)
REMOVE CAP FROM TOP OF CARBURETTOR SUCTION CHAMBERS AND ADD A TEASPOONFUL OF OIL TO REF. F.

EVERY 12,000 MILES
(20000 Km.)
CHECK ADJUSTMENT OF THE MAIN BEARING OIL LEVEL. REPLENISH IF NECESSARY WITH CORRECT FLUID.

B
EVERY 12,000 MILES
(20000 Km.)
APPLY GREASE GUN TO NIPPLES ON STEERING GEARBOX AND GIVE UP TO 10 STROKES PER JOINT.

C
EVERY 1,000 MILES
(1600 Km.)
APPLY GREASE GUN FILLED WITH GREASE TO REF. C TO FAN BEARING. LUBRICATE AND GIVE 3 STROKES.

D
EVERY 500 MILES
(800 Km.)
GIVE THREE OR FOUR STROKES OF GREASE GUN FILLED WITH GREASE TO REF. D TO NIPPLES ON STEERING JOINTS.

C
EVERY 6,000 MILES
(10000 Km.)
REMOVE FRONT WHEEL HUB DISCS AND PRIZE OFF GREASE RETAINING CAP FROM END OF HUB. FILL CAP WITH GREASE TO REF. C AND REPLACE SECURELY.

DF
EVERY 3,000 MILES
(5000 Km.)
WIPERARY OPERATOR, AIR AND ADD A NEW DROPE OF OIL TO REF. E TO OPENING AND TO ADVANCE REARWHEEL THROUGH CAP ROUND CHAIN DRIVE AND REFRILL WITH GREASE TO REF. D.

EVERY 1,000 MILES
(1600 Km.)
INSPECT FLUID LEVEL IN MASTER CYLINDER SUPPLY CHAMBER AND REFRILL IF NECESSARY WITH LOCKHEED GENUINE BRAKE FLUID.

EVERY 12,000 MILES
(20000 Km.)
REMOVE REAR HYDRAULIC DAMPERS. CAREFULLY CLEAN EXTERIOR AND REFRILL WITH CORRECT FLUID IF NECESSARY.

MULTIGRADE MOTOR OILS
In addition to the recommended lubricants listed in the Manual, we approve the use of these new motor oils for all climatic temperatures unless the engine is old and in poor mechanical condition. Some are more expensive than the recommended motor oils because of their special properties and greater fluidity at low temperatures.
We also draw your attention to the simpler greases requirements for your vehicle by the use of the multipurpose lithium greases.

EVERY 1,000 MILES (1600 KM.): USE OILCAN FILLED WITH OIL TO REF. F ON ALL CONTROL JOINTS, DOOR LOCKS, HINGES, ETC.
EVERY 3,000 MILES (5000 KM.): APPLY GREASE GUN FILLED WITH GREASE TO REF. D TO REVOLUTION INDICATOR GEARBOX AND GIVE TWO STROKES. FIT NEW EXTERNAL OIL FILTER ELEMENT.

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