P. OLYSLAGER MOTOR MANUALS 35

RILEY 4/68 4/72

SALOONS All models from 1959

RILEY 4/68

SALOONS

1959-1961

RILEY 4/72

SALOONS

from 1961

Handbook for the

RILEY 4/68

SALOONS
1959-1961

RILEY 4/72

SALOONS
from 1961

PIET OLYSLAGER MSIA MSAE

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SPECIAL NOTE

Although every care is taken to ensure accuracy and completeness in compiling this book, no liability can be accepted for damage, loss or injury caused by any errors or omissions in the information given.

Preface

THE PIET OLYSLAGER MOTOR MANUALS have been known to Continental motorists and garages for ten years and have proved their worth many times over. We consider that they are unique in their compact completeness and contain all the information needed to service, maintain and repair all makes of cars.

The manuals are presented in two forms in the English language, in these handy small books covering individual models and in cumulative loose-leaf form keeping abreast of all alterations and developments.

These two services set out to cover all that a motorist or garageman needs to know to get the best out of motoring, and the series will eventually cover all popular makes of cars in the world.

The manuals were described, after considerable research by the International Commission on Automobile Documentation as 'The best automobile documentation so far in the world'.

We are grateful to the manufacturers for their kind and enthusiastic co-operation in the production of this manual.

Fig. 1. Riley 4/Sixty-Eight Saloon, model R/HS1 (duo-tone finish)

Fig. 2. Riley 4/Sixty-Eight Saloon, model R/HS1 (single-tone finish)

RILEY 4/68 | SALOONS 1959-1961

General

INTRODUCTION

The Riley 4/Sixty-Eight Saloon (model R/HS1, ADO.9) was introduced in April 1959, and features body styling by Pininfarina of Turin, Italy, like the other BMC models in this class. These models are also known as BMC type ADO.9.

The car is conventional in lay-out, with four-cylinder 1489cc BMC 'B' series engine (fitted, however, with twin SU carburettors), four-speed gearbox with central floor gear change and synchromesh on second, third and top gear, hypoid final drive, independent front wheel suspension with coil springs and wishbones, rigid rear axle with semi-elliptic leaf springs, 5·90–14 tyres and four-door, four/five-seater saloon body of unit construction.

Traces of Riley parentage are retained in the radiator grille's profile, the hinged bonnet pressing following these contours. At either side of the radiator grille are horizontal subsidiary intakes, into which are recessed the sidelamps and the direction-indicator flashing lamps. At the rear, the lamp clusters, which form the trailing edges of the tail fins, have a forward slant, giving the tail a more compact appearance.

An engine rev-counter, driven from the camshaft, is fitted as standard equipment.

The 4/Sixty-Eight remained in production until October 1961, when it was succeeded by the 4/Seventy-Two (ADO.38) model, which featured several modifications, including a larger engine of 1622cc. For this model see page 56 onwards.

IDENTIFICATION

Model identification

Only one model, the saloon, was produced. The model identification symbol is R/HS1. This symbol also acts as prefix for the car serial number. If the car is equipped with left-hand drive, the letter 'L' is added to the symbol.

Explanation of model identification symbol:

R = Riley.
H = Engine group (1400–1999cc cubic capacity).
S = Four-door saloon.
1 = Model series, used to record major changes.

Chassis serial number or car number

This number is located on a plate mounted on the scuttle, in the engine compartment. The number is prefixed by the model identification symbol, as detailed under *Model identification*.

Chassis serial numbers (approximate, and for guidance only)

April 1959 (starting):	R/HS1 101
January 1960:	R/HS1 4250
May 1960:	R/HS1 7000
January 1961:	R/HS1 9600
October 1961 (final):	R/HS1 11084

Engine number

The engine number is stamped on a metal plate, which is fixed to the cylinder block, on the right-hand side. The number is prefixed by the engine type symbol, e.g. 15RB–U–H1234.

Explanation of engine number prefix/type symbol:

15 = 1500cc cubic capacity.
R = Riley.
B = Variation of engine type (A–Z).
U = Central floor gear change.
H = High compression ratio (8·3 : 1).

NOTE: Replacement engines have an engine number with a suffix indicating the cylinder bore oversize and the crankshaft journal undersize. *Example:* 15RB–U–H1234FF, which indicates a bore of 0·030in oversize and a crankshaft of 0·030in undersize.

Gearbox number

This number is stamped to the left of the oil-level dipstick and filler plug, on top of the gearbox.

Rear axle number

The rear axle identification number is stamped on the rear of the axle tube, adjacent to the left-hand rebound rubber.

Body number

The body number is stamped on a plate which is secured to the front right-hand wing valance, in the engine compartment.

MODIFICATIONS

NOTE: For modifications of a purely technical nature see *Repair Data* (page 17 onwards).

1959: Model introduced in April. During this year no major modifications were made.

1960: In March the number-plate illumination was improved (two bulbs).

In May new ashtrays with stubbing plates were introduced. At chassis serial number R/HS1–6995 several engine modifications were introduced, viz.: reshaped combustion chambers, modified camshaft, longer oil-level dipstick.

1961: No modifications of importance. The model was discontinued in October of this year, and replaced by the new 4/Seventy-Two (ADO.38) saloon, featuring larger engine (1·6 litre) with increased power, wider track and longer wheelbase, availability of Borg-Warner '35' automatic transmission, etc.

PRICES

U K prices are ex-works home retail prices, including heater and windscreen washer.

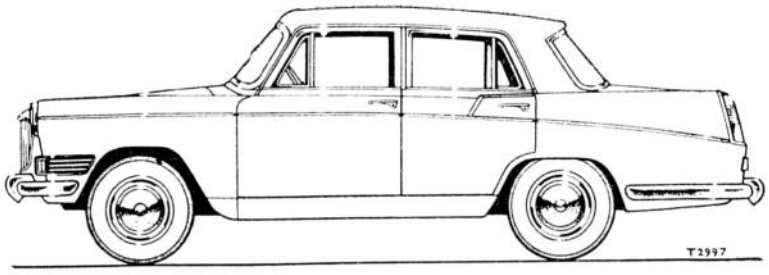


Fig. 3. Riley 4/Sixty-Eight Saloon, model R/HS1

	Basic	*Total*
UK April 1959:	£725	£1028.4.2
September 1960:	£725	£1028.4.2
April 1961:	£725	£1028.4.2*
Optional extras:		
Duo-tone paintwork, April 1959:	£12.10.0	£17.4.2
September 1960:	£12.10.0	£17.4.2
April 1961:	£12.10.0	£17.4.2*
Radio		
Heater (according to export markets)		
Rimbellishers		

*As from 26th July, 1961, these prices were subject to a Special Surcharge of 10 per cent Purchase Tax.

INSTRUMENTS AND CONTROLS

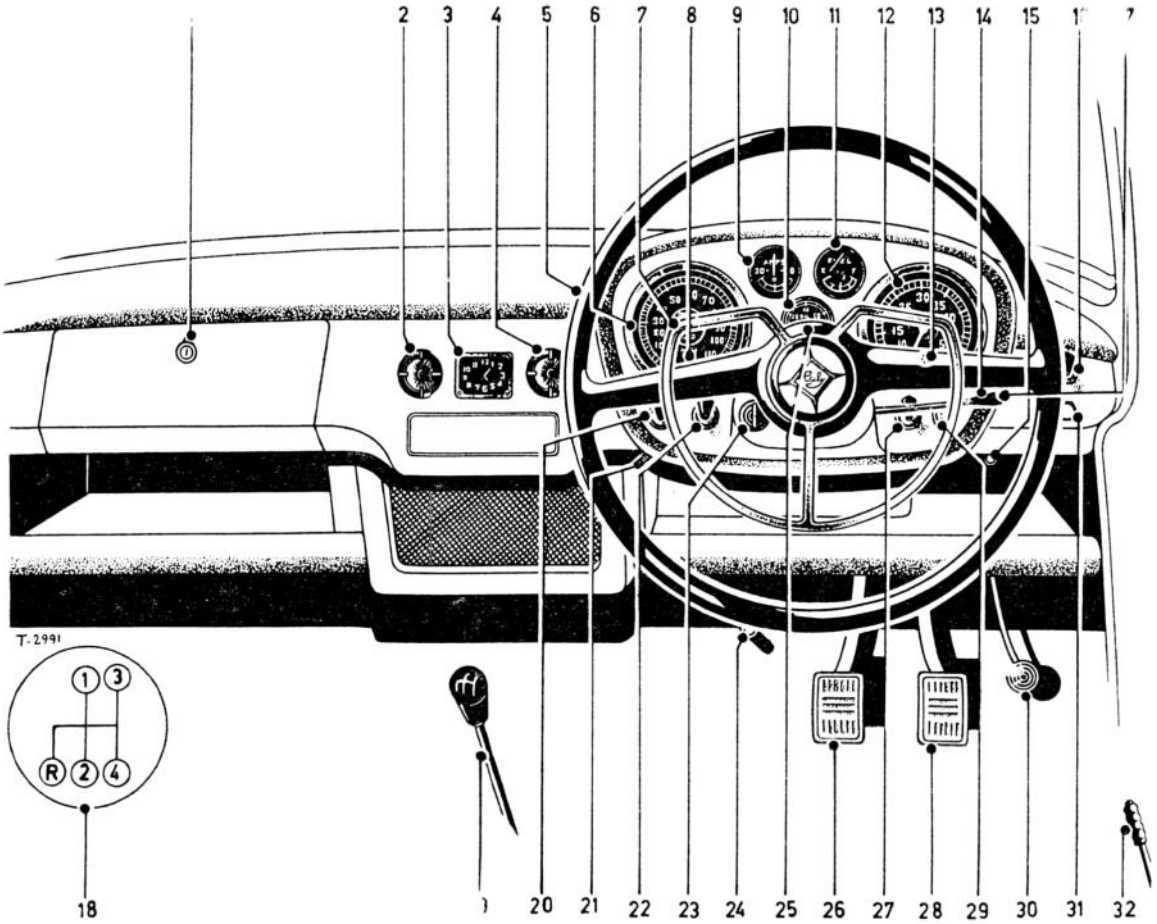


Fig. 4a. Instruments and controls, right-hand drive

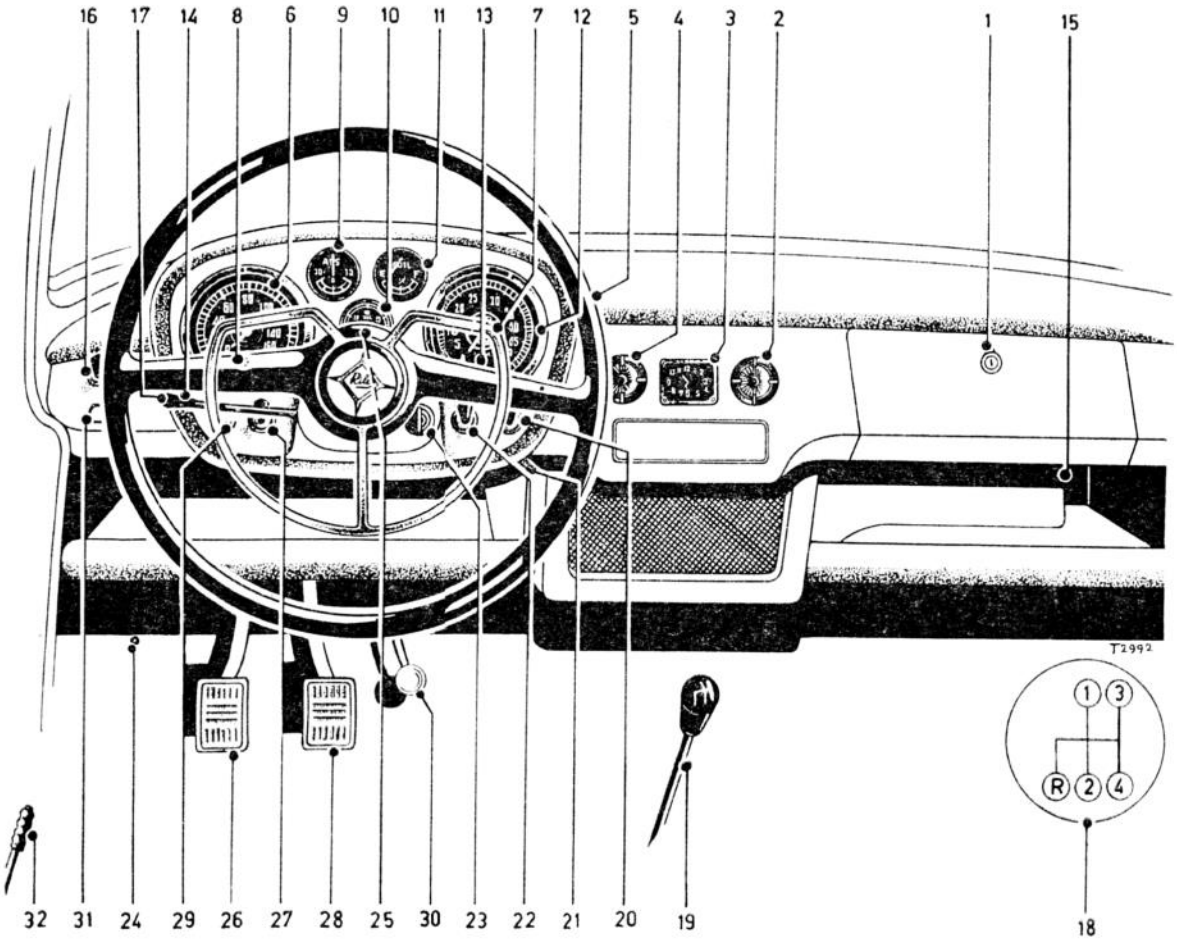


Fig. 4b. Instruments and controls, left-hand drive

1 Glove box
2 Heater temperature control (air control when heater is not fitted)
3 Electric clock
4 Heater air control
5 Steering wheel (three turns from lock to lock)
6 Speedometer with mileage recorder (trip and total)
7 Horn ring
8 Main beam warning light
9 Ammeter
10 Oil pressure gauge
11 Fuel gauge
12 Rev counter (max. 5500 rpm)
13 Ignition warning light
14 Direction-indicator switch
15 Bonnet release knob
16 Light switch
17 Direction-indicator warning light
18 Gear pattern
19 Gear lever
20 Windscreen-wiper switch
21 Trip recorder resetting knob
22 Heater fan switch
23 Ignition/starter switch
24 Dimmer switch
25 Water temperature gauge
26 Clutch pedal
27 Panel light switch
28 Brake pedal
29 Choke (mixture control)
30 Accelerator pedal
31 Windscreen washer
32 Parking brake

ELECTRICAL EQUIPMENT

Twelve-volt 58 Ah battery, located in the engine compartment, positive (+) terminal connected to earth. Built-in 7 in cowled headlamps. Foot-operated dimmer switch. Separate rectangular sidelamp/flasher units. Twin stop/taillamps and reflectors. Reversing lamp incorporated in boot lid grip. Number-plate lamp, which illuminates luggage compartment when open. Interior lamps, operated either manually or by courtesy switches on front door pillars. Amber flashing direction-indicators; self-cancelling switch with warning light, mounted on steering column. Twin electric self-parking windscreen-wipers. Combined ignition and starter switch. Warning lights for ignition/generator and headlamp main beam. Indirect instrument illumination with separate switch. Twin windtone horns. Electric (SU type PD) fuel pump. Electric clock. Radio and heater optional (heater is standard equipment on home market model).

BODY

Four/five-seater, four-door, four-light saloon of unit construction, designed by Pininfarina. Fully-stressed skin. Facia panel and door cappings in polished walnut veneer. Sponge rubber protecting rail above facia panel. Instruments placed in front of driver. Lockable glovebox on passenger's side. Parcel tray, with loudspeaker housing in centre, underneath facia. Bucket-type front seats with 5 in adjustment. Folding armrest in rear seat and armrests on rear doors. Doors have concealed hinges at leading edges, push-button outside handles; both front doors lockable from outside but arrangement is such that it is impossible to lock the car should the key be left inside; child-proof safety locks fitted to all doors. Wrap-around windscreen and rear window. Windscreen-washer. Safety glass all round.

Fig. 5. Riley 4/Sixty-Eight, three-quarter rear view

Four winding windows with hinged ventilating panels, all of toughened glass with stainless surrounds. Pile carpets with felt underlay. Two sunvisors. Four ashtrays. Leather upholstery with leather cloth on non-wearing parts. Foam-rubber seat cushions. Nineteen cu ft luggage compartment with counterbalanced lockable lid.

Spare wheel carried in tray below luggage compartment, lowered by means of starting handle.

Bonnet is locked from inside car; safety catch and telescopic stay.

Chromium-plated wrap-around bumpers, with overriders, front and rear.

COLOURS

1959:

Single-tone:

Leaf Green with green upholstery and green carpet.
Birch Grey with crimson upholstery and carpet, or blue upholstery and grey carpet.
Damask Red with crimson upholstery and carpet.

Duo-tone:

Yukon Grey and Birch Grey with crimson upholstery and carpet.
Damask Red and Old English White with crimson upholstery and carpet.
Connaught Green and Leaf Green with green upholstery and carpet.

1960–1961:

Single-tone:

Black with maroon upholstery and mushroom carpet.
Black with beige upholstery and green mottle carpet.
Porcelain Green with beige upholstery and green mottle carpet.
Old English White with blue upholstery and blue mottle carpet.
Smoke Grey with blue upholstery and blue mottle carpet.
Clipper Blue with beige upholstery and blue mottle carpet.
Maroon with beige upholstery and mushroom carpet.
Whitehall Beige with maroon upholstery and mushroom carpet.

Duo-tone:

Black and Old English White with maroon upholstery and mushroom carpet.
Maroon and Whitehall Beige with maroon upholstery and mushroom carpet.
Clipper Blue and Smoke Grey with beige upholstery and blue mottle carpet.
Smoke Grey and Old English White with blue upholstery and blue mottle carpet.

Dimensions

EXTERIOR DIMENSIONS

		(*inches*)
1	Wheel base	99 3/16
2	Track, front	48 9/16
3	Track, rear	49⅞
4	Total length	178
5	Total width	63½
6	Total height	59¾
7	Ground clearance	6½
8	Turning circle	37½ ft
15	Front door width	38½
16	Rear door width	33

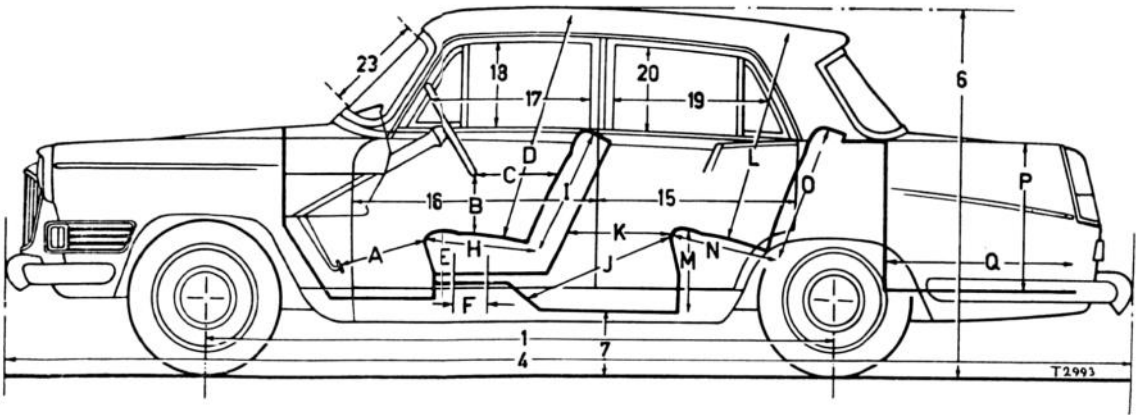


Fig. 6. Dimensions

		(inches)
17	Front door window width	23
18	Front door window height	$13\frac{1}{2}$
19	Rear door window width	29
20	Rear door window height	13
23	Windscreen height	17
	Rear window height	$14\frac{1}{2}$

INTERIOR DIMENSIONS

A	Pedal to front seat (max.)	19
B	Steering wheel to seat	6
C	Steering wheel to front seat back-rest	17
D	Height over front seat	36
E	Height of front seat	$13\frac{1}{2}$
F	Maximum adjustment of front seat	5
G	Pedal to front seat back-rest	37
H	Depth of front seat	18
I	Height of front seat back-rest	20
J	Leg-room, rear seat	23
K	Front seat back-rest to rear seat (max.)	14
L	Height over rear seat	35
M	Height of rear seat	14
N	Depth of rear seat	18
O	Height of rear seat back-rest	23
P	Height of luggage compartment	$20\frac{1}{2}$
Q	Depth of luggage compartment	$28\frac{1}{2}$
W	Width of front seat	2×21
X	Width of rear seat	55
Z	Width of luggage compartment	57

WEIGHTS

		(*lb*)
(1)	Complete car, dry weight	2280
(2)	Complete car, ready for use	2470
(3)	Complete car, ready for use, with two passengers	2740
(4)	Complete car, ready for use, with four passengers	3010
(7)	Ratio of load, front/rear, ready for use	54/46

Technical Specifications

Figures in the following tables are based on measurements and weights according to the Imperial system, as used in Great Britain, i.e. the Imperial Gallon and Long Ton.

Figures in parentheses represent measurements and weights according to the American system, i.e. the US gallon and Short Ton.

ENGINE

(1) Type:	water-cooled, four-stroke petrol engine in line with pushrod operated overhead valves
(2) Number of cylinders:	4
(3) Bore and stroke:	2·875×3·5in 73·025×88·9mm
(4) Piston displacement:	90·88cu in 1489cc
(5) Compression ratio:	8·3 : 1
(6) Stroke/bore ratio:	1·22
(7) Total piston area:	25·97sq in

PERFORMANCE

(1) Maximum bhp gross:	66·5 at 5200rpm
net:	60 at 4800rpm
(2) Maximum torque:	82ft/lb at 2600rpm
(3) Brake mean effective pressure (bmep):	136lb/sq in at 2600rpm
(4) Compression pressure at cranking speed:	150lb/sq in
(5) Bhp per sq in piston area (net):	2·314
(6) Bhp per litre (net):	40·3
(7) Mean piston speed at 1000rpm:	582ft/min
at 5200rpm:	3026ft/min

SPECIFIC PERFORMANCE

(based on dry weight)

(1) Piston area per ton:	25·29 (22·58) sq in
(2) Litres per ton:	1·46 (1·30)
(3) Bhp per ton (net):	58·8 (52·5)
(4) Brake lining area per ton (brake lining area 146·6sq in):	143·7 (128·7) sq in
(5) lb/bhp (net):	38
(6) lb per cu in piston displacement:	25·08
lb per cc piston displacement:	1·53
(7) Theoretical road speed in top gear at 1000rpm:	16·6mph
(8) Theoretical road speed in top gear at 2500ft/min piston speed:	71mph

GEAR RATIOS

	Gearbox	*Overall*
First gear:	3·637 : 1	15·64 : 1
Second gear:	2·215 : 1	9·52 : 1

Third gear:	1·373 : 1	5·91 : 1
Top gear:	1·000 : 1	4·3 : 1
Reverse:	4·755 : 1	20·45 : 1

Rear axle ratio: 4·3 : 1

THEORETICAL ROAD SPEEDS

(Road speeds in mph; piston speeds in ft/min)

	rpm	*First gear*	*Second gear*	*Third gear*	*Top gear*	*Piston speed*
a	1000	4·57	7·5	12·1	16·6	582
b	2600	11·9	19·5	31·5	33·2	1513
c	5200	23·8	38·6	62·3	85·4	3026

b = rpm at maximum torque

c = rpm at maximum power

ROAD TEST

(1) **Maximum speed:** 88 mph

(2) **Cruising speed:** 60–70 mph

(3) **Cruising range:** approx. 250–300 miles

(4) **Speed in gears:**

	Maximum
First gear:	25
Second gear:	44
Third gear:	74
Top gear:	88

(5) **Acceleration times:**

0–30 mph through gears:	6·0 sec
0–40 mph through gears:	9·0 sec
0–50 mph through gears:	14·0 sec
0–60 mph through gears:	20·5 sec
0–70 mph through gears:	30·0 sec
0–80 mph through gears:	44·0 sec
Standing quarter mile:	21·5 sec

	in top gear	*in third gear*	*in second gear*
10–30 mph	11·5 sec	8·5 sec	5·1 sec
20–40 mph	12·0 sec	8·2 sec	5·5 sec
30–50 mph	13·0 sec	9·1 sec	—
40–60 mph	13·5 sec	9·5 sec	—
50–70 mph	19·8 sec	—	—
60–80 mph	27·5 sec	—	—

(6) **Brake efficiency:**
Mean retardation from 30 mph: 0·85 g with 70 lb pedal pressure, equivalent to 34 ft stopping distance.

(7) **Climbing power:**

Maximum gradient in top gear:	1 in 11·5 = 8·5% = 5°
Maximum gradient in third gear:	1 in 8 = 12·5% = 7°
Maximum gradient in second gear:	1 in 5 = 20% = 11·3°

(8) **Fuel consumption** (at constant speed in top gear on level):
30 mph — 35·0 mpg (29·1 mpg)
40 mph — 34·0 mpg (28·3 mpg)
50 mph — 30·5 mpg (25·4 mpg)
60 mph — 27·5 mpg (22·9 mpg)
70 mph — 23·2 mpg (19·3 mpg)
80 mph — 20·0 mpg (16·6 mpg)
Approximate normal range: 25–30 mpg

(9) **Speedometer correction:** Speedometer approx. 3% fast.

Lubrication and Maintenance

RUNNING-IN SPEEDS

During the first 500 miles do not exceed 45 mph in top gear or corresponding speeds in the lower gears.

The engine should never be overloaded, therefore change down to a lower gear in good time when necessary; allow the engine to operate at normal rpm and avoid fierce acceleration.

GENERAL DATA

Engine: Sump capacity (including filter): 7·5 Imp pints (9 US pints).
Oil viscosity, down to 32°F (0°C): SAE 30
32°F (0°C) to 10°F (—12°C): SAE 20W } or Multigrade
below 10°F (—12°C): SAE 10W
Oil dipstick: on right-hand side of engine.
Oil filler cap: on valve rocker cover.
Oil drain plug: on right-hand side of sump.

Change the oil when the engine is warm.

Flush the sump and replace the oil filter element every 12,000 miles.

Every 24,000 miles the sump and the oil pump pick-up strainer should be thoroughly cleaned.

Engine oil filter: The full-flow oil filter is situated on the right-hand side of the engine. The element must be renewed every 6,000 miles, i.e. at every second oil change. Do not disturb the element at other intervals.

BMC Part No. for element: 8G683 (AC AC32A, Fram 814 PL, Purolator (felt element) CE. 194 A, Tecalemit FG 2471).

Wash filter casing in petrol and dry it thoroughly. Renew seating washer if necessary. Fill casing up with engine oil before reinstallation, during which the head of the fixing bolt should be held firmly against the bottom of the casing.

The oil capacity of the filter is 1·25 Imp pints (1·5 US pints).

Oil-bath type air cleaner: The air cleaner should receive attention at 6000-mile intervals. Clean filter casing and gauze and renew oil. Top-up to level mark.

Cooling system: Pressurized cooling system. Water capacity 11·5 Imp pints (13·8 US pints). Extra for heater: 1 Imp pint (1·2 US pints). Care should be taken when removing the filler cap. A thermostat is fitted in the water outlet of the

cylinder head. The drain cock for the radiator is situated at the left-hand side of the radiator bottom tank; the drain cock for the cylinder block is located on the right-hand side of the engine, at the rear. Owing to the location of the heater it cannot be drained by these two drain cocks.

In winter, when freezing conditions are encountered, anti-freeze should be used, especially if a heater is fitted. Use at least 2½ Imp pints (3 US pints) of anti-freeze, which should be of the ethylene/glycol type incorporating the correct type of corrosion inhibitor.

The anti-freeze should conform to specifications B.S. 3151 and B.S. 3152. Do not use this solution in the windscreen-washer system.

Water pump: In order to lubricate the water pump, temporarily remove the plug from the pump housing. Lubricate sparingly with lithium-base multi-purpose grease. NOTE: This supersedes previous instructions regarding SAE 140 or 140 EP Gear Oil.

Fuel tank: The fuel tank is situated in front of the luggage compartment. The capacity is 10 Imp gallons (12 US gallons).

Gearbox: To reach the combined dipstick and filler plug, lift the floor covering on top of the gearbox and remove the rubber cover from the floor. Clean area around dipstick before removing it and top-up if necessary to 'high' mark on dipstick, with engine oil SAE 30.

The drain plug is at the bottom of the gearbox housing and the oil should be drained when the oil is warm.

Oil capacity: 4·5 Imp pints (5·4 US pints).

Rear axle/differential: The combined oil filler and level plug is located on the rear side of the axle housing. Clean area around plug before removing it and top-up if necessary to bottom of filler-plug aperture with gear oil SAE 90EP; below 10°F (—12°C) SAE 80 EP. Do not overfill, so after topping-up allow time for any surplus oil to run out should too much have been injected. The oil drain plug is at the bottom of the housing and the oil should be drained when the rear axle is warm.

Oil capacity: 2·25 Imp pints (2·7 US pints).

Steering gear: The steering gear is of the worm and peg type and has a filler plug on top of the steering box. Clean area around plug before removing it. Correct oil level is flush with bottom of filler hole. Top-up if necessary with gear oil SAE 90 EP; below 10°F (—12°C) SAE 80 EP.

Steering idler: Top-up if necessary with gear oil. Oil recommendation as for steering box. Clean area around filler plug before removing it.

Front wheel bearings: Periodically remove hub grease-retaining caps and repack hubs with lithium-base multi-purpose grease; partially fill grease-retaining caps. Do not overgrease.

Rear wheel bearings: The rear wheel bearings do not require maintenance.

Universal joints: Lubricate both nipples with low-pressure grease-gun filled with lithium-base multi-purpose grease.

Grease nipples: Fifteen grease nipples are fitted (apart from the two on the propeller shaft mentioned above) and their location is shown on the lubrication chart on page 15. Use lithium-base multi-purpose grease, or, alternatively, gear oil SAE 140 EP. Partly jack-up the front end of the vehicle when lubricating the king pins.

Carburettor dampers: Top-up the damper reservoirs periodically with SAE 20W engine oil to $\frac{1}{2}$in from the top of the piston rod.

Generator bearing: Add two or three drops of light engine oil to the generator bearing through the hole in the rear end of the bearing plate. Do not overlubricate.

Speedometer and rev counter drive: Every 12,000 miles the drive cables should be lubricated as follows. Disconnect drive cable at upper end and pull inner cable from outer casing. Sparingly grease inner cable with a light grease and wipe surplus grease from top 8in of cable. Do not overlubricate. To reassemble, thread inner cable into casing with a twisting motion. When engagement of union at driven end is felt, cable can be pushed fully in so that square end stands out about $\frac{3}{8}$in from outer casing. Reconnect to speedometer and rev counter.

Shock-absorbers: The shock-absorbers need periodical checking of the fluid level. In the case of the rear units this is more easily done after removing them. Thoroughly clean area around filler plug before removing it. Top-up with Armstrong Super (Thin) Fluid No. 624 (works recommendation). If this fluid is not available, a good-quality mineral oil conforming to specification SAE 20/20W may be used, but these alternatives are not suitable for operation at low temperatures.

Brake and clutch fluid reservoirs: These fluid reservoirs are located on the steering side of the engine compartment. They should be topped-up to $\frac{1}{2}$in below the bottom of the filler cap if necessary. Use Castrol Girling Fluid (works recommendation) or, alternatively, fluid conforming to specification SAE 70 R3.

TYRE PRESSURES (Cold)

	lb/sq in
All conditions, front:	23
rear:	25

ROUTINE MAINTENANCE

Daily: Check engine oil level, radiator, fuel tank, tyres and lights.
Weekly: Check battery electrolyte and tyre pressures.

Running-in period:
After the first 500 miles: drain oil from engine sump, gearbox and rear axle/differential; refill with fresh oil. Free 500-mile service by dealer.

A. Every 1000 miles:

*A*1 to *A*6 incl. Lubricate with grease or oil gun:
*A*1 King pins (four nipples).
*A*2 Suspension outer fulcrum pins (two nipples).
*A*3 Steering linkage (six nipples).
*A*4 Universal joints (two nipples).
*A*5 Parking brake cable (one nipple).
*A*6 Rear spring shackles (two nipples).
*A*7 Gearbox: check oil level, top-up if necessary.
*A*8 Rear axle/differential: check oil level, top-up if necessary.
*A*9 Steering gear: check oil level, top-up if necessary.
*A*10 Steering idler: check oil level, top-up if necessary.
*A*11 Carburettors: top-up damper reservoirs. Lubricate carburettor controls.
*A*12 Brake and clutch master cylinder reservoirs: check fluid level, top-up with brake fluid if necessary.

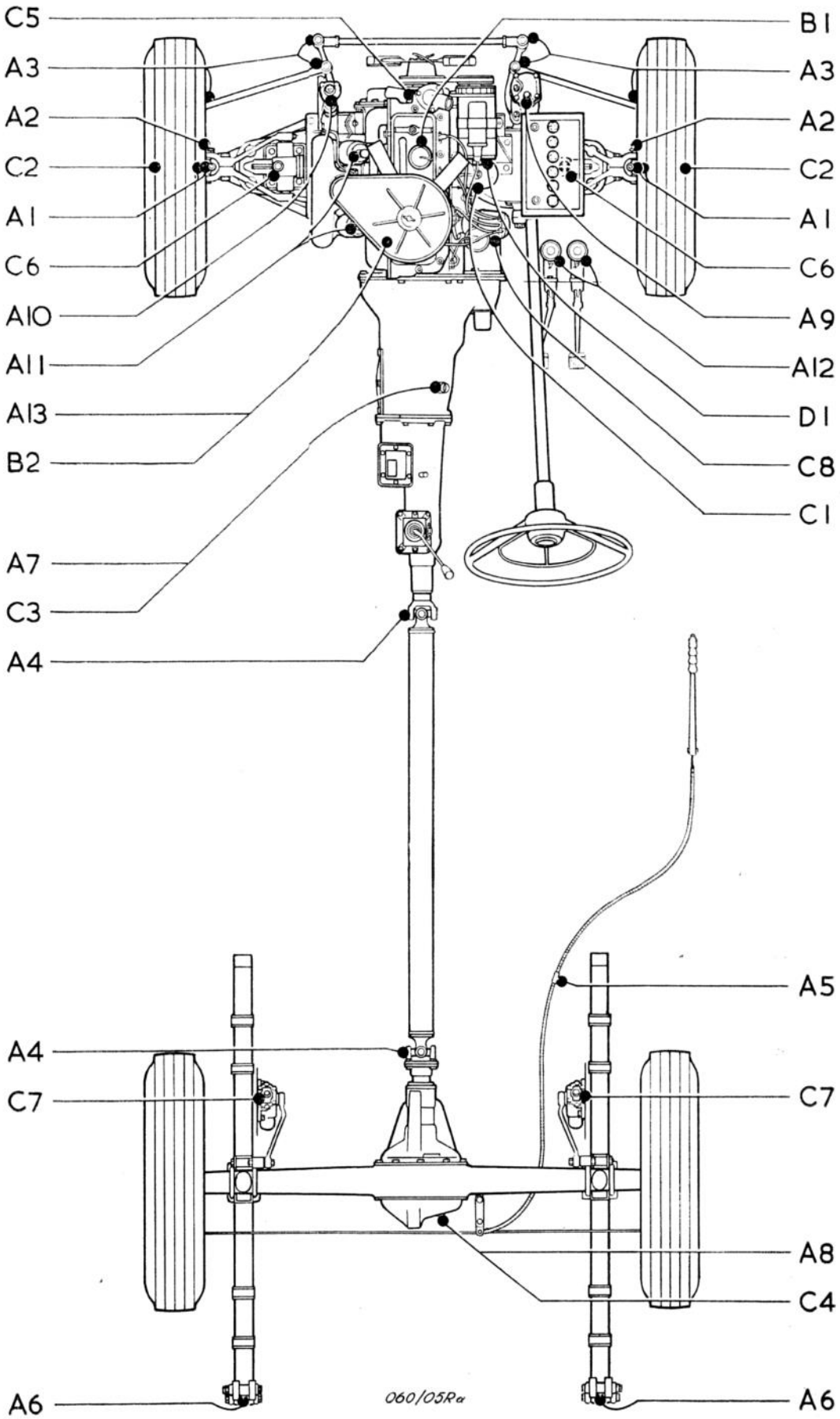


Fig. 7. Lubrication chart

*A*13 Air-cleaner, oil-bath type: check oil level, top-up if necessary.
Brakes: check pedal adjustment; inspect brake lines and pipes.
Shock-absorbers: check for leaks.
Battery: check specific gravity of electrolyte.
Wheels: check wheel nuts for tightness.

B. Every 3,000 miles:

*B*1 Engine sump: drain and refill.

*B*2 Air-cleaner, oil-bath type: clean and refill with fresh oil. Clean wire gauze mesh.
Bodywork: lubricate door hinges and locks, bonnet lock, safety catches and operating mechanism with engine oil. Check opening and closing of doors; inject oil through key slots, through oil holes in locks and around push-buttons. Lightly smear dovetails and striking plates with a suitable grease.
Generator drive belt: check tension.
Spark plugs: clean and adjust (0·025 in).
Clutch: check pedal free movement, bleed hydraulic system if necessary.
Brakes: check, adjust if necessary.
Wheels: change round, check tyre pressures.

C. Every 6,000 miles:

*C*1 Engine oil filter: clean bowl and renew element.

*C*2 Front wheel hub caps: clean and refill with wheel bearing grease. Check for leakage at 3,000 miles intervals.

*C*3 Gearbox: drain when hot and refill.

*C*4 Rear axle/differential: drain when hot and refill.

*C*5 Water pump: see current recommendation under *D*.

*C*6 Front shock-absorbers: check fluid level, top-up if necessary.

*C*7 Rear shock-absorbers: check fluid level, top-up if necessary.

*C*8 Ignition distributor: remove rotor and apply a few drops of engine oil on screw thus exposed, one drop on breaker-arm pivot and a few drops on automatic advance mechanism through gap round cam spindle. Lightly smear cam profile with grease or oil.
Engine: check valve rocker clearances, adjust if necessary.
Rear road springs: tighten seat bolts.
Bodywork: check door hinges, locks, and striker plate securing screws.

D. Every 12,000 miles:

*D*1 Generator: lubricate rear bearing with two drops of engine oil. (Current recommendation: every 6,000 miles).
Water pump—current recommendation: lubricate with grease; see page 13.
Engine sump: drain, flush out with flushing oil and refill.
Carburettors: remove suction chambers and pistons, clean, reassemble and top-up; remove, clean and refit float chambers.
Speedometer and rev counter drive: lubricate inner cables with light grease.
Spark plugs: renew.
Steering and suspension: check moving parts for wear.
Cooling system: drain, flush-out and refill.
Headlamps: check beam setting, adjust if necessary.

E. Every 24,000 miles:

Engine: remove sump and oil-pump pick-up strainer, clean and reassemble, refill with fresh oil.

Repair Data

Repairs are best performed by authorized dealers, who possess the necessary experience and special equipment. These data have been compiled from the official workshop manuals and other manufacturer's information, which were supplied through the kind co-operation of the British Motor Corporation Ltd.

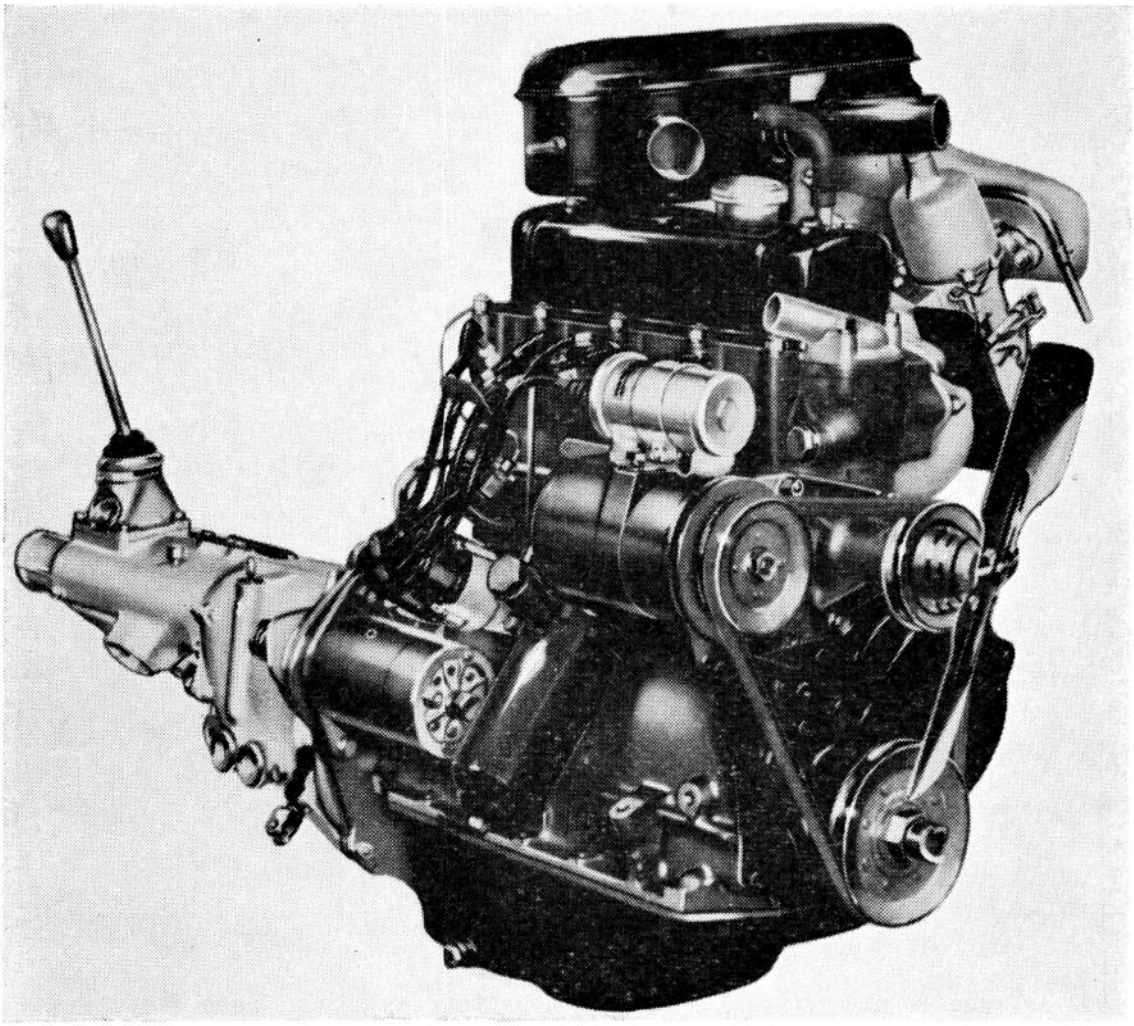


Fig. 8a. Engine unit, general view, right-hand side

ENGINE

Engine: BMC Series 'B'. The engine is built in unit with clutch and gearbox. The engine can be removed as a single unit or together with the front suspension unit.

Engine removal (as a single unit):

(1) Remove the bonnet, disconnect the battery and remove the battery together with the battery support.
Drain engine and gearbox.

(2) Remove the air-cleaner and the carburettors. Remove the radiator and disconnect the electrical leads at the wheel housings. Remove the radiator bridge piece.

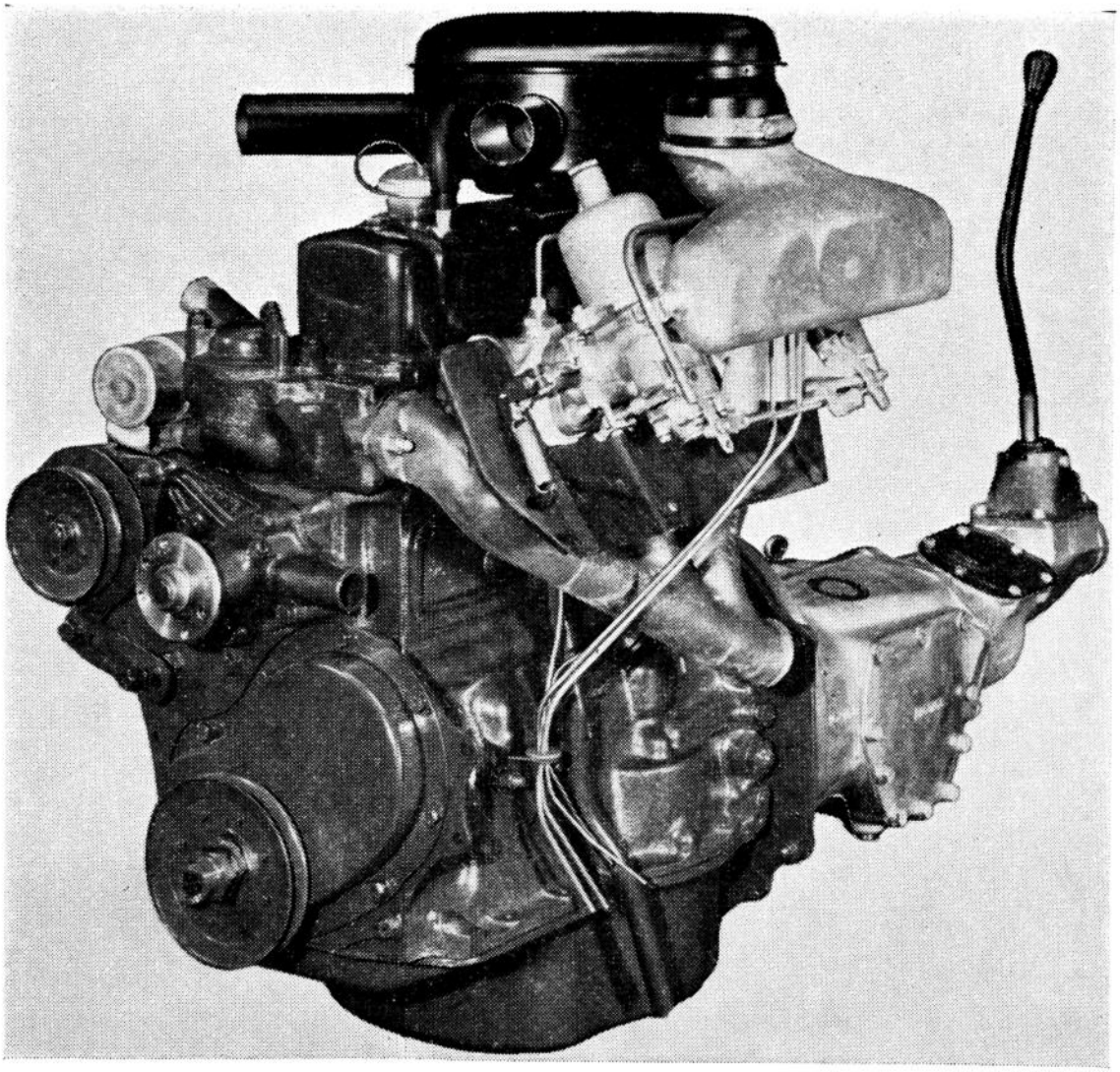


Fig. 8b. Engine unit, general view, left-hand side

(3) Disconnect the oil pressure pipe from the adaptor and remove the vacuum pipe from the support clip under the cylinder head nut.

Remove the heater hoses.

(4) Disconnect the wiring from the starter motor, generator, distributor and coil. Disconnect the rev counter drive cable and the thermometer connection. Release the exhaust pipe from the manifold.

(5) Fold back the rubber cover around the gear lever, remove the circlip from the remote control housing and withdraw the gear lever.

(6) Remove the clutch actuating cylinder and tie it up so that it is out of the way. Disconnect the speedometer drive cable from the gearbox.

(7) Mark the rear universal joint flange and pinion drive flange, and disconnect the propeller shaft.

Hang the engine in a suitable tackle and take engine weight.

(8) Unscrew the engine front mounting bolts and nuts and remove the engine front mountings.

Support the gearbox with a jack and remove the rear cross-member from the body floor.

(9) Remove the engine tie-bar and unscrew the bolts securing the gearbox mounting rubbers to the cross-member.

Remove the jack from under the car. Carefully hoist the engine and remove it from the car. Be careful not to foul the extension housing.

Reinstallation is done in the reverse order of removal.

Measure the gap between the engine and the mountings; install shims as required and tighten the nuts evenly.

Engine removal (together with suspension unit):

(1) Drain the cooling system, disconnect and remove the battery and the battery support. Remove the radiator and heater hoses.

(2) Disconnect the primary lead from the distributor, take off the distributor head and remove the rotor to avoid it getting lost. Disconnect the wiring from the coil, generator and starter motor.

(3) Unscrew the oil pressure pipe union and disconnect the lead from the water temperature transmitter unit.

Remove the throttle and choke cables. Disconnect the fuel pipe from the carburettors. Disconnect the rev counter cable.

(4) Release the exhaust pipe from the manifold. Remove the clutch actuating cylinder.

(5) Remove the parking brake connection from its bracket. Disconnect the speedometer drive cable from the gearbox. Mark the rear universal joint flange and pinion drive flange and disconnect the propeller shaft.

(6) Disconnect the brake lines from the connections at the wheel housings. Remove the track-rods from the respective levers.

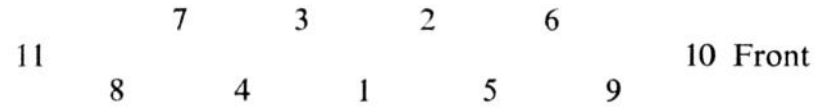
(7) Support the gearbox with a floor jack. Unscrew the four nuts securing the suspension unit to the body (two nuts on each side). Unscrew the bolts securing the gearbox cross-member to the body.

(8) Attach suitable tackle to the front of the car and raise the body. The complete suspension unit, with engine and gearbox, can now be wheeled away from under the car.

Reinstallation is done in the reverse order of removal.

Engine compression: Compression pressure on warm engine at cranking speed with wide-open throttle should be approximately 150 lb/sq in.

Cylinder head: Cast-iron cylinder head. Unscrew and tighten the cylinder head nuts in the sequence given below. Tightening torque: 40 ft/lb.



The cylinder head nuts Nos. 7, 3, 2 and 6 also secure the rocker-shaft supports.

Cylinder-head gasket: The cylinder-head gasket is marked 'Top' and 'Front' to facilitate installation.

Cylinder block: Cast-iron cylinder block, integral with the upper half of the crankcase. No separate cylinder liners are used, but when the cylinder bores are unfit for the installation of 0·040 in oversize pistons, dry liners can be pressed in.

Standard bore diameter: 2·875 in.

Cylinder liners: The cylinder block must be bored-out to the dimensions given under *Specifications*, to provide the necessary interference fit. When the liners are pressed

into the block, the pressure must be released several times during the first inch. This will allow the liner to line-up properly. The cylinder liners must be installed with the chamfered end downards. Press the liners in until the upper edge is flush with the cylinder block mating face.

Specifications:

Bore diameter in cylinder block:	3·0165–3·017 in
Outer diameter of liner:	3·0185–3·01925 in
Inner diameter of liner, pressed in and reamed:	2·8745–2·8760 in

Inlet and exhaust mainifold: Separate one-piece inlet and exhaust manifolds with a pair of hot-spot areas for pre-heating of the mixture.

Engine sump: The removable engine sump is a steel pressing, having an uninterrupted mating face.

Crankcase ventilation: Positive crankcase ventilation by means of a connection between the valve-rocker cover and the air-cleaner. The air enters the engine via a pipe on the left-hand side of the cylinder block.

Pistons: Anodized aluminium alloy, solid skirt, hollow crown pistons equipped with three compression rings and one coil control ring. The crown of the piston is marked 'Front'.

Oversize pistons are identified by a number, enclosed in an ellipse. The number on the piston indicates the actual bore size to which it must be fitted.

Always stamp the size of the piston on the cylinder block mating face adjacent to the cylinder bore, whenever pistons differing in size from those removed, are installed.

The pistons can be removed upwards from the cylinder block.

Piston diameter is measured at bottom of skirt, at right angles to the piston pin.

Specifications:

Standard diameter:	2·8757–2·8760 in
First oversize:	2·8857–2·8860 in
Second oversize:	2·8957–2·8960 in
Third oversize:	2·9057–2·9060 in
Fourth oversize:	2·9157–2·9160 in
Piston clearance at top of skirt:	0·0035–0·0042 in
Piston clearance at bottom of skirt:	0·0017–0·0023 in

Piston rings: Three compression rings and one oil control ring are fitted above the piston pin. The top compression ring is plain, the others are tapered and must be installed with the side marked 'T' upwards. When installing the piston rings, make sure that the ring gaps are equally spaced around the piston circumference.

Specifications:

Height of compression rings:	0·0615–0·0625 in
Thickness of compression rings:	0·119–0·126 in
Fitted gap:	0·008–0·013 in
Clearance in groove:	0·0015–0·0035 in
Height of oil control ring:	0·1552–0·1562 in
Thickness of oil control ring:	0·119–0·126 in
Fitted gap:	0·008–0·013 in
Clearance in groove:	0·0018–0·0038 in

Piston pins: The hollow steel piston pins are clamped in the connecting-rod small

ends. The piston pins should be a hand-push fit through the piston; this can be checked by holding the piston and connecting rod assembly in a horizontal position. The connecting rod should turn the piston pin by its own weight.

NOTE: When, during dismantling or reassembly, the piston-pin clamp bolt is loosened or tightened, it is essential to clamp the piston pin in a vice by means of the special clamping plugs which are available for this purpose. In the absence of these clamping plugs, a steel rod may be clamped in a vice and the hollow piston pin slid over it.

On no account should the connecting rod be clamped in a vice when the bolt is loosened or tightened, since such practice will always result in distorting the connecting rod.

Specifications:

Length of piston pin:	2·27125–2·2809 in
Outer diameter:	0·6869–0·6871 in
Fit in piston:	0·0001–0·00035 in
Fit in connecting rod:	0·0001–0·0006 in

Connecting rods: The connecting rods are steel forgings of I-beam section, equipped with replaceable steel-backed bearing shells. Connecting rods, bearing caps and shells should never be filed or scraped.

The connecting rods are numbered 1 to 4 from front to rear; the big ends of the connecting rods are off-set; the wide side of the numbers 1 and 3 connecting rods face the rear; those of numbers 2 and 4 connecting rods face the front.

When reinstalling the connecting-rod and piston assemblies, take good note of the following:

The number stamped on the connecting rod and bearing cap must correspond with the cylinder bore in which the piston is to be installed; the bearing shell locating notches in cap and rod must be on the same side and the oil squirt hole must be towards the thrust side of the engine, i.e. must be facing away from the camshaft. Tighten the piston-pin clamp nut to 25 ft/lb.

Specifications:

Length, centre to centre:	6·448–6·502 in
Axial clearance:	0·008–0·012 in
Radial clearance:	0·0016–0·0031 in

Connecting-rod big-end bearings: Thin-wall, steel-backed, lead-bronze or lead-indium plated bearing shells. The bearing caps and shells should on no account be filed or scraped.

Bearing shells are available in standard size and in 0·010, 0·020, 0·030 and 0·040 in undersize.

Tighten the big-end bearing cap bolts to 35 ft/lb.

Crankshaft: Forged-steel crankshaft with integral counterweights, running in three main bearings. End-float is controlled by semi-circular thrust washers on both sides of the centre main bearing. The oil grooves in these thrust washers must face outwards.

Specifications:

Standard journal diameter:	2·0005–2·001 in
Minimum regrind diameter:	1·9605–1·961 in
Crank pin diameter:	1·8759–1·8764 in
Minimum regrind diameter:	1·8358–1·8364 in
Crankshaft end-float:	0·002–0·003 in

Main bearings: Replaceable thin-wall, steel-backed, white metal bearing shells. The bearing caps must never be filed or scraped. Each main bearing cap is stamped with a number, corresponding with the number stamped on the web near each bearing. The horizontal joint faces of the rear main bearing cap must be lightly smeared with jointing compound to ensure a perfect oil-seal when the cap is bolted down. Tighten the main bearing cap bolts to 70ft/lb.

Specifications:

Length of bearing caps:	1·375in
Axial clearance:	0·0005–0·002in

Flywheel: The flywheel is bolted on to the crankshaft rear flange. The starter ring gear is shrunk on. A new starter ring gear should be heated to 300–400°C (575–752°F) before it is placed on the flywheel.

To facilitate the reinstallation of the flywheel, the crankshaft rear flange is stamped with a timing mark, which should be in line with the timing mark on the flywheel.

Tighten the flywheel bolts to 35–40ft/lb.

Maximum allowable run-out of clutch surface: 0·003in

Camshaft: The camshaft is situated in the left-hand side of the cylinder block and runs in three bearings. Camshaft end-float is taken by a thrust plate behind the camshaft sprocket. From chassis number R/HS1–6995 a new camshaft, having a modified cam profile, was fitted. Valve clearance and timing clearance remained unchanged. See also under *Valve timing*.

Specifications:

Diameter of front camshaft journal:	1·78875–1·78925in
Diameter of centre camshaft journal:	1·72875–1·72925in
Diameter of rear camshaft journal:	1·62275–1·62325in
Camshaft end-float:	0·003–0·007in

Camshaft bearings: The camshaft runs in three thin-wall, steel-backed, white metal bearing bushes. To renew the bearing bushes, the use of a special removing and replacing tool is strongly recommended.

Specifications:

Inner diameter of front bearing, pressed in and reamed:	1·790in
Inner diameter of centre bearing, pressed in and reamed:	1·730in
Inner diameter of rear bearing, pressed in and reamed:	1·624in
Radial clearance:	0·001–0·002in

Camshaft drive: The camshaft is driven by means of a duplex roller chain, which is kept at the right tension by means of a spring-loaded rubber tensioner. To free the tensioner from spring pressure, the bottom plug is removed and an $\frac{1}{8}$in Allen wrench inserted.

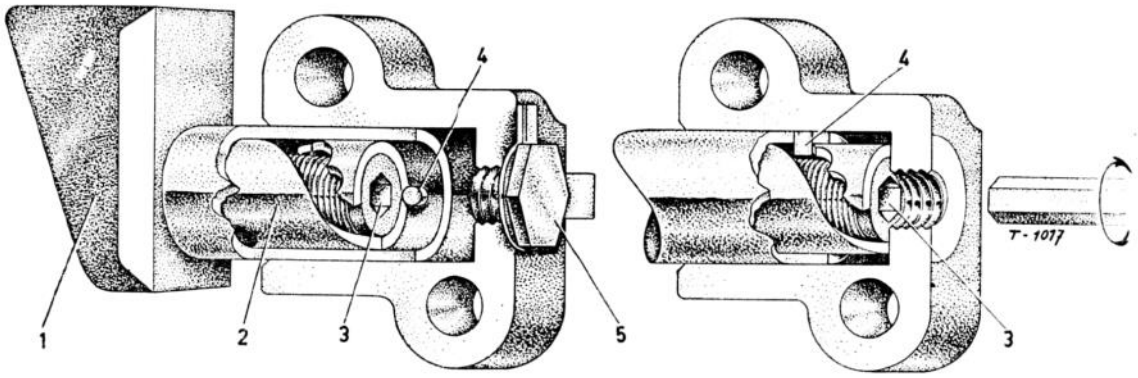
Turn the wrench in a clockwise direction, until the synthetic rubber slipper is free (between one half and one full turn).

The tensioner is released for operation by turning the plunger in a clockwise direction, until the slipper moves against the chain.

Never turn the wrench in an anti-clockwise direction or force the slipper head on to the chain by external pressure.

When reinstalling the camshaft drive, make sure the sprockets are properly

aligned. If necessary, align the sprockets by varying the number of shims behind the crankshaft sprocket. The timing marks should be in line and towards each other.



1 Rubber pad
2 Sleeve with non-return ratchet
3 Sleeve retractor
4 Stop pin
5 Plug

Fig. 9. Timing chain tensioner

Specifications:

Chain pitch:	$\frac{3}{8}$ in
Number of links:	52
Number of teeth on crankshaft sprocket:	20
Number of teeth on camshaft sprocket:	40

Valve timing: Valve timing must be checked with a theoretical valve clearance of 0·021 in.

		*Later models**
Inlet valve opens:	5° BTDC	TDC
Inlet valve closes:	45° ABDC	50° ABDC
Exhaust valve opens:	40° BBDC	35° BBDC
Exhaust valve closes:	10° ATDC	15° ATDC

Valve clearance: The valve clearance is adjusted when the engine is hot.

Valve clearance for timing:	0·021 in
Running valve clearance:	0·015 in

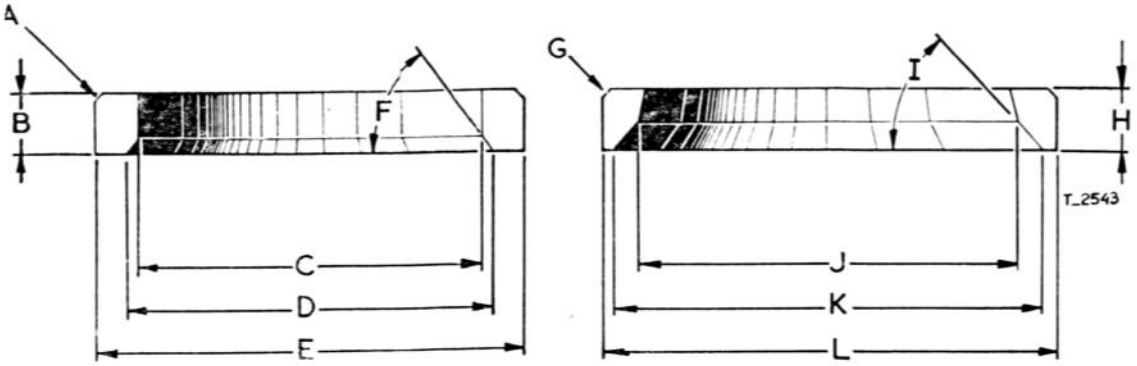
Valves: Overhead valves, operated by means of push-rods and rockers. The valve-keepers are of the split cotter type. When replacing the valves, make sure that the new packing rings are correctly located in the bottom of the cotter groove. Valve material, inlet: Silchrome 1, exhaust XB.

Specifications:

Valve head diameter,	inlet:	1·500–1·505 in
	exhaust:	1·281–1·286 in
Valve stem diameter,	inlet:	0·3422–0·3427 in
	exhaust:	0·34175–0·34225 in
Valve lift:		0·360 in
Clearance in guide,	inlet:	0·0015–0·0025 in
	exhaust:	0·002–0·003 in

*See also under *Camshaft*.

Valve seats: The valve seats are integral with the cylinder head. If it should be necessary during an engine overhaul to install new valve seats, the cylinder head must be machined to the dimensions given in Fig. 10.



A	Maximum radius: 0·015 in	exhaust	G	Maximum radius: 0·015 in	inlet
B	0·186–0·188 in		H	0·186–0·188 in	
C	1·165–1·175 in		I	45°	
D	1·268–1·288 in		J	1·302–1·322 in	
E	1·437–1·438 in		K	1·487–1·507 in	
F	45°		L	1·530–1·531 in	

Fig. 10. Valve seat machined dimensions

Valve springs: Double valve springs; the valve spring keepers are of the split cotter type.

Specifications:

Free length inner spring, inlet and exhaust:	1 31/32 in
Free length outer spring, inlet and exhaust:	2 3/64 in
Fitted length inner spring, inlet and exhaust:	1 7/16 in
Fitted length outer spring, inlet and exhaust:	1 9/16 in
Number of active coils, inner spring:	$6\frac{1}{2}$
Number of active coils, outer spring:	$4\frac{1}{2}$
Spring pressure, inner spring, valve opened:	50 lb
Spring pressure, inner spring, valve closed:	30 lb plus or minus 2 lb
Spring pressure, outer spring, valve opened:	105 lb
Spring pressure, outer spring valve closed:	60·5 lb plus or minus 2 lb

Valve guides: Cast-iron, removable valve guides.

If it is necessary to replace the valve guides, the old ones must be driven out towards the combustion chamber.

The new valve guides must be pressed in from the top, the inlet valve guides with the largest chamfer at the top, the exhaust valve guides with the counterbored end to the bottom. The valve guides must protrude 0·625 in above the machined surface of the valve spring seats.

Specifications:

Length, inlet and exhaust:	$1\frac{7}{8}$ in
Outer diameter, inlet and exhaust:	0·5635–0·5640 in
Inner diameter, inlet and exhaust:	0·34425–0·34475 in

Valve tappets: Valve tappets of the 'barrel type'. New tappets should be fitted by selective assembly; they must just fall down their bores by their own weight when lightly lubricated.

Specifications:

Length:	2·293–2·303 in
Diameter:	0·81125–0·81175 in

Valve rockers: The valve rockers are assembled on a hollow rocker shaft, which rests in four supports on the cylinder head. The outer nuts of the rocker-shaft supports also serve to retain the cylinder head. It is therefore essential to drain the cooling system and to unscrew all the cylinder head nuts (engine cold) in the sequence given on page 19 before the valve-rocker assembly is removed.

To facilitate the removal and reinstallation of the valve rocker bushes, the use of tool 18G 226 is recommended.

When new bushes are pressed in, the split must be just above the oil hole in the rocker, on the adjusting screw side. Use a 0·093 in drill for the oil hole on the adjuster screw side and a 0·0785 in drill for the oil hole on the valve spring side. Plug the opening in the end of the rocker on the adjusting screw side. Ream the new bush to 0·6255–0·626 in.

Specifications:

Bore of rocker arms:	0·7485–0·7495 in
Rocker ratio:	1·4 : 1
Clearance of rockers on shaft:	0·0005–0·002 in
Outer diameter of rocker shaft:	0·624–0·625 in

Engine lubrication: Full-pressure lubrication by means of an oil pump of the eccentric rotor type. The oil enters the pump through a gauze screen; the oil is delivered via a pressure relief valve on the rear left-hand side of the cylinder block and an external pipe on the right-hand side of the cylinder block to a full-flow oil filter.

From the oil filter the oil is delivered to a high-pressure oil gallery from which the main bearings receive their oil.

The connecting-rod bearings are lubricated in the usual way; the second and third connecting-rod bearing receive their oil from the centre main bearing; the first and fourth connecting rod from the front and rear main bearing respectively. From the front main bearing oil is fed to the front camshaft bearing. A transverse drilling in the cylinder block feeds the oil from the front camshaft bearing to the timing chain tensioner, to lubricate the timing chain and sprockets. From the centre camshaft bearing oil is fed to a low-pressure oil gallery on the left-hand side of the engine. Oil from this gallery lubricates the oil-pump drive shaft.

The rear camshaft bearing is lubricated by oil from the rear main bearing. From the rear camshaft bearing, oil under reduced pressure is fed to the rear rocker-shaft support and the hollow valve rocker shaft. The valve rockers are provided with two oil holes, one squirt hole for the valve stem tip and the valve springs and one for the push-rod ball-cup. The oil flowing down from the cylinder head lubricates the push-rods and tappets.

The connecting-rod big-ends are drilled for additional cylinder-wall lubrication; the piston pins are lubricated by splash.

Oil pressure relief valve: At the rear left-hand side of the cylinder block a non-adjustable oil pressure relief valve is installed.

Specifications:

Free length of spring:	3·0 in
Fitted length of spring:	2·156 in
Fitted load:	16 lb

Oil pump: An eccentric-rotor type oil pump is mounted in the left-hand side of the crankcase and is driven by a short vertical shaft from the camshaft.

Oil pressure: The normal oil pressure with a warm engine is 75 lb/sq in, or 15 lb/sq in when idling.

Oil filter: A full-flow oil filter is mounted on the right-hand side of the cylinder block. The by-pass valve in the filter head is set to open at a pressure difference of 13–17 lb/sq in.
Filter element: see under *Lubrication and maintenance*.
Oil capacity: 1·25 Imp pints (1·4 US pints).

Ignition system: Ignition by means of battery and coil. Firing order: 1–3–4–2.

Ignition timing: The contact breaker points should just start to open when the notch in the crankshaft pulley is almost midway between the centre and the right-hand tooth on the timing cover and No. 1 cylinder is almost at TDC on its compression stroke. This will be 8° BTDC (the longest tooth indicates TDC, the centre tooth 5° BTDC, the right-hand tooth 10° BTDC). To time the distributor proceed as follows:

Turn the crankshaft until the crankshaft pulley is almost midway between the centre and right-hand tooth on the timing cover and No. 1 cylinder is almost at TDC on its compression stroke.

Check that the contact breaker gap is set to 0·014–0·016 in.

Insert the distributor into its housing and slowly rotate the rotor arm to engage the drive shafts. The vacuum control unit should be to the rear and vertical. Secure the distributor to the cylinder block.

Slacken the clamp-plate bolt; take up any lost motion in the drive by turning the rotor clockwise as far as it will go, and turn the distributor anti-clockwise until the contact breaker points are closed and then turn the distributor clockwise until the breaker points just start to open. Tighten the clamp bolt.

The ignition is now timed to 8° BTDC. A slight readjustment to the distributor may be necessary to suit the particular type of fuel in use and the setting should be corrected after checking the timing as described above, or during a road test. If necessary, the correction can be made by means of the vernier control on the distributor housing.

Distributor: Lucas DM 2.

Contact breaker point gap:	0·014–0·016 in
Breaker arm tension:	20–24 oz
Distributor setting:	8° BTDC
Direction of rotation:	anti-clockwise, when viewed from above
Condenser capacity:	0·2 microfarad

Centrifugal advance (distributor rpm and distributor degrees)

Maximum advance:	11–13° at 2400 rpm
	9–11° at 1500 rpm
	3– 6° at 500 rpm

No advance below 250 rpm.

Vacuum advance
7–9° at 20 in Hg
6–8° at 12 in Hg
3–5° at 8¼ in Hg
½–3° at 6½ in Hg
0–½° at 5 in Hg
No advance below 3½ in Hg.

Spark plugs: Champion N5, 14mm.
Spark plug gap: 0·024–0·026 in.

Ignition coil: Lucas LA 12.

Fuel system: The fuel tank is situated at the rear. The capacity is 10 Imp gallons (12 US gallons). The fuel is fed to the SU carburettors by means of an SU electric fuel pump.

Carburettor: Twin SU–HD 4 semi-downdraught carburettors are fitted.

Specifications:

Diameter:	1½ in
Needle:	FU (standard)
Jet:	0·090 in
Piston spring:	red

Construction and principles of operation:
The SU–HD 4 carburettor is of the diaphragm jet type. Like other SU carburettors, it is a variable throat type carburettor, in which the fuel is metered by a tapered needle in the jet. The jet needle is secured to a sleeve which determines the amount of throat opening, the position of the sleeve and needle being controlled by a vacuum piston (the upper part of the sleeve), according to throttle valve opening. In Fig. 12 a schematic view of the carburettor is shown. The piston is a free fit in the vacuum chamber with very little clearance. A guide spindle is centrally located in the piston; this spindle is free to move up and down in the guide bore of the vacuum chamber, thus ensuring correct alignment of the piston in the vacuum chamber at all times. When the engine is not running, the piston and needle assembly will be resting on the bridge in the throat. On top of the vacuum piston a soft spring is fitted, and a damper, consisting of an oil plunger and check valve, is fitted in the upper part of the vacuum chamber guide bore; this damper assembly operates in the hollow guide plunger (which is partly filled with light oil), its function being to delay the upward movement of the piston during acceleration, thus slightly enriching the mixture and also preventing piston flutter. The idling mixture is supplied via a separate channel and adjustment screw. With the engine running, the sleeve forms a restriction to the air-stream; thus a partial vacuum is created. This pressure drop also creates a partial vacuum in the vacuum chamber above the piston, causing the piston, the sleeve and the needle to rise a certain amount, increasing the effective diameter of the throat. The raised needle increases the amount of fuel emerging from the jet, thus automatically establishing the correct air/fuel mixture.

The jet is fitted to the diaphragm by means of the upper and lower cups; the jet return spring keeps the jet upwards as far as possible, the actual position being determined by the jet control arm, the fork of which rests on the upper cup. The control arm incorporates an adjusting screw; turning this screw in lowers the jet and enriches the mixture. Also connected to the jet control arm is the choke cable,

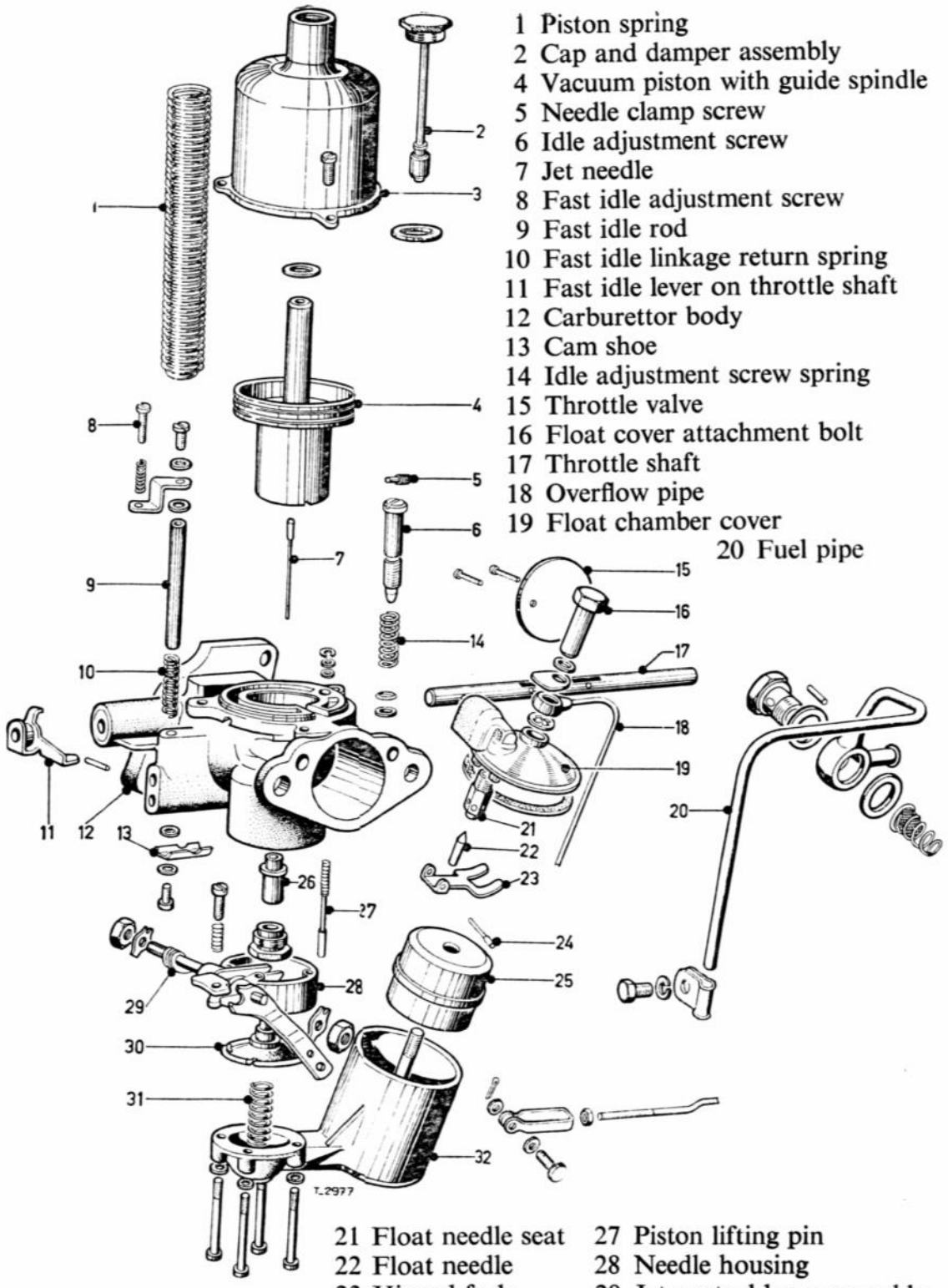


Fig. 11. SU HD4 carburettor, exploded view

arranged so that the jet is moved down when the choke control is pulled out. When the choke control is pulled out, the throttle valve is also opened a certain amount by means of the fast-idle mechanism, which consists of a cam and link system connected to the jet control arm.

From the float chamber, fuel is fed to the diaphragm chamber below the jet from which it enters the open bottom end of the jet.

Fitting the jet and centring the needle:

When fitting the needle, the portion that is marked with the dotted line must be flush with the bottom of the piston sleeve (see Fig. 13).

For proper functioning of the carburettor, it is of the utmost importance that the jet and needle are correctly centred. This may be checked by lifting the piston and needle assembly and then letting it fall.

NOTE: The jet must be in its topmost position while performing this check. The piston sleeve should hit the bridge in the carburettor throat with an audible 'click'. If necessary, the jet must be centred as follows:

Unscrew the four screws securing the float chamber and diaphragm housing assembly to the carburettor body. Mark the diaphragm and the carburettor body on one of the screw holes, in order that the diaphragm and jet assembly may be reinstalled in their original position. This is necessary because the jet bore may not be perfectly concentric with the jet outer diameter and turning the jet from its original position may put the needle out of centre. Remove the jet return spring and the diaphragm and jet assembly. Now loosen the jet retainer nut, so that the retainer is able to move in the housing.

Reinsert the jet and, while keeping it in its topmost position, allow the piston assembly to fall. When the piston falls freely with an audible 'click', the jet is centred and the retainer nut may be tightened. Check again to ensure that the piston still falls freely and repeat the jet centring operation, if necessary.

Carburettor adjustment:

(1) Ensure that the choke control allows the jets to return to their topmost position, that both throttle valves close properly when the accelerator is released, and that there is a clearance between the tip of the fast-idle adjustment screw and the lip beneath it. Now screw in each idle adjustment screw until it is seated and back-off three-quarters of a turn.

(2) Back-off each mixture adjustment screw, slowly screw it in until it just touches the jet control arm and then screw it in one turn more. This preliminary adjustment will provide a fair average to start with. Run the engine until it has attained its normal operating temperature; then adjust the mixture adjustment screws and the idle screws to obtain even and regular engine idling, making adjustments one-eighth of a turn at a time, and by an identical amount on both carburettors together.

(3) The adjustment may be finally checked by momentarily lifting each piston in turn by means of the lifting pin (at the bottom of the carburettor body).

If, when the piston is lifted, the engine speed increases, the mixture is too rich and on that carburettor the mixture adjustment screw must be backed-off a little. If the speed decreases, the mixture is too weak, which is corrected by screwing in the mixture adjustment screw slightly. If necessary, readjust the idle adjustment screw.

(4) Continue adjusting each carburettor until, when either piston is lifted, no increase, or a very slight increase followed by a decrease in speed, is noticed. The

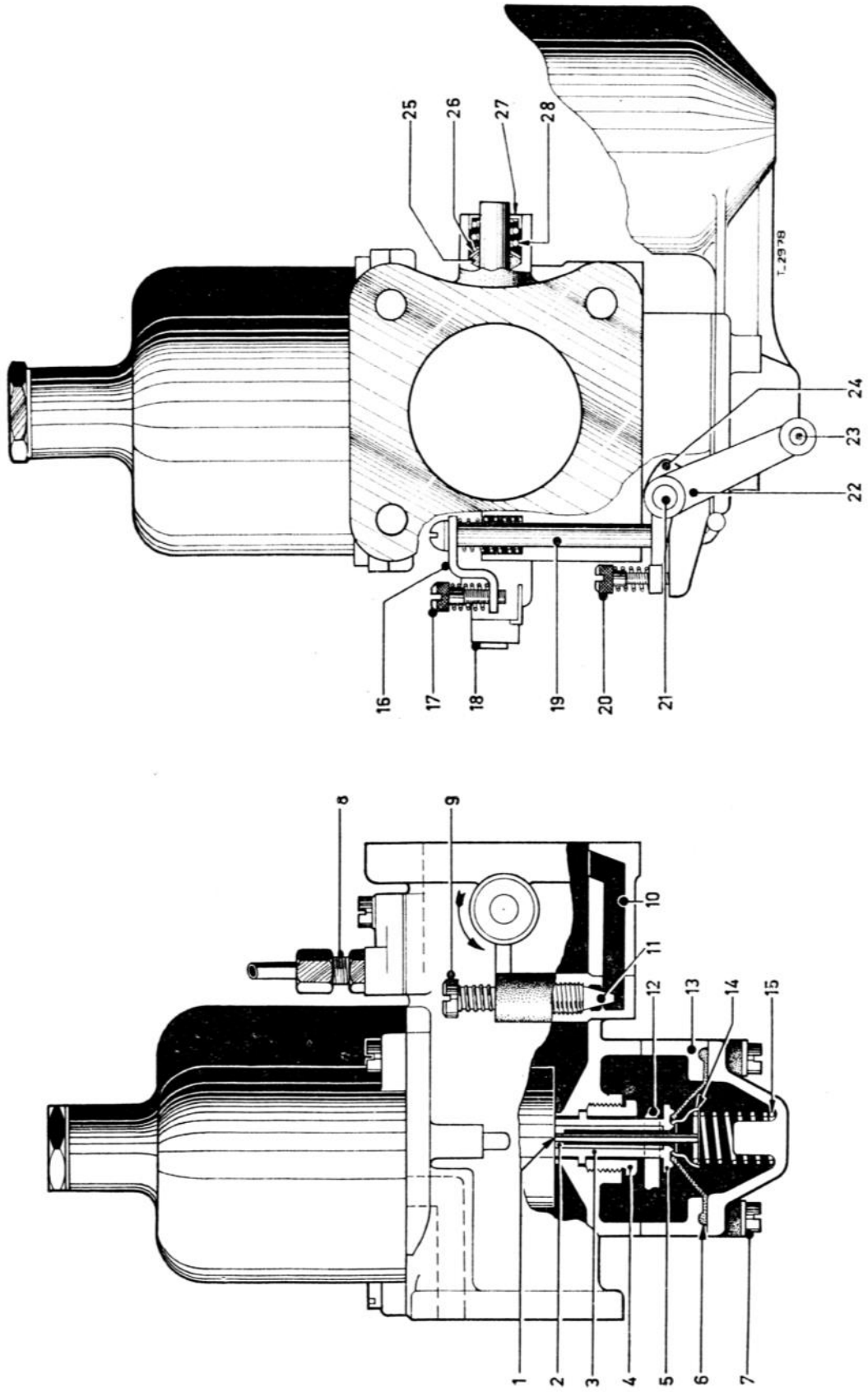


Fig. 12. SU HD4 carburettor, part-sectioned view

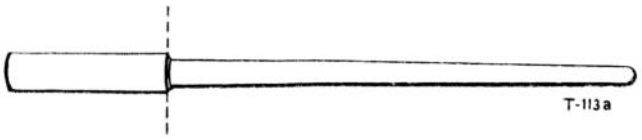


Fig. 13. SU carburettor, jet needle

mixture is then correct and the engine should run evenly. The fast-idle adjustment screw may now be screwed in until there is 1/64in clearance between the tip of the screw and its abutment.

It is important to make sure that both throttle valves are correctly seated when the accelerator is released; if necessary, the throttle connector rod must be loosened, both valves seated and the connector rod clamps tightened. Proper synchronization may be checked by means of a piece of tubing of about $\frac{3}{8}$in diameter, one end of which is held to the ear and the other end at each carburettor intake in turn. This will facilitate comparing the hissing sound of each carburettor, which will be equal if the units are properly synchronized.

Fuel pump: The electric SU–PD fuel pump is located beside the fuel tank in the luggage compartment, and can be reached after removing a detachable panel. A plunger-type solenoid is used.

On the PD-type fuel pump there is no provision for adjustment of the contact points. If trouble from the points is suspected, the pump must be replaced. A normal feature of this type of pump is that the pump continues 'tick' when the float chamber of the carburettor is full, with the ignition switched on and the engine not running.

Specifications:

Delivery:	45 pints/ hour (54 US pints/hour)
Pump pressure:	2–3lb/sq in

NOTE: later models are fitted with an SU-type SP pump.

Air-cleaner: Either a dry-type or an oil-bath air-cleaner may be fitted. The paper element of the dry-type air-cleaner must be renewed every 12,000 miles. The oil-bath air-cleaner must be inspected periodically and filled with fresh oil every 3000 miles.

Cooling system: Pressurised water cooling with pump and fan. A thermostat is fitted in the water outlet in the front of the cylinder head. When the thermostat is closed, the water circulates via a by-pass pipe.

Capacity: $12\frac{1}{2}$ Imp pints (15 US pints), including heater.

Key to Fig. 12:

1 Jet needle
2 Jet
3 Jet retainer
4 Jet retainer nut
5 Jet cup
6 Diaphragm
7 Float chamber attachment screw
8 Vacuum advance union
9 Idle adjustment screw
10 Idle mixture channel
11 Idle adjustment screw tip
12 Jet control fork
13 Diaphragm housing
14 Jet return spring cup
15 Jet return spring
16 Fast idle link
17 Fast idle adjustment screw
18 Throttle stop lever
19 Fast idle rod
20 Mixture adjustment screw
21 Jet lever spindle
22 Jet control arm
23 Choke cable connection
24 Fast idle cam
25 Cork seal
26 Dished washer
27 Spring retainer
28 Thrust spring

The cooling system is provided with two drain taps, one on the right-hand side of the cylinder block, the other at the radiator base.

As the cooling system is pressurised, the filler cap must be removed before the cooling system is drained. When a heater is fitted, anti-freeze should be used as a frost precaution as the heater cannot be drained completely.

The pressure relief valve in the filler cap opens whenever the pressure in the cooling system exceeds 7 lb/sq in.

Water pump: Impeller-type water pump. The water pump runs on a double-row ball bearing; the pump shaft and the bearing are serviced as a unit.

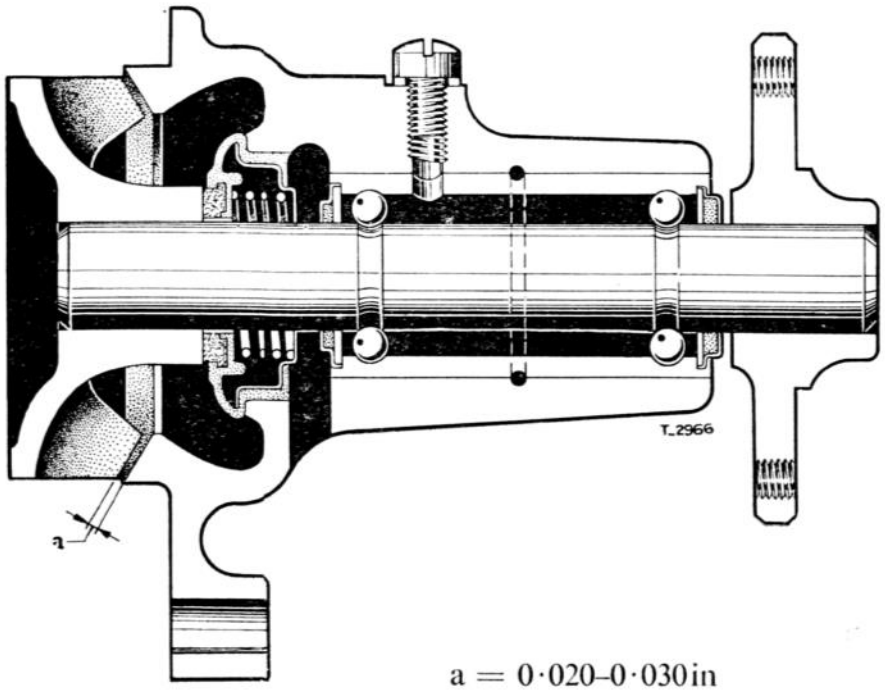


Fig. 14. Water pump, sectioned view

Thermostat: The thermostat is installed in the water outlet on the cylinder head and is set to open at 65°C (149°F) and starting from engine number 15 RA/U/H269 at 70°C (158°F).

This setting cannot be altered, but in very cold weather, it may be worth while fitting an alternative thermostat with a higher temperature setting.

Frost precaution: The cooling system is not suited to the use of anti-freeze mixtures with an alcohol base, owing to the high temperatures attained in the top radiator tank. Only anti-freeze mixtures of the ethylene/glycol or glycerine type should be employed. Use only anti-freeze of a reputable brand and mix it according to the manufacturer's instructions. See also under *Lubrication and maintenance*.

TRANSMISSION

Clutch: Borg & Beck single dry-plate clutch, hydraulically-operated. The clutch release bearing is a carbon ring in a bearing cup; when worn, the complete bearing must be renewed. The height of the release levers is set during assembly; no individual adjustment is provided to compensate for wear.

Specifications:

Type:	A6–G
Diameter:	8in
Number of thrust springs:	6
Colour:	black and yellow
Number of damper springs:	6
Colour:	black and light green
Maximum permissible run-out of clutch plate:	0·015in
Release lever ratio:	4·6 : 1
Maximum permissible difference in spring pressure, when assembled:	10–15lb

Clutch master cylinder: Girling type CV.

The clutch master cylinder is mounted on the scuttle. The fluid reservoir, which is built together with the master cylinder, should be topped-up with Castrol Girling Fluid or fluid conforming to specification SAE 70 R3. The fluid level must be maintained at $\frac{1}{2}$in below the bottom of the filler neck.

1 Retaining washer
2 Push-rod
3 Outlet
4 End seal
5 Plunger
6 Plunger seal
7 Spring thimble
8 Return spring
9 Valve spacer
10 Spring washer
11 Valve stem
12 Valve seal

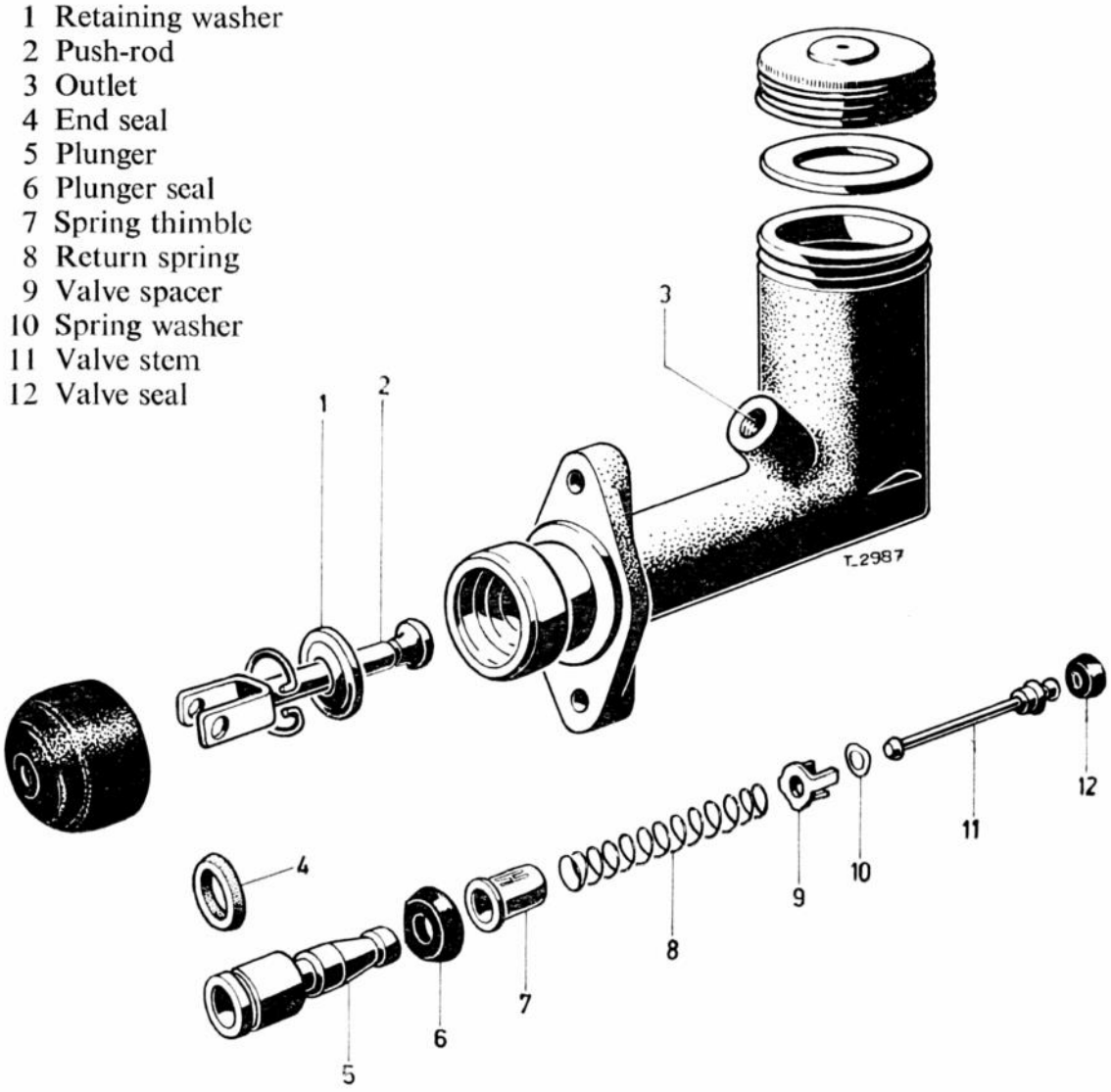


Fig. 15. Clutch master cylinder

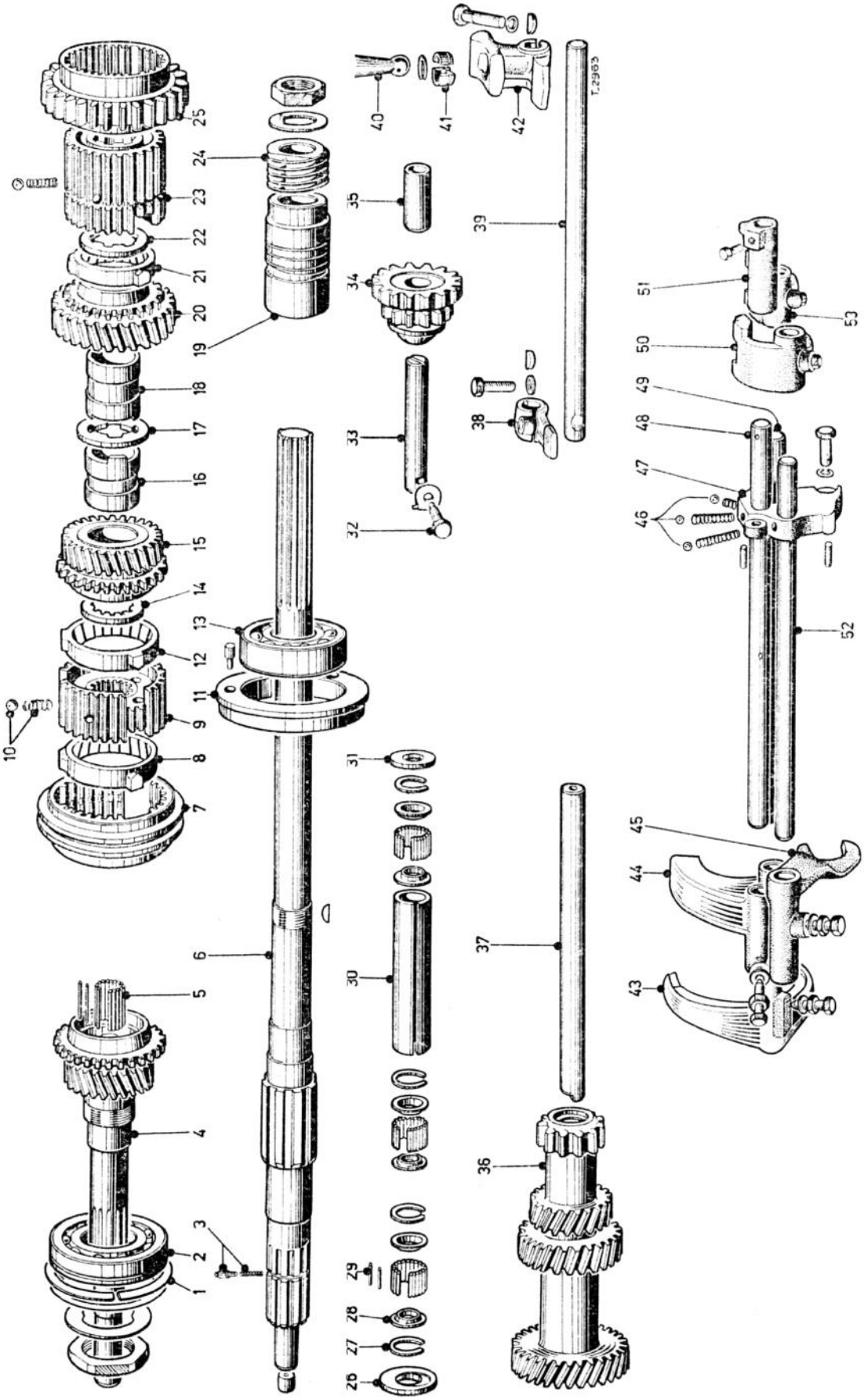


Fig. 16. Gearbox, exploded view

Gearbox: Four-speed gearbox with synchromesh on second, third and top gear. Top gear is a direct drive, third and second idler gears are in constant mesh, and first and reverse gears are obtained by sliding-spur gears.

For gear ratios, see under *Technical specifications*.

Dismantling:

After removal from the car, the gearbox is dismantled as follows:

(1) Unscrew the speedometer drive, but do not withdraw the pinion from the bush, or the oil-seal will be damaged. Remove the gear-lever tower.

(2) Remove the extension housing top cover. Remove the interlock arm and plate from the extension housing.

Remove the gearbox side cover.

(3) Unscrew the bolts and nuts securing the extension housing to the gearbox, pull the extension housing rearward and turn it to free the shifter/selector finger from the shifter dogs. Remove the gearbox extension. The dismantling and re-assembly of the gearbox extension and the gear-lever tower is a straightforward operation which requires no special description.

NOTE: Do not remove the sliding joint bush unless necessary, as removal will make it unfit for further use.

(4) Break the lock wire and unscrew the shifter-dog set-bolts. Remove the shifter dogs.

Unscrew the three shifter-fork set-bolts.

(5) Unscrew the two cap screws securing the shifter-fork shaft guide block and withdraw the shifter-fork shafts together with the guide block, from the gearbox. Take care not to lose the two dowels.

(6) Wrap the guide block in a cloth to prevent the detent balls from jumping out and withdraw the shifter-fork shafts. Remove the shifter forks from the gearbox in the following order: reverse, top/third, second/first.

(7) Remove the clutch fork and the clutch release bearing.

Remove the main drive gear bearing cover complete with oil-seal, taking care not to lose the shims between the bearing cover and the bearing.

(8) Gently tap out the countershaft and lower the gear cluster to the bottom of the gearbox.

Unscrew the reverse idler shaft set-bolt, drive out the shaft and remove the reverse idler gear.

Key to Fig. 16:

1 Circlip
2 Main drive pinion bearing
3 Interlock plunger and spring
4 Main drive pinion
5 Mainshaft pilot bearing
6 Mainshaft
7 Third/top-gear synchronizer sleeve
8 Top-gear baulk ring
9 Third/top-gear synchronizer hub
10 Detent ball and spring
11 Mainshaft bearing housing
12 Third-gear baulk ring
13 Mainshaft rear bearing
14 Front thrust washer
15 Third-gear idler pinion
16 Third-gear idler pinion bush
17 Interlock ring
18 Second-gear idler pinion bush
19 Spacer bush with oil scroll
20 Second-gear idler pinion
21 Second-gear baulk ring
22 Rear thrust washer
23 Second-gear synchronizer hub
24 Speedometer worm wheel
25 First-gear sliding pinion
26 Front thrust washer
27 Circlip
28 Needle bearing cage
29 Bearing needles
30 Spacer bush
31 Rear thrust washer

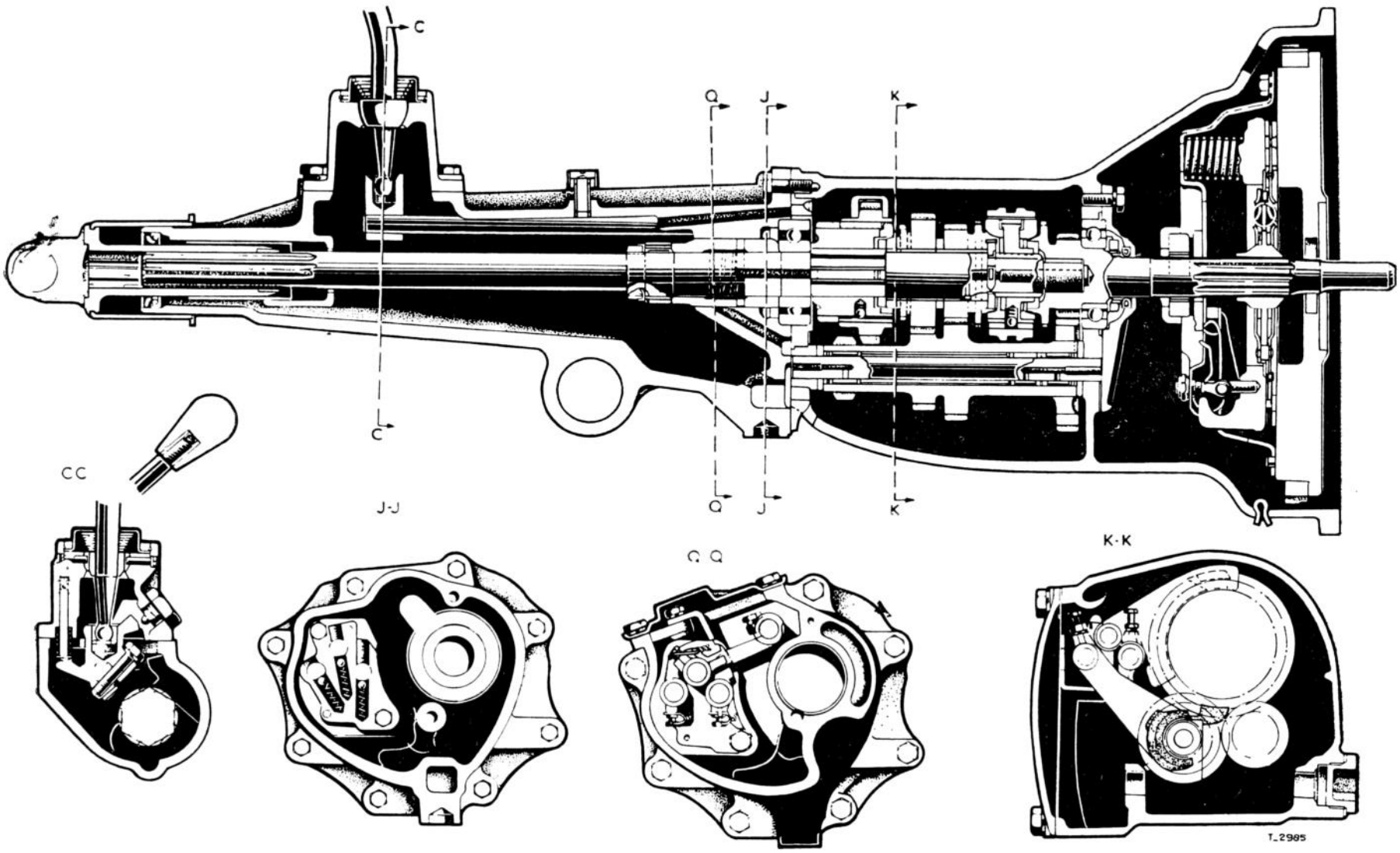


Fig. 17. Gearbox, transverse section

(9) Withdraw the mainshaft assembly towards the rear and the main drive gear towards the front. Take care not to lose the 18 needle rollers. Remove the countershaft gear cluster and the two thrust washers.

(10) The needle bearings and spacer can be pushed from the countershaft gear cluster after removal of a circlip.

To reassemble the needle bearings proceed as follows:

Install a circlip in the innermost groove of the gear cluster.

Clamp the countershaft vertically in a vice (cut-away portion downwards) and assemble the inner roller bearing on the shaft against the vice jaws.

Slide the gear cluster, with the large gear downwards, over the shaft and the bearing.

(11) Remove the shaft from the vice and push the bearing against the circlip. Install a circlip, the roller assembly and a circlip. Insert the spacer tube into the other end of the gear cluster.

Install the end bearing and a circlip. Remove the countershaft.

Disassembly of the mainshaft:

(1) Remove the top-gear baulk ring, synchronizer hub (together with the synchronizer sleeve) and third-gear baulk ring. When the shifter sleeve is separated from the synchronizer hub, care must be taken not to lose the balls and springs.

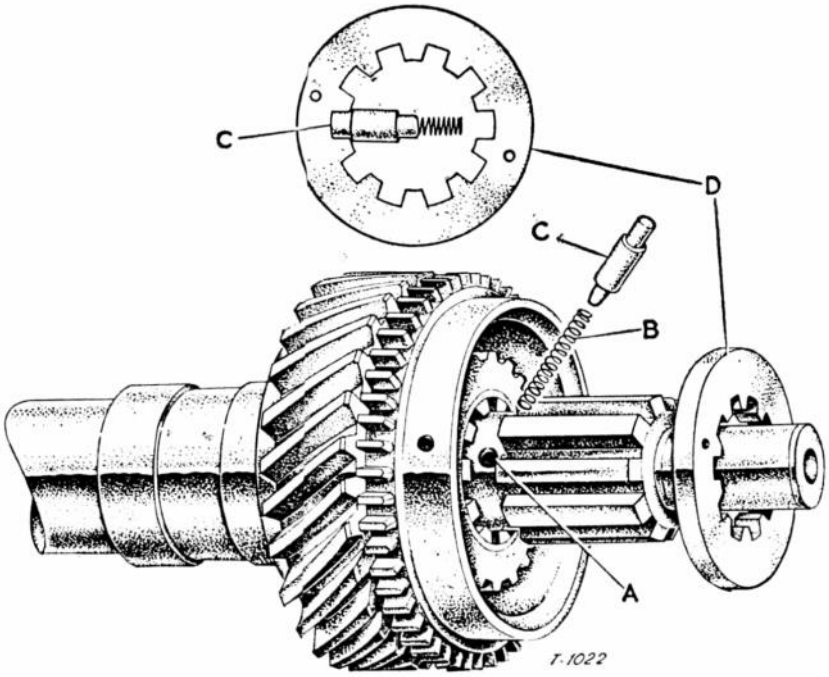


Fig. 18. Mainshaft gear securing plunger

(2) Depress the small spring-loaded plunger in the front end of the mainshaft and turn the splined ring so that one of its teeth covers the plunger.

(3) Slide the splined ring, together with the third-gear idler pinion and its bush, off the mainshaft; remove the plunger and the spring. Slide the interlock ring and the second-gear idler pinion, together with its bearing bush and baulk ring, off the mainshaft.

(4) Remove the rear thrust washer and slide the second-gear synchronizer hub and the first-gear sliding pinion from the mainshaft. Take care not to lose the synchronizer balls and springs when the first-gear sliding pinion is separated from the hub.

(5) Bend back the lock washer and unscrew the nut securing the speedometer worm wheel. Remove the lock washer, speedometer worm wheel, spacer bush and Woodruff key.

If necessary, the mainshaft ballbearing can be pressed off.

Carefully clean and inspect all parts and replace those that are damaged or worn.

Reassembly of the mainshaft:

(1) Slide the rear thrust washer, with the ground side towards the front, on to the mainshaft.

Heat the second-gear idler pinion bush (the longer of the two) in warm oil and pass it over the mainshaft (notches towards the front), making sure the oil-hole in the bush corresponds with the bore in the mainshaft.

(2) Install the second-gear idler pinion and its baulk ring on the bearing bush. The plain side of the gear must be towards the front.

(3) Slide the interlock ring and the third-gear idler pinion bush over the mainshaft. Locate the notches of both bushes in the interlock ring.

(4) Slide the third-gear idler pinion, flat face first, on to its bearing bush and install the spring-loaded plunger in the hole in the mainshaft. Depress the plunger and pass the front thrust washer, machined face towards the gear, over it. Turn the thrust washer, until the plunger is released and locks it.

(5) Assemble the synchronizer balls and springs in the third/top-gear synchronizer hub and slide the synchronizer sleeve over it.

(6) Install the third/top-gear synchronizer hub assembly, together with the two baulk rings, on the mainshaft. The plain side of the hub must face the rear.

(7) Assemble the synchronizer balls and springs to the second-gear synchronizer hub and slide the first-gear sliding pinion over it.

(8) Install the second-gear synchronizer hub, the first-gear sliding pinion and the baulk ring on the mainshaft.

(9) Press the rear mainshaft bearing into its housing and fit it onto the shaft.

Slide the spacer bush over the mainshaft and fit the speedometer worm wheel; tighten the nut and bend over the lock washer.

Reassembly of the gearbox:

(1) Insert dummy shaft 18 G 471 into the countershaft cluster, assemble the needle bearings, spacer bush and thrust washers and lower the complete gear cluster to the bottom of the gearbox.

(2) Reinstall the main drive gear, making sure that the bearing is correctly located. Stick the 18 bearing needles, with grease, in the pilot bearing bore.

Insert the mainshaft into the gearbox and enter the spigot in the needle rollers of the main drive gear.

Offer up the gasket, fitted between the gearbox and the extension housing, to position the dowel and the bearing housing. Push the mainshaft right home.

(3) Lift the countershaft gear cluster into mesh with the mainshaft gears and the main-drive gear; insert the countershaft and line-up the cutaway portion with the locating groove in the front cover.

(4) Install the reverse idler gear and shaft and secure the shaft with a lock bolt.

(5) Fit the main drive gear bearing cover, together with the shimpack found during dismantling. Install the clutch lever and fork.

(6) Reinstall the shifter forks in the following order in the gearbox: first/second, third/top, and reverse.

(7) Bolt the shifter-shaft guide block to the rear face of the gearbox, refit the detent springs and balls and push the shifter-fork shafts through the guide block into the respective shifter forks.

Tighten the set-bolts.

(8) Place the shifter dogs on the rear ends of the shifter-fork shafts, tighten and wire the set-bolts.

(9) If necessary, replace the extension housing oil-seal, preferable with tool 18 G 134 and adaptor 18 G 134 N.

Bolt the extension housing to the gearbox, making sure that the shifter/selector finger engages the shifter dogs properly.

(10) Reinstall the interlock arm and plate and fit the top cover. Bolt the gear-lever tower and the side cover to the extension housing.

Screw in the speedometer drive and fill the gearbox with the correct grade of oil.

Propeller shaft: Open propeller shaft with Hardy-Spicer universal joints. The front yoke of the front universal joint is a sliding fit over the gearbox mainshaft splines.

NOTE: Prior to removing the shaft, the flange of the rear universal joint and the pinion drive flange must be marked, in order that the shaft may be refitted in its original position.

Do not forget to top-up the gearbox after the propeller shaft has been reinstalled.

Length, centre to centre: 42¾ in
Diameter: 2½ in

Rear axle: Three-quarter floating rear axle with hypoid pinion and crownwheel. In Fig. 19 an exploded view of the rear axle is shown. Rear axle ratio: 4·3 : 1.

Removal of a hub:

(1) Jack-up the car and remove the appropriate wheel. Remove the brake drum. Take precautions to prevent rear axle oil from leaking on to the brake linings when the shaft is withdrawn.

(2) Unscrew the drive-shaft retaining screw and pull the drive shaft outwards.

(3) Bend back the lip of the lock washer and unscrew the bearing retaining nut. the left-hand hub nut has a left-hand thread. Remove the washer.

(4) Withdraw the hub with a suitable extractor. The bearing and oil seal will come away with the hub. If necessary, the bearing and oil seal can be pressed out; a new oil seal is fitted with its lip towards the bearing.

Reassembly and reinstallation is done in the reverse order of removal.

The outer face of the bearing must protrude 0·001–0·004 in beyond the outer face of the hub to ensure that the bearing is gripped between the abutment shoulder in the hub and the drive flange of the axle shaft.

Removal and dismantling of the differential:

(1) Drain the rear axle. Disconnect the propeller shaft (mark the flanges to ensure reinstallation in the original position) and remove the drive shafts as previously described.

(2) Unscrew the nuts securing the differential carrier to the axle housing and remove the carrier.

(3) Ensure that the differential bearing caps are marked; unscrew the bearing-cap nuts and remove the differential housing.

(4) Tap out the differential pinion-shaft lock pin from the crownwheel side and remove the differential shaft, the pinions, thrust washers and side gears.

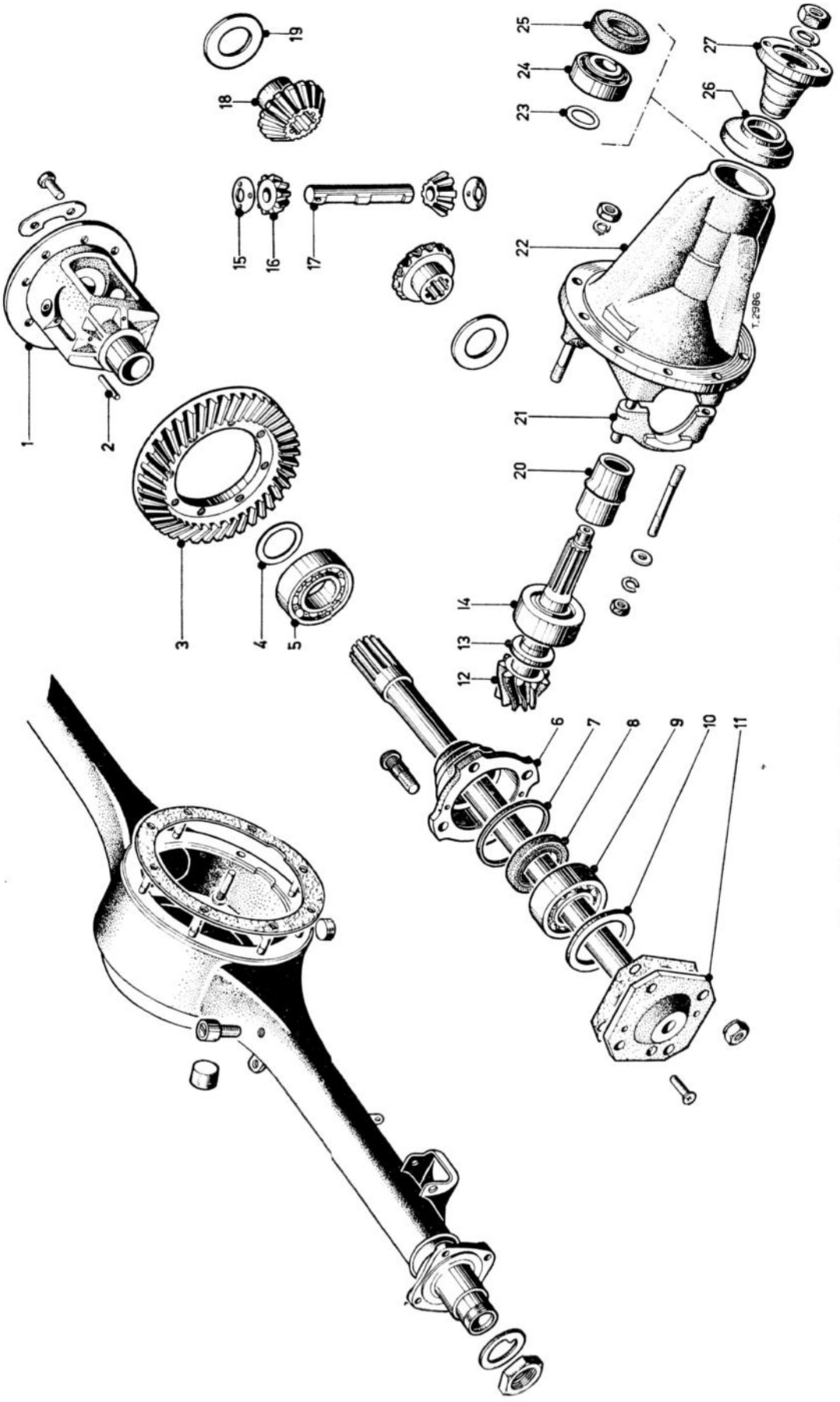


Fig. 19. Rear axle/differential, exploded view

(5) Remove the differential bearings with a suitable puller.
Note that the bearings are marked on one side with the word 'thrust'.
Take care not to lose the shims fitted between each bearing and the differential housing.
(6) Knock back the tabs of the lockwashers, unscrew the crownwheel bolts and gently tap the crownwheel from the housing.
(7) Remove the pinion flange and gently tap the pinion rearward. The pinion rear bearing inner race will come away with the pinion.
(8) Remove the pinion shaft oil-seal and the pinion front bearing inner race. If necessary, the bearing outer races can be withdrawn with a suitable puller.
(9) Slide the spacer bush and the shims off the pinion shaft. Now the pinion rear bearing can be withdrawn.
Carefully clean and inspect all parts and replace those that are damaged or worn.

Reassembly and adjustment:
(1) Reinstall the pinion bearing outer races, place the shim found during dismantling on the pinion head and press on the pinion rear bearing.
(2) Install the pinion in the carrier, fit the pinion front bearing and the pinion flange; tighten the nut until a preload of 10–12 in/lb is obtained. The oil seal, the spacer bush and preload shims are omitted at this stage.
(3) Zero a dial gauge on the machined step 'B' of the large gauge block 18 G 191 B. Remove the keep disc from the magnetic gauge block and position the magnet and the dial gauge on the pinion.
The dial gauge plunger must rest on the centre of the differential bearing bore. Obtain the maximum depth reading and note the difference from the zero reading.
Repeat this check in the opposite bearing bore and note the mean reading.
(4) The pinion head is in some cases marked with a minus figure (unbracketed).
(*a*) If the gauge reading is minus, the gauge reading must be added to the pinion-head marking and the thickness of the shim be reduced by this amount.
(*b*) If the gauge reading is plus, but numerically less than the pinion-head marking, the shim thickness must be reduced by the difference.
(*c*) If the gauge reading is plus and numerically greater than the pinion-head marking, the shim thickness must be increased by the difference.

Key to Fig. 19:

1 Differential housing
2 Differential pinion shaft lock pin
3 Crownwheel
4 Shim
5 Differential bearing
6 Hub assembly
7 Oil-seal ring
8 Oil-seal
9 Hub bearing
10 Bearing spacer
11 Drive shaft
12 Pinion
13 Pinion thrust washer
14 Pinion rear bearing
15 Thrust washer
16 Differential pinion
17 Differential pinion shaft
18 Differential side gear
19 Thrust washer
20 Spacer bush
21 Bearing cap
22 Differential carrier
23 Adjustment shim
24 Pinion rear bearing
25 Oil seal
26 Dust cover
27 Companion flange

Example of (a):

Gauge reading:	—0·003 in
Pinion-head marking:	—0·002 in
Amount to be subtracted from the shim thickness:	0·005 in

Example of (b):

Pinion-head marking:	—0·004 in
Gauge reading:	+0·003 in
Amount to be subtracted from the shim thickness:	0·001 in

Example of (c):

Gauge reading:	+0·006 in
Pinion-head marking:	—0·003 in
Amount to be added to the shim thickness:	0·003 in

When the gauge reading is plus and numerically equal to the pinion-head marking, no correction is necessary; this also applies in cases where an unmarked pinion is fitted and the gauge reads zero.

(5) The actual mounting distance (pinion depth adjustment) of the pinion is marked on the pinion head in a rectangular bracket. If the marking is a plus figure, the shim thickness must be reduced by an equal amount. If the marking is a minus figure, the shim thickness must be increased by the same amount.

(6) Remove the pinion, install the correct number of depth adjustment shims under the pinion head and assemble the bearings, the new spacer bush, the preload shims (approximately 0·012 in), oil seal and pinion flange.

(7) Tighten the pinion nut gradually to 140 ft/lb. Check the preload frequently; this should not exceed 15 in/lb, or the spacer bush will be distorted. If, however, this preload is exceeded, the pinion must be removed and a new spacer bush installed.

If necessary, correction to the preload is made by adding or removing shims between the spacer bush and the pinion front bearing.

(8) Install a differential bearing onto the small surface plate of tool 18G 191B, the inner race over the recess and the side marked 'thrust' facing downwards.

(9) Place the magnetic gauge block on to the surface plate and zero the dial gauge on the step marked 'B' of the small gauge block. Transfer the pointer to the plain surface of the bearing inner race and press the race firmly against the balls. Make a note of the dial reading.

A positive reading denotes the thickness of the shim pack to be subtracted from the shims at this side; a negative reading indicates the thickness of the shim pack to be added (variations from standard width of bearings, see also (10), (11)).

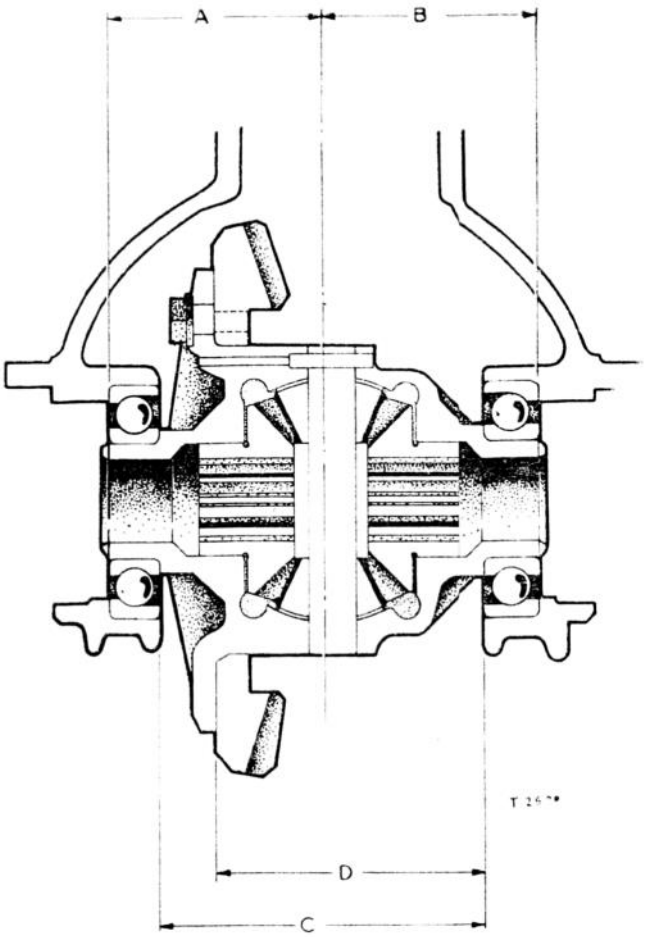
Repeat this operation with the other bearing.

(10) Refer to Fig. 20.

Variations of the dimensions *A* and *B* are stamped on the differential carrier, near the bearing bores.

Variations of the dimensions *C* and *D* are stamped on the differential housing.

The shim pack on the left-hand side is established as follows: $A+D-C+0{\cdot}007$ in.



A Centre-line of differential unit to bearing shoulder in carrier on left-hand side

B Centre-line of differential unit to bearing shoulder in carrier on right-hand side

C Total width between bearing shoulders of differential housing

D Crownwheel mating face to bearing shoulder of right-hand differential housing

Fig. 20. Differential adjustment

The shim pack on the right-hand side is calculated as follows: $B—D+0{\cdot}006$ in.

The letters in the formula are to be substituted by the dimensional variations stamped on the carrier and the housing.

(11) Compose shim packs as described under (10) and add or subtract the correction for the bearing height as established under (9).

When the back of the crownwheel is marked with a framed number, this must be taken into account before assembling the shims and bearings into the differential housing.

If the framed number on the crownwheel is, e.g. —2, a shim of 0·002 in must be transferred from the right-hand side to the left-hand side (crownwheel side). If the number is +2, a shim pack of 0·002 in must be transferred from the left-hand side to the right-hand side.

Press the differential bearings (thrust face outwards) and the shims onto the differential housing.

(12) Assemble the side gears, the differential pinions, thrust washers and the pinion shaft into the differential housing; burr over some metal to secure the lockpin in place.

(13) Bolt the crownwheel to the differential housing (60 ft/lb), but do not yet bend over the lock plates.

Place the assembly in 'V' blocks and check the crownwheel run-out by means of a dial gauge.

The maximum permissible run-out is 0·002 in. When the crownwheel runs true, the lockplates can be tapped over.

(14) Install the differential housing, together with the differential bearings, in the carrier; install the bearing caps in their original positions and tighten the bearing cap nuts to 65ft/lb.

(15) Check gear backlash with a dial gauge. The recommended backlash is etched on the crownwheel. Backlash should be within 0·005–0·007in. Backlash is adjusted by moving the crownwheel in or out of mesh by transferring shims from one side to the other. Do not alter the total number of shims. The transfer of a 0·002in shim from one side to the other results in a variation in backlash of about 0·002in.

(16) Further reassembly is done in the reverse order of removal.

CHASSIS

Chassis: The all-steel body and chassis are welded together to form a single unit. See Figs 21 and 22 for dimensions.

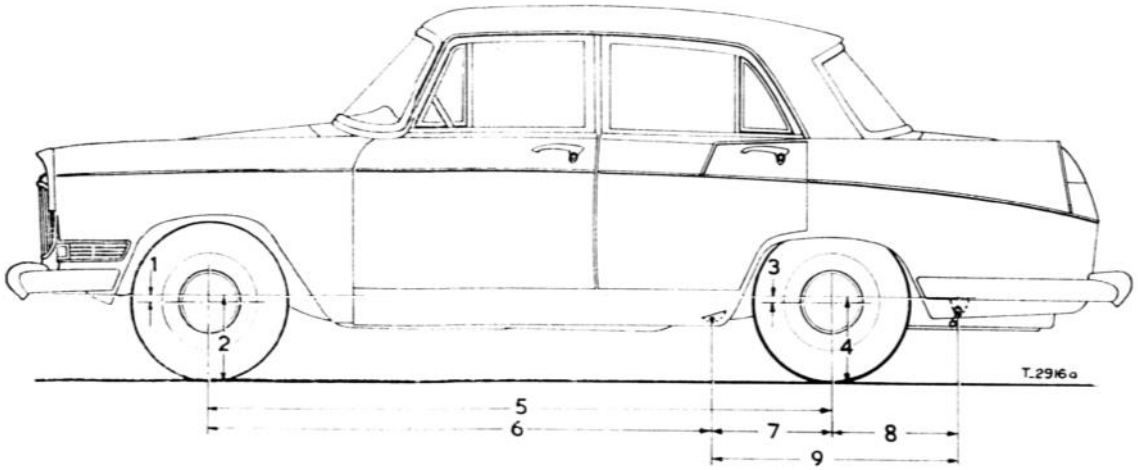


Fig. 21. Body/floor dimensions

1 1·875in	4 13·9in	7 22in
2 13·675in	5 99·25in	8 21-5/16in
3 2·12in	6 77·25in	9 43-5/16in

Front suspension: Independent front suspension by means of suspension arms of unequal length, coil springs and piston-type hydraulic shock-absorbers.

The suspension unit is mounted under the detachable sub-frame, which is bolted at four points to the body.

On some earlier models a packing cup was fitted over the coil spring. When on these suspension units the later type coil springs are installed, the packing cups are omitted.

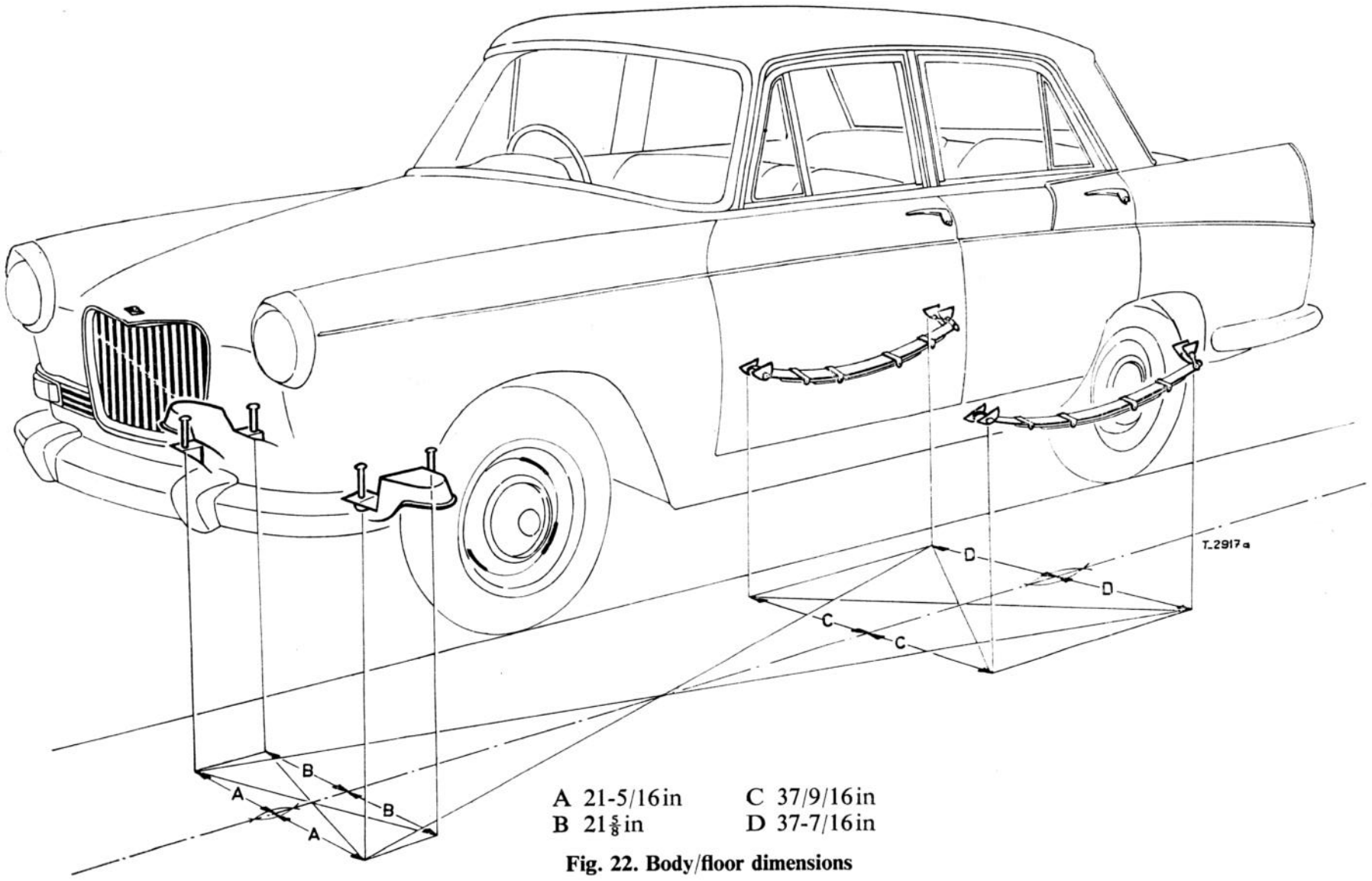
Removal:

The complete front suspension unit can be removed together with engine and gearbox. See page 19.

To remove the suspension unit only, proceed as follows:

(1) Jack-up the front of the car and place stands under the body cross-member. Remove the wheels. Take engine weight by means of suitable tackle.

(2) Disconnect the battery and the horn wires.



A 21-5/16in C 37/9/16in
B 21 5/8 in D 37-7/16in

Fig. 22. Body/floor dimensions

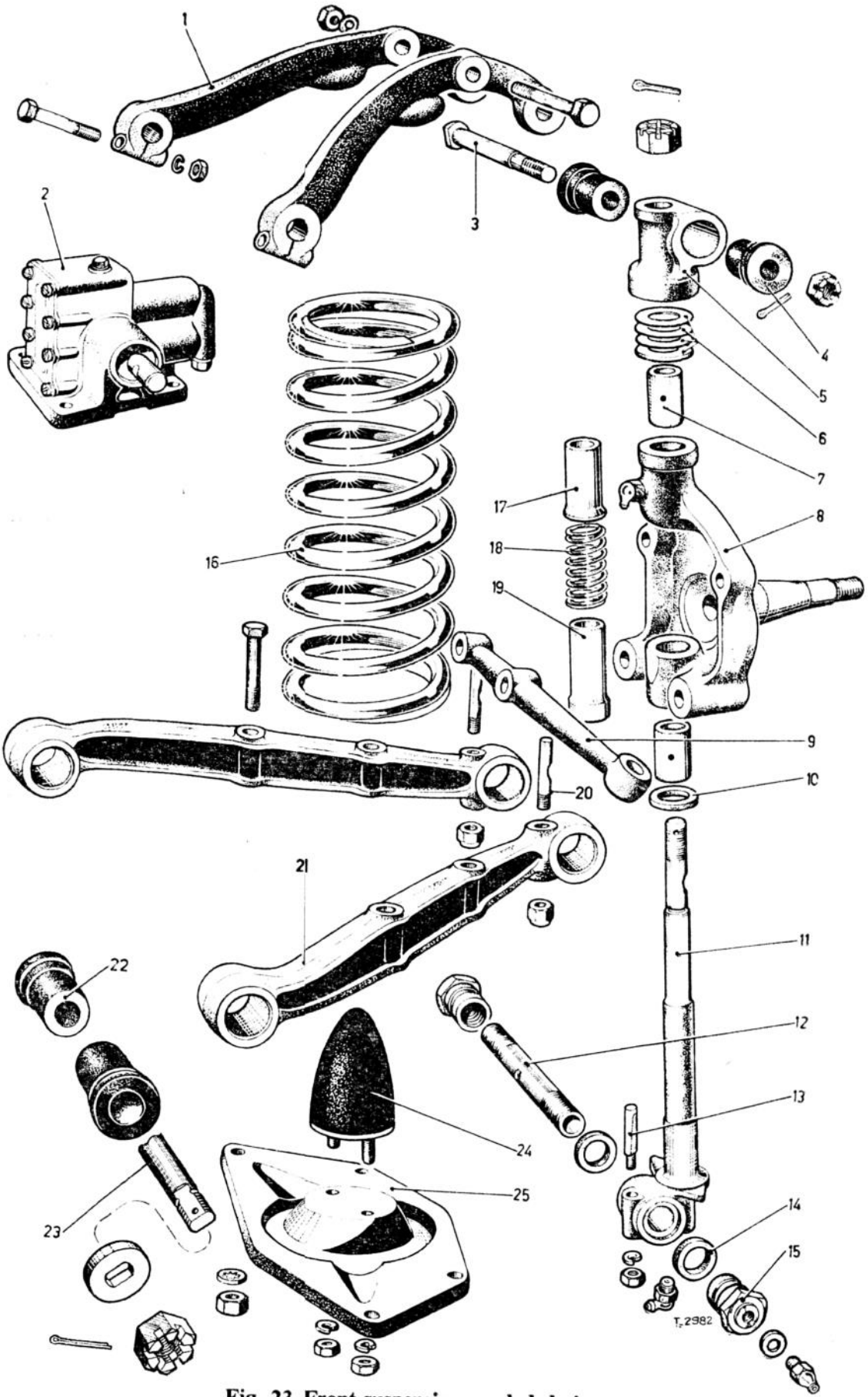


Fig. 23. Front suspension, exploded view

Drain the brake system and disconnect the two flexible brake shoes. Disconnect the centre steering rod from the pitman arm and the steering idler arm. Remove the ball joints.

(3) Remove the front engine supports, position a floor jack under the suspension unit and unscrew the four nuts securing the suspension unit to the body floor.

Lower the jack and remove the suspension unit from under the car.

Reinstallation is done in the reverse order; do not forget to install the rubber packing pieces and to bleed the brakes.

Dismantling:

(1) Install tool 18G 37 and unscrew the four spring seat bolts. Gently release the coil spring and remove it from the suspension unit.

(2) Instead of tool 18G 37, two 4 in, fully-threaded slave bolts can be used. Replace two diagonally opposite spring seat bolts by the slave bolts and screw the nuts down to the suspension arms.

Remove the two remaining spring seat bolts and unscrew the slave bolt nuts a little at a time until the spring is fully released.

(3) Unscrew the wishbone arm tie-bolt. Unscrew the castellated nut on the upper fulcrum pin.

Partially withdraw the forward half of the upper suspension arm after slackening the clamping bolt and remove the upper trunnion fulcrum shaft.

Remove the shock-absorber and the upper suspension arm.

(4) Remove the two rubber bearing bushes from the upper trunnion, unscrew the castellated nut and lift off the upper trunnion.

Separate the steering swivel from the steering swivel pin. The dust-excluder tubes and spring will come away with the steering swivel pin.

Remove the cork washer from the lower end of the steering swivel.

(5) Slacken the nuts of the lock pins, located in the outer ends of the lower wishbones, and screw-out the threaded bushes. Tap out the lock pins.

NOTE: Do not tap out the lock pin with the threaded bushes in place.

(6) Unscrew the lock-pin nut located in the centre of the lower trunnion and tap out the lock pin.

Withdraw the fulcrum shaft.

Reassembly is done in the reverse order of removal.

Key to Fig. 23:

1 Upper suspension arm
2 Shock-absorber
3 Upper suspension arm outer fulcrum bolt
4 Rubber bearing bush
5 Upper trunnion
6 Shims
7 Steering swivel upper bush
8 Steering swivel
9 Steering arm
10 Cork washer
11 Swivel pin
12 Lower suspension arm outer fulcrum shaft
13 Key
14 Felt washer
15 Bearing bush
16 Coil spring
17 Upper dust sleeve
18 Dust sleeve spring
19 Lower dust sleeve
20 Lock pin
21 Lower suspension arm
22 Rubber bearing bush
23 Lower suspension arm inner fulcrum shaft
24 Rubber buffer
25 Spring plate

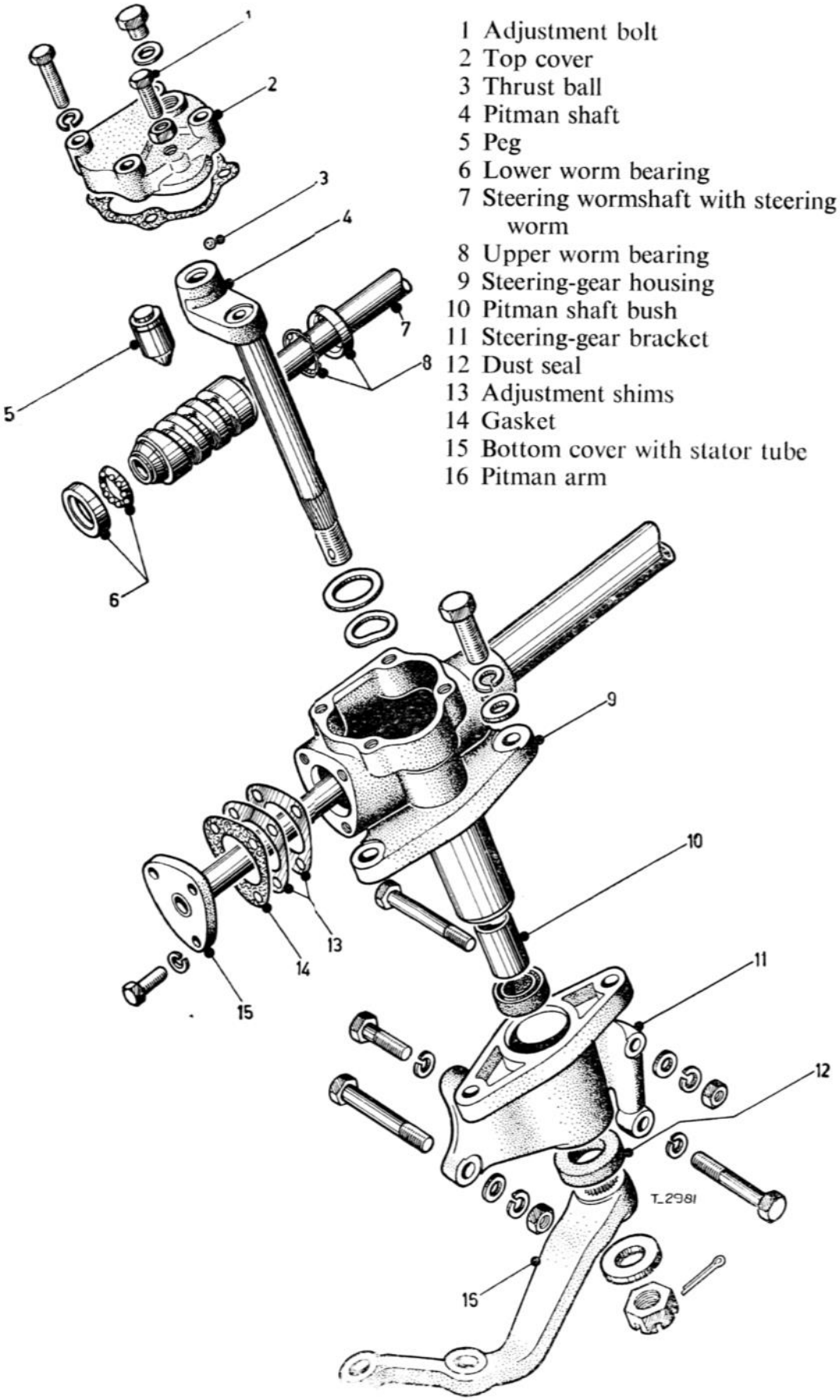


Fig. 24. Steering gear, exploded view

Specifications:

Free length of coil spring:	10·75in
Mean coil diameter:	4 3/16in
Number of active coils:	7
Spring rate:	352lb/in

Front wheel alignment: When checking front wheel alignment, the car should be standing on an absolutely horizontal level floor. The tyres should be inflated to the correct pressure. Move the car up and down a few times so it will settle to the normal driving position, then turn the wheels in the straight-ahead position.

Camber: $\frac{3}{4}$ to 1° positive.

Caster: $1\frac{1}{2}$°.

King pin inclination: $6\frac{1}{2}$°.

Toe-in: 1/16–$\frac{1}{8}$ in.

The centre steering rod is adjustable in order to correct toe-in.

Rear suspension: Rear suspension by means of conventional semi-elliptic leaf springs and double-acting hydraulic shock-absorbers of the piston type. The front spring eye and the rear spring shackles are fitted with rubber bushes.

When reinstalling the rear springs, do not tighten the front spring eye-bolt and the shackle nuts, until the normal load is applied to the springs, so that the flexible 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 spring bushes.

Specifications:

Number of leaves:	6
Width of leaves:	$1\frac{3}{4}$in
Free camber:	2 7/16in

Wheel bearings and hubs: The front wheel hubs run on two non-adjustable ballbearings, preload being determined by a collapsible spacer. The rear wheel hubs run on a single non-adjustable ballbearing which is fitted to the outer end of the rear axle housing. See also *Removal of a hub* on page 39.

Shock-absorbers: Hydraulic shock absorbers of the lever-type. The units are set during production and no attempt should be made to dismantle them without the use of special tools.

Shock-absorbers which do not function properly must be replaced. Only Armstrong Super Thin Shock-absorber Fluid should be used for topping-up. If this fluid is not available, any mineral oil of a reputable brand conforming to SAE 20/20W can be used. This alternative is not suitable for low-temperature operation.

Steering gear: Steering gear of the worm and needle-mounted peg type.

Removal:

(1) Disconnect the battery: on right-hand drive cars the battery must be removed. Remove the radiator. Disconnect the horn wire and remove the horn ring and the steering wheel. Disconnect the wiring from the ignition/starter switch.

(2) Remove the steering column cowl, the packing plate, wooden packing block and the rubber strip. Remove the cable clips from the steering column. Remove the windscreen-washer bottle on right-hand-drive cars.

(3) Jack up the car and disconnect the track rod and centre steering rod ball joints from the pitman arm; unscrew the steering gear attachment bolts and remove the steering gear from under the car.

Reinstallation is a reversal of the above procedure.

Do not tighten the bolts securing the steering-gear housing to the side-member until the steering column has been correctly positioned in the car.

Dismantling:

(1) Remove the pitman arm. Drain the oil and remove the top cover. Suitably support the steering-gear housing and tap out the pitman shaft. The peg can be removed after removal of a circlip.

(2) Remove the steering-gear end cover; gently tap the upper end of the steering worm shaft with a wooden block until the shaft can be withdrawn from the outer column. Remove the bearings.

(3) If necessary, the felt bush at the top of the mast jacket can be removed with a piece of hooked wire.

A new bush should be smeared with hypoid oil before installation.

Reassembly is done in the reverse order of dismantling. Shims should be fitted to the end cover until the worm shaft bearings have no end-float without being pre-loaded. The pitman shaft endfloat is adjusted when the steering gear is reinstalled in the car. Check that the front wheels are in the straight-ahead position and screw the adjuster down until there is no free movement. Note that there is slight end-float towards each lock. Top-up with the recommended oil and check that there is free movement from lock to lock.

Steering idler: The steering idler is supported in two bronze bearing bushes. The idler shaft is drilled for lubrication of the bushes. End-float is adjusted by adding or removing shims under the top cover. The idler shaft should turn freely without end-float when the top cover bolts are fully tightened.

Steering rod and track-rods: The steering rod and track-rods are equipped with non-adjustable ball joints. The centre steering rod is adjustable in order to correct toe-in.

Brakes: Girling hydraulically-operated footbrake on all four wheels. Mechanically-operated parking brake on the rear wheels only. The front brakes are of the two leading shoe type with a separate cylinder for each brake shoe; the rear brakes have a single-acting floating cylinder for both shoes. The rear wheel brake cylinders incorporate a mechanical expander, operated by the parking brake lever. When the brake shoes have been removed, make sure that the shorter hook of each retracting spring is hooked to a brake shoe.

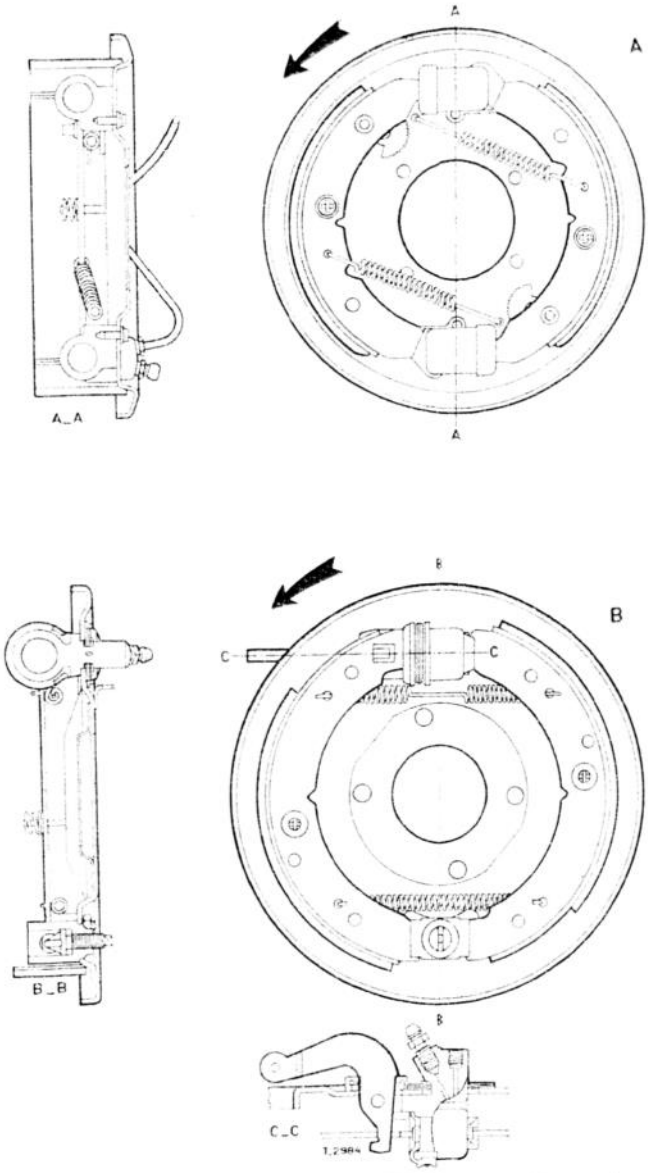
Specifications:

Diameter of drum:		9 in
Length of brake lining,	front:	8·625 in
	rear:	8·625 in
Width of brake lining,	front:	2·5 in
	rear:	1·75 in
Total brake lining area:		146·65 sq in

Brake adjustment:

Front brakes:

(1) Jack-up the car, spin the wheel and apply the footbrake hard to centralize the brake shoes.



A Front wheel brake assembly

B Rear wheel brake assembly

Fig. 25. Front and rear brake assembly

(2) Turn one of the square adjusters on the brake backplate in a clockwise direction, until the brake shoe is in contact with the brake drum; then turn back the adjuster two 'clicks'.
(3) Repeat these operations on the second adjuster and adjust the brake shoes of the opposite wheel in the same way.

Rear brakes:

(1) Place a block in front of one of the front wheels and jack-up the rear of the car. Spin the wheel and apply the footbrake hard to centralize the shoes.
(2) Turn the adjuster on the brake backplate in a clockwise direction until the brake shoes are in contact with the brake drum; then turn back the adjuster just enough to free the drum.
(3) Repeat these operations on the brake shoes of the opposite wheel.

Brake master cylinder: The brake master cylinder is built in unit with the brake fluid reservoir.

Keep the fluid reservoir about three-quarters full by topping-up with Castrol Girling Crimson Brake Fluid or any other fluid of a reputable brand, conforming to SAE 70 R3.

1 Retaining washer
2 Push-rod
3 Outlet
4 Plunger
5 Plunger seal
6 Spring thimble
7 Return spring
8 Valve spacer
9 Spring washer
10 Valve stem
11 Valve seal

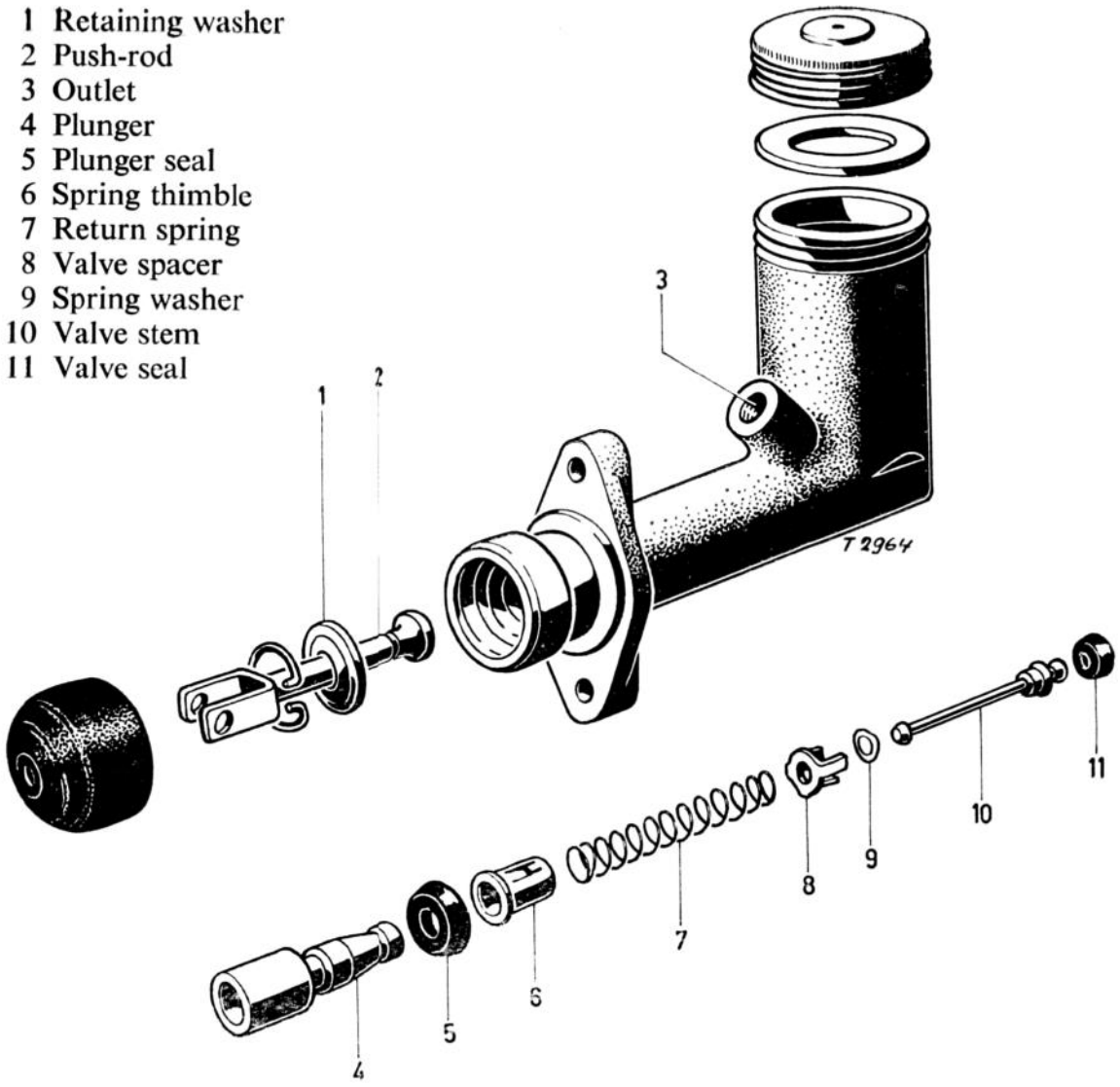


Fig. 26. Brake master cylinder

Wheels and tyres: Pressed-steel disc wheels with four bolt-holes.
Rim dimension: 4½J×14
Tyre size: 5·90—14
For tyre pressures see under *Lubrication and maintenance.*

ELECTRICAL EQUIPMENT

Electrical equipment: 12-volt, positive terminal connected to earth.

Wiring diagram: See Fig. 27.

Battery:

Type:	Lucas, type BT7A, 12-volt, 43 Ah at 20-hour rate
Cell electrolyte capacity:	½ pint
Normal recharge current:	5 A
Sg of electrolyte:	1·270–1·285 at normal temperature 70°F (21°C), fully charged
Sg of electrolyte:	1·110–1·130 at normal temperature 70°F (21°C), discharged

Add four points of specific gravity for every 10°F (5½°C) above 70°F.
Subtract four points of specific gravity for every 10°F (5½°C) below 70°F.

Generator: Lucas C39PV/2 or C40/1, two poles, shunt wound.

Cut-in speed:	1050–1200rpm
Maximum output:	13·5–19A
Field resistance:	6·0–6·30 Ohm
Maximum undercutting depth of the commutator insulation:	1/32in
Minimum permissible length of brushes:	11/32in
Brush spring tension:	20–25oz

Starter motor: Lucas M35 G1.

Number of brushes:	4
Brush spring tension:	30–40oz

Do not undercut the commutator insulation.

If the starter pinion becomes jammed in the starter ring gear, the starter pinion may be freed by placing a wrench on the square end of the armature shaft.

Control box: Lucas RB 106/2, or modified RB 106/2.

Cut-in voltage:	12·7–13·3V
Drop-off voltage:	8·5–11·0V
Reverse current:	5·0A (max.)
Regulator voltage at 20°C (68°F):	16·0–16·7V
(Early models with C39PV/2 generator):	15·4–16·4V

For every 10°C (18°F) above or below 20°C add, respectively subtract, 0·1V.

Fuses: A fuse block, containing two fuses (35 and 50A) and two spares, is mounted on the scuttle.

Lamp bulbs:	*Wattage*
Headlamps (right-hand drive) except Sweden:	50/40 (dip left)
Headlamps (right-hand drive), Sweden:	45/40 (vertical dip, hooded)
Headlamps (Europe), except France:	45/40 (vertical dip)
Headlamps (left-hand drive), France:	45/40 (vertical dip, yellow)
Headlamps (left-hand drive), except Europe:	50/40 (dip right)
Sidelamps:	6
Stop/taillamps:	21/6
Direction-indicator flasher:	21
Number-plate illumination:	6
Interior lamp:	6
Reversing lamp:	21
Instrument illumination and warning lights:	2·2
Direction-indicator warning light (Lilliput bulb):	1·5

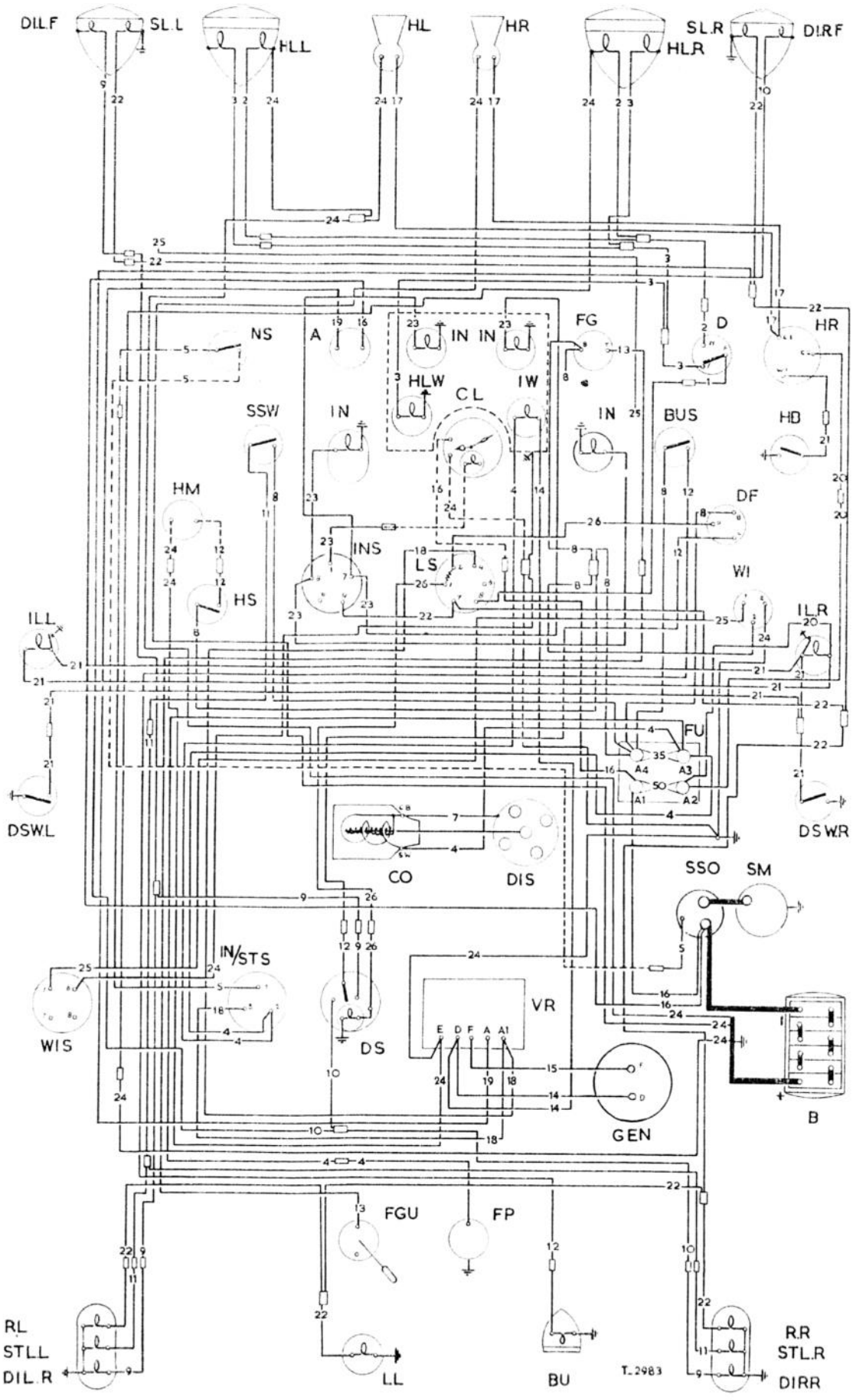


Fig. 27. Wiring diagram

Key to Fig. 27:

A	Ammeter
B	Battery
BU	Reversing lamp
BUS	Reversing lamp switch
CL	Clock
CO	Coil
D	Dimmer switch
DF	Direction-indicator flasher
DI.L.F	Direction-indicator, left front
DI.L.R	Direction-indicator, left rear
DI.R.F	Direction-indicator, right front
DI.R.R	Direction-indicator, right rear
DIS	Distributor
DS	Direction-indicator switch
DSW.L	Door switch, left
DSW.R	Door switch, right
FG	Fuel gauge
FGU	Fuel tank gauge unit
FP	Fuel pump
FU	Fuses
GEN	Generator
H.L	Horn, left
H.R	Horn, right
HB	Horn ring
HL.L	Headlamp, left
HL.R	Headlamp, right
HLW	Main beam warning light
HM	Heater motor
HR	Horn relay
HS	Heater motor switch
IL.L	Interior light, left
IL.R	Interior light, right
IN	Instrument light
INS	Instrument light switch
IS/STS	Ignition/starter switch
IW	Ignition/generator warning light
LL	Number-plate lamp
LS	Light switch
NS	Neutral switch (if automatic transmission is fitted)
R.L	Rearlamp, left
R.R	Rearlamp, right
SL.L	Sidelamp, left
SL.R	Sidelamp, right
SM	Starter motor
SSO	Starter solenoid
SSW	Stoplamp switch
STL.L	Stoplamp, left
STL.R	Stoplamp, right
TG	Water temperature gauge
TGS	Water temperature gauge sender unit
VR	Voltage regulator
WI	Windscreen-wiper
WIS	Windscreen-wiper switch

Key to wire colours (*Fig.* 27):

1 Blue	8 Green	15 Yellow/green	22 Red
2 Blue/red	9 Green/red	16 Brown	23 Red/white
3 Blue/white	10 Green/white	17 Brown/yellow	24 Black
4 White	11 Green/purple	18 Brown/blue	25 Black/green
5 White/red	12 Green/brown	19 Brown/white	26 Light green
6 White/purple	13 Green/black	20 Brown/green	
7 White/black	14 Yellow	21 Brown/black	

RILEY 4/72

SALOONS
from 1961

NOTE: This supplement is to be used in conjunction with the description of the Riley 4/Sixty Eight, and deals only with the principal differences found in the 4/Seventy Two model.

General

INTRODUCTION

The Riley 4/Seventy Two (ADO.38) Saloon, model R/HS3, followed the preceding 4/Sixty Eight (ADO.9) model on 12th October 1961.

Externally the 4/Seventy Two is identical to the 4/Sixty Eight model. Technical modifications include increased cylinder bore and larger valves, which contribute towards a higher output, and the availability of the Borg-Warner model '35' torque converter type automatic 'three-speed' transmission.

For more details of these modifications see page 57.

IDENTIFICATION

Chassis or Car Serial Number

This number is located on a plate mounted on the bulkhead, in the engine compartment. The number is prefixed by the model identification symbol (R/HS3).

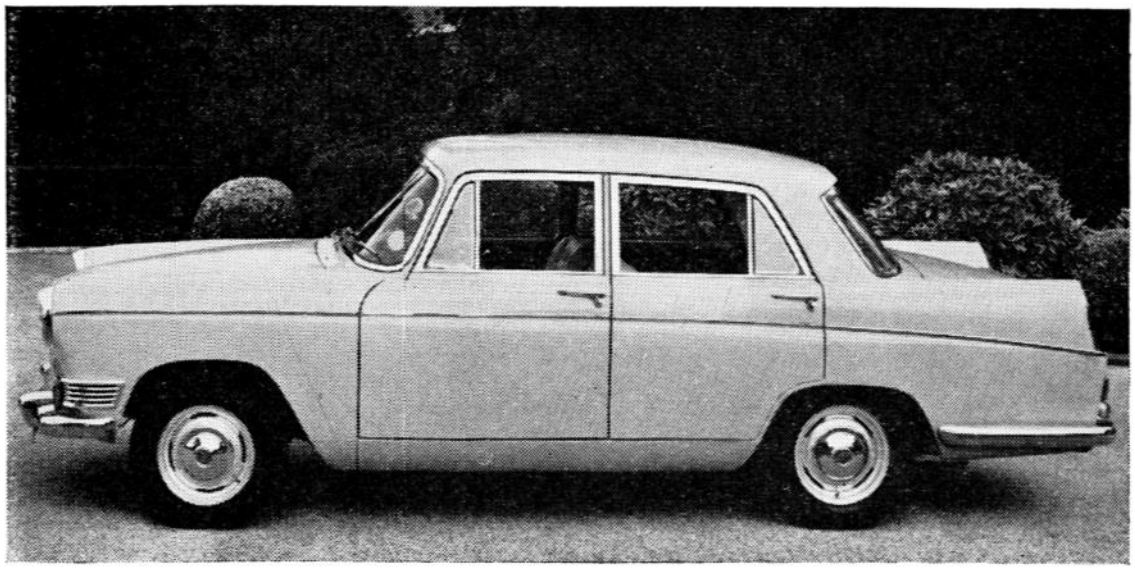


Fig. 28. Riley 4/Seventy Two Saloon, model R/HS3

NOTE: If the car is fitted with left-hand drive, the letter 'L' is added to the model identification symbol.

Chassis Serial Numbers (for guidance only)
October 1961 (starting) 11101
January 1962: 11783

NOTE: Although the 4/Seventy Two model was introduced in October 1961, actual production commenced during the preceding month.

Engine Number
The engine number is stamped on a metal plate fixed to the cylinder block, on the right-hand side.

The number is prefixed by the engine type symbol, e.g. 16RA-U-H-12345.

Explanation of engine number prefix
See page 4.

Gearbox and Rear Axle Number
See page 4.

Body number
The body serial number is stamped on a plate which is secured to the front right-hand wing valance, in the engine compartment.

MODIFICATIONS

NOTE: For modifications of a purely technical nature see *Repair Data* on page 67.

1961 (1962 model)
As compared to the preceding 4/Sixty Eight model, the following major changes were made:

Engine: The power output was increased to 68 bhp (net) at 5,000 rpm and the cubic capacity enlarged to 1,622 cc by increasing the cylinder bore to 76·2 mm, giving a piston area of 28·3 sq. in. Larger valves with double valve springs, modified pistons, piston pins (gudgeon pins), connecting rods, and crankshaft.

The torque was increased from 82 to 89ft lb at 2,500 rpm. Advantage of this was taken to reduce engine speed in relation to road speed by 5·5%, which puts the road speed at 1,000 rpm to 16·62 mph instead of 15·63 mph.

The silencing system was revised, and now has double expansion chambers.

Transmission: Two gear change options, viz four-speed gearbox with improved floor-mounted gear change lever, and 'three-speed' Borg-Warner model '35' automatic transmission. The automatic transmission consists of a hydraulic torque converter, which provides a fluid connection between the engine and the gearbox, which has a planetary gear set providing three forward ratios and one reverse. For a more detailed description of this transmission see page 58.

The final drive ratio was changed from 4·55 : 1 to 4·3 : 1, which steps up the effective gearing (see under *Technical Specifications* on page 64).

Suspension and wheels: The suspension was modified to improve ride and stability. Stronger Armstrong Heavy Duty shock absorbers were fitted in addition to rear springs with increased deflection, a stabilizer bar at the rear and an anti-roll bar at the front. Stability was further improved by widening the track and lengthening the wheel base. At the front this was achieved by mounting the existing suspension

units on a cross member which is wider and stiffer than the previous design, and at the rear by displacing the (now wider) axle rearwards by one inch. The combination of reduced roll resistance at the rear, and increase at the front, together with the introduction of the anti-roll bar, has increased comfort over bad roads and provided a more powerful understeer characteristic.

Wheel rim size was changed from 4½in to 4in.

Steering: Lower steering gear ratio; turning circle 37ft.

Body: The body of the 4/Seventy Two model remained virtually unchanged. More space is provided for the rear-seat passengers by virtue of the fact that the rear wheel arches now occupy less space in the rear compartment. In the front compartment, the bucket seats may now be more conveniently adjusted.

Electrical equipment: Sealed beam headlamps. SU type SP electric fuel pump. Repositioned ignition/starter switch on facia panel.

Dimensions: Wheelbase increased from 8ft 3-3/16in to 8ft 4¼in; track increased at front from 4ft 0 $\frac{9}{16}$in to 4ft 2$\frac{1}{8}$in, at rear from 4ft 1$\frac{7}{8}$in to 4ft 3$\frac{3}{8}$in. See also page 64.

PRICES

UK prices are ex-works home retail prices. Prices for October 1961 and January 1962 include 10% tax surcharge.

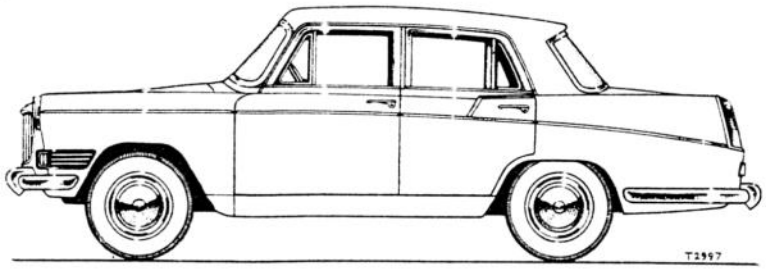


Fig. 29. Riley 4/Seventy Two Saloon, model R/HS3

	Basic	*Total*
UK October 1961	£745	£1,087 13 11
January 1962	£745	£1,087 13 11
May 1962	£745	£1,025 7 9

Optional extras (May 1962)

	Basic	*Total*
Automatic Transmission	£68 0 0	£93 10 0
Duo-tone paint finish	£12 10 0	£17 3 9

INSTRUMENTS AND CONTROLS

The location of the ignition/starter switch and the windscreen washer control was changed.

The ignition/starter switch is now located at the extreme end of the facia, on the driver's side, below the lighting switch. The windscreen washer control is adjacent to it.

AUTOMATIC TRANSMISSION

Description

The automatic transmission which can be supplied at extra cost on the Riley 1·6 litre ADO.38 model is the 'three-speed' Borg-Warner model '35', which was

specially designed and developed for vehicles of under 2 litres cubic capacity. It consists of a hydraulic torque converter and gearbox with a planetary gear set, providing three forward ratios and one reverse. Use is made of high-pressure die casting techniques, developed by Doehler-Jarvis, and the main castings for gearbox and torque converter are made from aluminium alloy, which combines thin walls with exceptional soundness of material and ample rigidity, yet the total weight of the gearbox is no more than 90lb, only 13lb more than the standard gearbox, which weighs 77lb. The torque converter (filled) weighs 47lb whereas the standard clutch and flywheel weigh 60lb, so that overall there is no difference in weight.

Principles of operation

In practice, the driver has the choice between automatic gear-changing, with ratios that have been selected to provide maximum performance under all conditions, and leisurely top-gear motoring at any speed between 15mph and the car's maximum. Lower ratios may also be engaged and held by other means if desired.

The engine can only be started with the selector lever (Fig. 30) in either the 'N' (Neutral) or 'P' (Park) position. Once the engine is running, if the selector lever is moved to the 'D' (Drive) position, and the accelerator pedal depressed, the car will move away smoothly, upward and downward gear-changes taking place entirely automatically, according to the car's speed and the degree of throttle opening.

NOTE: See page 68 for towing and push-starting instructions.

On a level road, if the accelerator is depressed lightly to the point where the throttle is fully open, upward gear-changes will take place at 20 and 39mph. If, however, only the minimum throttle is used, the upward changes will occur at speeds as low as 7 and 11mph and at proportionate speeds for intermediate throttle openings.

The driver has yet another choice, in that by pressing still harder on the throttle pedal, it may be moved slightly beyond the full throttle position against the supplementary spring. This is known as the 'detent' position and if it is used, upward gear-changes will be delayed until 30 and 50mph, giving maximum acceleration.

Once top gear is engaged, a change down to second will not take place until the speed drops to below 15mph, even if full throttle (but without 'detent') is used. At the lower end of this top gear speed range, the fluid torque-converter will 'slip' and multiply the available torque, being particularly effective at around 20mph, enabling smooth motoring to be enjoyed in a leisurely manner without any gear changes over a very wide speed range.

However, if greater acceleration is required, the accelerator pedal may be depressed to the 'detent' position. In this case, at any speed below 42mph the gearbox will immediately change down to second gear, or if the speed is below 23mph, directly to first gear, giving a very lively performance for a car of this size. Upward changes will then be made at the speeds mentioned earlier until top gear is engaged again.

Similarly, if a steep gradient is encountered, and the car's speed falls away, top gear will normally be held until the speed drops to below 15mph, even at full throttle, unless 'detent' is used, when down-changes will be made at 42 and 23mph.

If the car is started from rest with the selector lever in the 'L' (Low) position, first gear will be held regardless of throttle opening and no upward change will take place, unless the lever is moved to the 'D' position, when changes will take place normally as before. If, when driving with top gear engaged, the selector

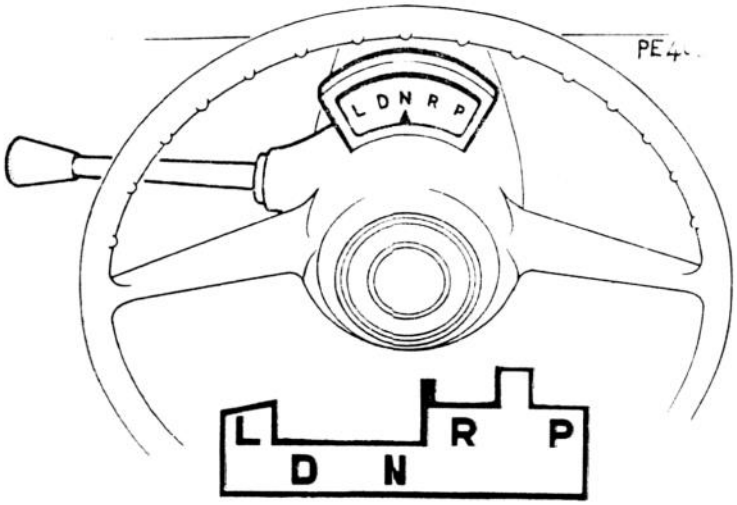


Fig. 30. Selector: The steering column selector lever is so connected that the engine can only be started when it is in the 'N' or 'P' position. The driver can over-ride the automatic gear changes effected in the 'D' position by a simple downward movement to 'L' which will normally engage second gear. At very low speeds or if the car is started from rest in position 'L', first gear will be held irrespective of throttle position.

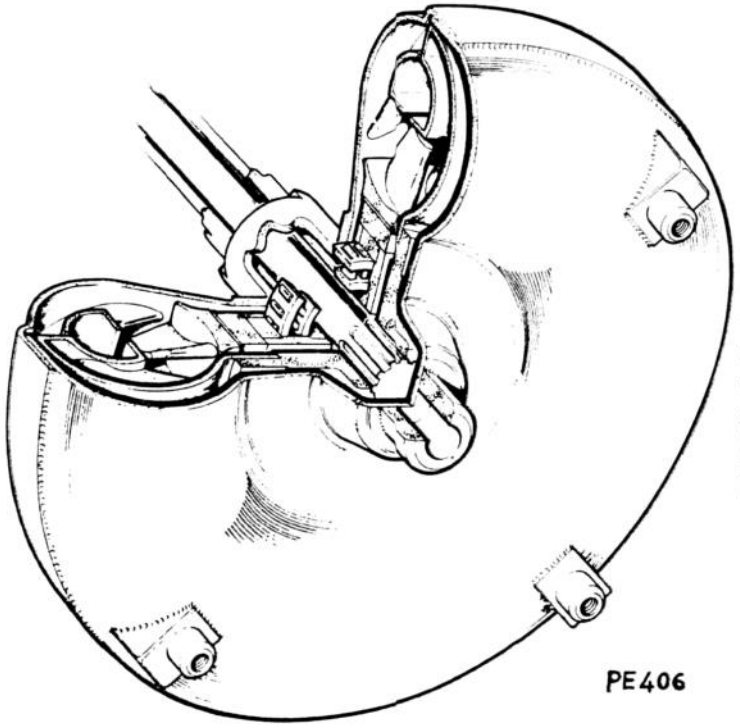
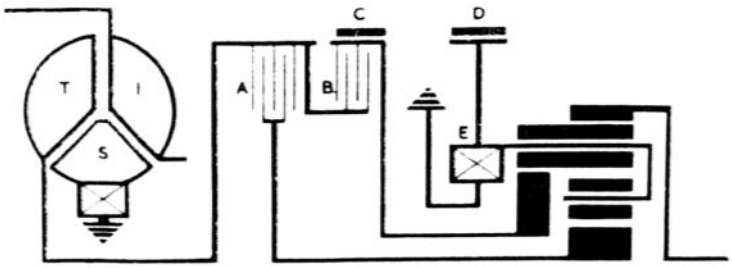


Fig. 31. Torque converter: The three-element torque converter acts as a fluid coupling and also doubles engine torque when the engine is running and the car is at rest, thus providing an 'equivalent' bottom gear of 4·78:1.

is moved from 'D' to 'L', (it is not recommended that this be done at above 60 m p h), an immediate change down to second gear will be made and from then on, second will be held engaged, regardless of throttle opening, unless the speed drops below 5 m p h, when a change to first gear will be made. First gear will now be locked in engagement as before and no further up-change will be made. Similarly, if second gear is already engaged when the selector is moved from 'D' to 'L', this gear will be held unless the speed drops below 5 m p h when a change to first gear will be made. Thus full engine braking in the lower gears is always available for the descent of steep hills, and second gear can always be selected manually if desired for cornering,



	A	B	C	D	E
LOCK UP 1	★			★	
DRIVE 1	★				★
LOCK UP 2 DRIVE 2	★		★		
DRIVE 3	★	★			
NEUTRAL					
REVERSE		★		★	
PARK					

Fig. 32. Power flow diagram: The path of torque from the converter to the propeller shaft is shown schematically in this diagram. The 'stars' in the table show which of the multi-plate clutches A and B, the band brakes C and D, and the over-running free wheel E, are in use for any particular gear combination.

(Lock up='Low' position)

or held, for example when climbing a hill with many bends, when continuous automatic changes up and down would be undesirable. On moving the selector back again to 'D' normal automatic control is resumed.

Reverse ('R') and Park ('P') should only be selected when the car is stationary; in the latter position, the transmission is mechanically locked.

First Gear (*Low selected, as shown in Fig.* 33)

The front clutch is applied, connecting the converter to the forward sun gear. The rear band is applied, holding the pinion carrier stationary; the gear set provides a reduction of 2·39 : 1. The reverse sun gear rotates freely in the opposite direction to the forward sun gear.

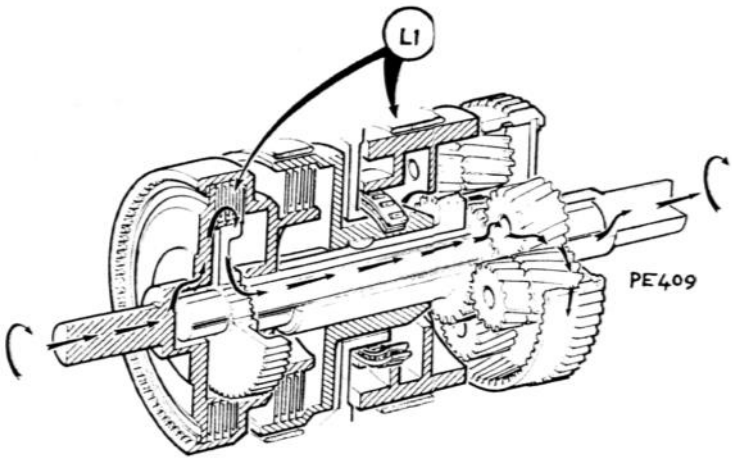


Fig. 33. Emergency low: With this combination bottom gear remains engaged both when driving, and on the over-run, irrespective of throttle position.

First Gear (*Drive selected, as shown in Fig.* 34)

The front clutch is applied connecting the converter to the forward sun gear. The one-way clutch is in operation preventing the pinion carrier from rotation-clockwise; the gear set provides the reduction of 2·39 : 1. When the car is coasting the one-way clutch overruns, and the gear set freewheels.

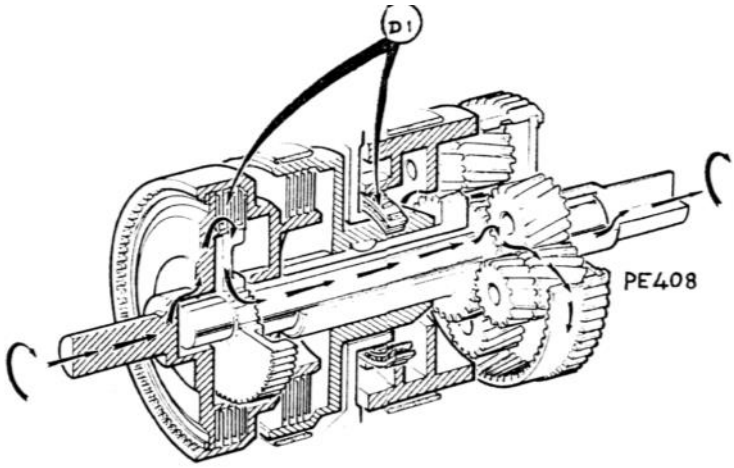


Fig. 34. Normal low: With this combination of clutches a bottom gear of 2·39:1 is provided with an over-running free wheel. The change speeds are :
Second at 7 mph on minimum throttle.
Second at 20 mph at full throttle.
Second at 39 mph on 'detent'.

Second Gear (*Low or Drive selected as shown in Fig.* 35)
Again the front clutch is applied, connecting the converter to the forward sun gear. The front band is applied holding the reverse sun gear stationary; the gear set provides a reduction of 1·45 : 1.

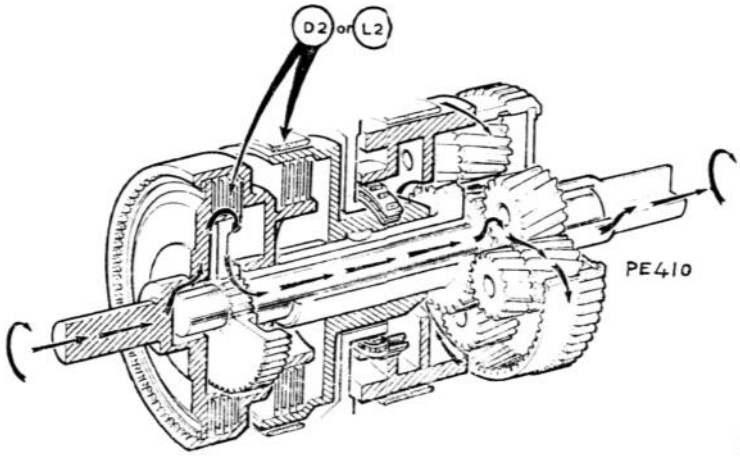


Fig. 35. Alternative intermediate ratios: This drawing shows the clutch and gear combination in the second ratio of 1·45:1. With the lever in position 'L' this gear will be held at all speeds over 5 mph on closed throttle. In the 'D' position automatic gear changes will be made at:
11 mph up to top on minimum throttle.
39 mph up to top on full throttle.
50 mph up to top on 'detent'.
Downward changes to first gear will automatically be effected at:
23 mph on 'detent'.
2 mph in other conditions.

Third Gear (*Direct Drive, as shown in Fig.* 36)
The front clutch is applied, connecting the converter to the forward sun gear. The rear clutch is also applied thereby connecting the converter to the reverse sun gear also. Both sun gears are therefore locked together, the gear set rotating as one unit, thereby providing a ratio of 1 : 1.

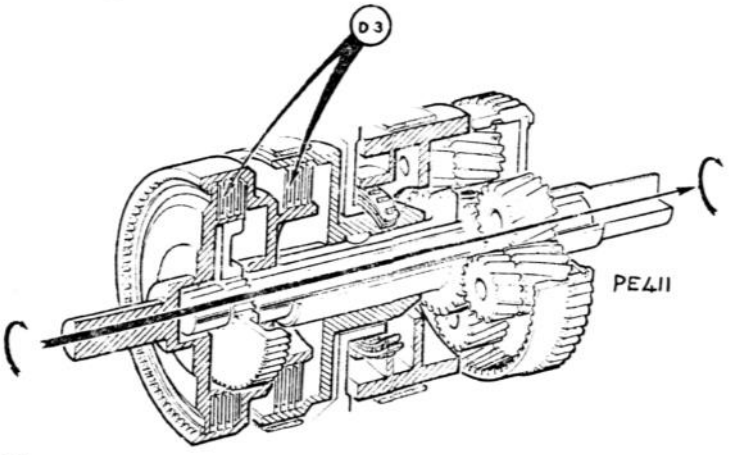


Fig. 36. Direct drive: In this condition the drive is taken straight through the gearbox from end to end. With the lever at 'D' automatic downward changes will be made to second gear at the following speeds:
On minimum throttle at 6 mph.
On full throttle at 11 mph.
On 'detent' at 42 mph.

Neutral

The front and rear clutches are off and no power is transmitted from the converter to the gear set. The front and rear bands are also inoperative.

Park

The situation is mainly the same as in 'Neutral', the only difference being that in 'Park' the parking pawl is engaging the parking pawl gear, thus preventing the car from rolling.

Reverse

The rear clutch is applied, connecting the converter to the reverse sun gear. The rear band is applied holding the pinion carrier stationary. The gear set provides a reduction of 2·09 in the reverse direction.

NOTE: Since in this transmission no automatic lock-out system is used to prevent the engagement of 'Reverse' or 'Park' at speed, the selector lever must *on no account* be placed in 'P' until the car has come to a *complete stop*. Neither should 'R' be selected while travelling at anything over the merest 'crawl', since doing so could cause severe damage to the transmission components and drive line. In order to 'rock' the car out of deep snow, loose sand or mud, however, the selector may be moved alternately from D" to 'R' while the engine is running at fast idle.

ELECTRICAL EQUIPMENT

The electrical equipment is basically similar to that of the preceding model. Sealed-beam headlamp units are now standard equipment. The fuel pump is an SU type SP unit.

BODY

The body construction is basically similar to that of the 4/68 model. The differences are detailed under 'Modifications' on page 57. Interior trim is leather, with leather-cloth on non-wearing parts.

COLOURS

	Paintwork	*Upholstery*	*Carpet*
Single tone	Dove grey	Crimson	Crimson
	Dove grey	green	green
	Dove grey	blue	blue
	Arianca beige	Mushroom	beige
	Arianca beige	Crimson	Crimson
	Maroon	Crimson	Crimson
	Maroon	Mushroom	beige
	Black	Crimson	Crimson
	Black	blue	blue
	Iris blue	blue	blue
	Almond green	green	green

Duo-tone

Arianca beige and Sandy beige.
Dove grey and Old English white.
Almond green and Porcelain green.
Iris blue and Old English white.

NOTE: the first colour is always the top colour; the upholstery and carpet schemes are the same as those available for the top colour in the single tone schemes. The road wheels are in all cases finished in aluminium colour.

Dimensions and Weights

EXTERIOR DIMENSIONS

Similar to 4/68 model (see Fig. 6) except for:

		Inches
1.	Wheelbase	$100\frac{1}{4}$
2.	Track, front	$50\frac{5}{8}$
3.	Track, rear	$51\frac{3}{8}$
4.	Total length	$178\frac{1}{8}$
5.	Total width	$63\frac{1}{2}$
6.	Total height	$58\frac{1}{8}$

INTERIOR DIMENSIONS

Basically similar to 4/68 model. Greater effective width of rear seat owing to the reshaped wheel arches.

WEIGHTS

Unladen weight, approximately 2,500 lb.

Technical Specifications

ENGINE

1.	Type	water-cooled, in line, ohv petrol engine
2.	Number of cylinders	4
3.	Bore and stroke	3·00 × 3·5in. 76·2 × 88·9mm
4.	Piston displacement	98·94 cu. in. 1,622cc
5.	Compression ratio	8·3 : 1
6.	Stroke/bore ratio	1·16 : 1
7.	Total piston area	28·3 sq in.

PERFORMANCE

1.	Maximum bhp (net)	68 at 5,000 rpm
	Maximum bhp (gross)	71 at 5,000 rpm
2.	Brake mean effective pressure at max. torque	136 lb/sq in.
3.	Maximum torque	89 ft lb at 2,500 rpm
4.	Bhp per sq in. piston area (gross)	2·51
5.	Bhp per litre (gross)	44·4
6.	Mean piston speed	2,915 ft/min at 5,000 rpm

GEAR RATIOS

	*Gearbox**	*Total*
First gear:	3·636 : 1	15·64 : 1
Second gear:	2·214 : 1	9·52 : 1

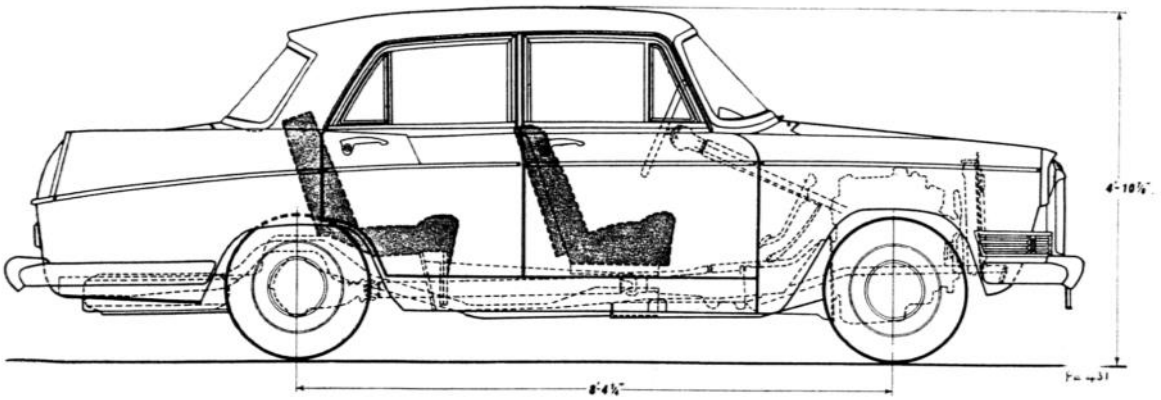


Fig. 37. Riley 4/Seventy Two (ADO.38), general arrangement

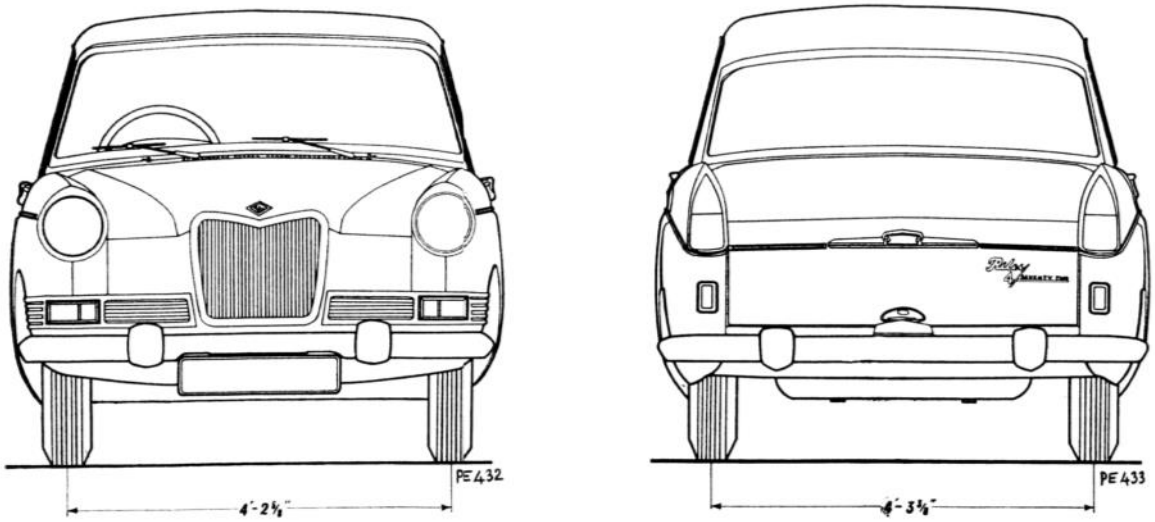


Fig. 38. Riley 4/Seventy Two, front and rear elevation

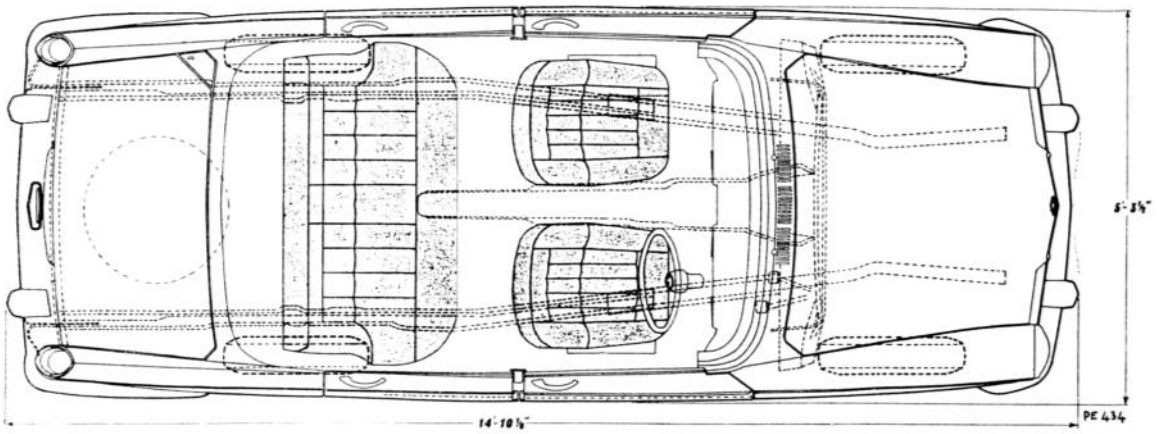


Fig. 39. Riley 4/Seventy Two, plan view

Third gear:	1·374 : 1	5·91 : 1
Top gear:	1·000 : 1	4·30 : 1
Reverse:	4·755 : 1	20·45 : 1
Rear axle ratio:	4·3 : 1	
Tyre size:	5·90–14	

★ Manual gearbox; ratios for automatic transmission are: first gear 2·39 : 1, second gear 1·45 : 1, top gear 1·00 : 1, reverse 2·09 : 1.

THEORETICAL ROAD SPEEDS

(*Road speeds in mph, piston speeds in ft/min*)

	rpm	*1st gear*	*2nd gear*	*3rd gear*	*top gear*	*Piston speed*
(*a*)	1000	4·57	7·50	12·09	16·62	583
(*b*)	2500	11·42	18·75	30·22	41·55	1457
(*c*)	5000	22·85	37·50	60·45	83·10	2915

(*b*) = rpm at max. power
(*c*) = rpm at max. torque

ROAD TEST

(*Saloon with automatic transmission*)

Maximum speeds:	in low gear	34 mph
	in intermediate gear	53 mph
	in top gear	86 mph
Acceleration:	0-30 mph in 5·5 sec.	
	0-40 mph in 8·9 sec.	
	0-50 mph in 13·4 sec.	
	0-60 mph in 20·0 sec.	
	0–70 mph in 31·1 sec.	
Fuel consumption:	at steady 30 mph: 37·6 mpg	
	at steady 40 mph: 32·6 mpg	
	at steady 50 mph: 29·6 mpg	
	at steady 60 mph: 26·6 mpg	
	at steady 70 mph: 23·6 mpg	
	touring fuel consumption: 27·6 mpg	

Lubrication and Maintenance

As for 4/68 *Model, except:*

Automatic Transmission (if fitted)

Fluid capacity: 11·25 Imp pints (13·5 U S pints), including 5 Imp pints (6 U S pints) in torque converter.

Recommended fluid: Automatic Transmission Fluid Type A, Suffix A.

Filler tube: The filler tube with breather is on the right-hand side of the transmission and extends into the engine compartment, just forward of the bulkhead.

Dipstick: The dipstick is located in the filler tube. The difference between the 'LOW' and 'HIGH' marks is 1 Imp pint (1·2 US pints).

Checking fluid level and topping-up—Every 3,000 *miles*

NOTE: Scrupulous cleanliness is essential during this procedure.

Drive the car on to a level surface with engine and transmission at normal running temperature. Select position 'P' and allow the engine to idle for two minutes. With the engine still idling in 'P' withdraw the dipstick from the filler tube and wipe it with a clean, lint-free cloth or paper. Insert the dipstick again and withdraw it immediately. If necessary add fluid to bring the level to the 'HIGH' mark.

Do not overfill. Frequent need for topping-up indicates leakage, which should be rectified immediately in order to prevent damage to the transmission.

Grease nipples

The grease nipples on the steering linkage joints and rear spring shackles have been omitted. The remaining nipples are two for each king pin, one for each lower suspension arm, one for each propeller shaft universal joint and one for the parking brake cable. They need attention at 1,000 miles intervals.

Repair Data

NOTE: *Repair data are generally similar to those of the preceding model. The principal differences in specifications are stated below.*

ENGINE

Engine type

BMC Series 'B' type 16 RA, 98·94 cu. in. (1·622cc)

Cylinder block

Cylinder bore: 3·00 in. (76·2mm)

Pistons

Solid-skirt, controlled-expansion aluminium-alloy pistons.

Piston pins (gudgeon pins)

Enlarged piston pins.
Diameter: 0·75in.

Connecting rods

Larger section connecting rods.

Crankshaft and main bearings

Modified crankshaft, with thicker webs; slightly reduced main bearing width.
Main bearing dimensions: 2·00in × 1·218in.
Copper-lead bearing material.

Valves

Cast-iron valve rocker brackets.
Enlarged valves, double valve springs.
Valve material, inlet: Silchrome 1
exhaust: 21-4NS
Valve head diameter, inlet: 1·562in.
exhaust: 1·343in.

Ignition system

Static ignition timing: 4° BTDC.
Advance degrees, centrifugal: 26° vacuum: 8°
Advance commences at 700 rpm, ends at 3,700 rpm.

Fuel pump
Make SU, type SP.

The pump is located on the luggage compartment lid hinge bracket. To gain access to the fuel pump, remove the fuel tank cover. The fuel pump filter should be cleaned every 6,000 miles. Release the fuel pipe from the inlet connection and remove the filter. Clean the filter in clean fuel with a soft brush and replace it in the reverse order of removal.

Exhaust system
Silencing system bore increased by $\frac{1}{8}$ in; extra silencer.

TRANSMISSION

Clutch
Stronger clutch springs. Larger slave cylinder.

Gearbox (manual)
Strengthened fork rod detents; improved second and third gear mainshaft bush material, to prevent gear jumping; first and reverse gear teeth chamfered to provide easier engagement.

Automatic transmission (*optional equipment*)
Borg-Warner type '35' hydraulic torque converter with 'three-speed' planetary type gear box. For description see page 58, for periodical maintenance see page 66. For emergency starting the car may be push- or tow-started, but pushing is recommended since it avoids the danger of the car over-running the towing vehicle. Proceed as follows: select position 'N', switch the ignition on, set the mixture control (choke), and release the parking brake; allow the car to attain a speed of approximately 25 mph, then select position 'L'. When the car has to be towed, always check the fluid level in the transmission, and top up if necessary (as described under 'Lubrication and Maintenance').

If there is any reason to suspect that the transmission is damaged or faulty, the propeller shaft must be removed or, alternatively, the rear wheels lifted clear of the ground, before towing commences. When towing select position 'N' and ensure that the parking brake is released.

Rear axle/Differential
The rear axle housing is wider than that of the preceding models, to provide a wider track. The final drive ratio was changed, as outlined on page 57.

CHASSIS

Chassis/Body construction
Body and chassis are welded together and form a single unit, which is basically similar to that of the preceding models. The rear wheel arches were slightly modified, due to the longer wheelbase.

Front suspension
The front suspension is basically identical to that of the preceding models, but the cross member to which the suspension units are fitted is wider and stiffer. A 0·69in. diameter anti-roll bar is now fitted.

Front wheel alignment

Camber: $\frac{3}{4}°$ to 1°
Caster: $1\frac{1}{2}°$
S.A.I.: $6\frac{1}{2}°$
Toe-in: $\frac{1}{16}$ to $\frac{1}{8}$in.

Rear suspension
The rear springs have a lower spring rate and less negative camber. The rear axle has been placed 1 inch farther back on the springs. Addition of 0·55in diameter stabilizer bar.

Shock absorbers
Heavy duty Armstrong lever-type two-valve, variable leak shock absorbers, incorporating minor construction changes.

Wheels and tyres
Wheel rim size changed from 4½in to 4in.

ELECTRICAL EQUIPMENT

Tail/stop/flasher lamp units
These bulbs can be removed with the bulb holders by pulling them from the sockets in the back-plate of the lamp, inside the luggage compartment. The upper bulb is for the flashing indicator and is of the single-filament type. The lower one is for the tail/stop lamp and is of the twin-filament type. Correct replacement is ensured by the offset peg bayonet fixing.

ENGINE FAULT FINDING CHART

Engine will not start

A. Starter does not crank engine	
Battery run down	*Recharge; replace if defective*
Battery posts and terminals loose or corroded	*Clean and tighten. If badly corroded, soak with water to facilitate removal and avoid damage to the battery posts*
Faulty starter switch or solenoid, if fitted; broken battery cable or loose connection	*Check wires and cables; check solenoid and switch, replace if defective*
Starter motor defective	*Repair or replace*
Starter drive stuck (starter will run, but does not crank engine)	*Clean and if necessary repair or replace*
Starter drive pinion jammed with starter ring gear	*Free by rotating squared end of starter spindle with a spanner*
B. Starter cranks engine slowly	
Battery partly run down	*Recharge; replace if defective*
Loose or corroded connections	*Clean and tighten*
Faulty starter switch or solenoid; partly broken cable or loose connection	*Check wires and cables; check solenoid and switch, replace if necessary*
Starter motor defective	*Repair or replace*
C. Starter cranks engine, but engine will not start	
Trouble in ignition system:	
No spark at plugs:	
Moisture on spark plugs, ignition distributor, coil and wires (this trouble often occurs after parking overnight in foggy or rainy weather)	*Clean and dry. Avoid recurrence by coating wires, distributor rotor, cap, coil and spark plug insulators with moisture-proof lacquer*
Spark plugs flooded, due to excessive use of choke	*Start engine on full throttle. If this does not help, clean plugs. With plugs removed, turn over the crankshaft a few times to blow the accumulated fuel from the cylinders*

Spark plugs oiled up	*Clean; if necessary replace*
Spark plug insulator cracked	*Replace*
Spark plug gap too wide or too close	*Reset gap*
No spark at distributor:	
Loose, broken or shorted low-tension lead between coil and/or inside distributor	*Check and tighten; also check internal leads in distributor. These leads sometimes break inside their insulation, and the break is not always visible. Pull carefully on one end; a broken lead will stretch*
Cracked rotor or distributor cap	*Replace*
Contact breaker points dirty, worn or maladjusted	*Clean and adjust; if necessary replace Free; if necessary replace*
Carbon brush in distributor cap not making contact	*Replace*
Faulty condenser	*Replace*
No spark at coil:	
High tension lead loose or broken	*Check wiring, repair or replace; check*
Broken or loose low-tension leads or faulty ignition switch	*switch, replace if defective*
D. Starter cranks engine, but engine will not start	
Trouble in fuel system:	
No petrol in carburettor:	
Empty fuel tank	*Fill-up. If necessary, check and repair or replace fuel gauge*
Obstructed or damaged fuel pipe	*Clean; if necessary repair or replace*
Air leak in petrol line	*Check and repair or replace. Pay special attention to flexible fuel line (if fitted). If flexible fuel line is porous, a temporary 'get-you-home' repair can often be made by securely wrapping the line with friction tape or rubbing with hard soap*
Fuel filter clogged	*Clean and refit with new gasket. Always carry a spare gasket and a glass filter bowl, if so equipped*

Fuel pump defective	*Repair or replace. If electric pump does not function, lightly tap pump housing until ticking resumes*
Petrol in carburettor:	
Jets clogged	*Clean; blow out with air (never use wire to clean jets)*
Float needle stuck	*Clean or replace*
Carburettor flooded	*Clean float needle valve; if necessary replace. If this trouble persists, check fuel pump pressure*
Choke control faulty	*Repair or replace*
Air leak at inlet manifold or carburettor base	*Check nuts and bolts for tightness; if necessary replace gaskets*
Water or dirt in carburettor	*Clean. If this trouble persists, check rubber hose in fuel tank filler neck for damage or looseness, causing water to enter tank*

NOTE: *If ignition system and carburettor are in order, yet the engine will not start, check timing*

Engine starts but does not run properly

E. Engine misfires	
Ignition trouble	
Spark plug or coil leads loose or damaged	*Tighten; replace if necessary*
Incorrect spark plug gap	*Regap*
Cracked spark plug insulator	*Replace faulty spark plug*
Spark plug oiled up	*Clean, if necessary replace with spark plug of correct type. If trouble persists, check for mechanical trouble*
Cracked distributor cap	*Replace*
Loose connection in primary circuit	*Check and repair. Also check, and if necessary replace, ignition switch. In rare cases the ammeter has been found to be the cause of this trouble, due to faulty internal connection*
Distributor otherwise faulty	*See* **C**
Trouble in fuel system	*See* **D**

Mechanical trouble	
Incorrect valve clearance	*Adjust*
Valve sticking	*Try to free by pouring a gum solvent of good quality into carburettor air intake; if not successful, dismantle and repair*
Valve spring broken	*Replace. Usually the valve concerned will have to be ground*
Worn piston, piston rings and cylinder or burnt valve; cylinder-head gasket blown	*Test compression; if too low, dismantle for repairs*
F. Engine starts and stops	
Trouble in ignition or fuel system:	*See* **C** *and* **D**
Obstructed exhaust system	*Check and repair or replace*
G. Engine runs on wide throttle only	
Idle jet clogged or mixture improperly adjusted	*Clean idle jet and/or idle air bleed; adjust*
Valve sticking or burnt; valve spring broken; other mechanical trouble	*Check and repair. Pay special attention to heat riser, if so equipped, since a burnt heat riser tube will cause exhaust gas to enter intake manifold. This will sometimes cause backfiring in carburettor*
H. Lack of power	
Ignition too far retarded or other ignition trouble	*Check and correct* (*See* **C**)
Obstructed exhaust system	*Dented exhaust pipe and/or muffler* *Dislocated baffle plate or muffler* *Replace*
Trouble in fuel system	*Check and correct* (*See* **D**)
Loss of compression	*Test compression; if found to be too low, check valve clearance. If valve clearance is properly adjusted and compression is still low, check for other mechanical trouble, such as burnt valves and/or worn pistons, rings and cylinders*
Dragging brakes	*Check and correct. Essentially this is not an engine trouble*

I. Engine runs roughly	
Ignition timing incorrect	*Check and correct. Pay attention to possibly stuck advance mechanism, because the fixed advance may be correctly adjusted, yet the timing while running will be incorrect if the automatic advance is stuck*
Lean or rich mixture	*Check carburettor and fuel system, see* **D**
Improperly adjusted valve clearance	*Check and correct*
J. Engine knocks	
Ignition too far advanced	*Check and correct. Attend to possibly stuck advance mechanism, see* **I**
Excessive carbon deposit	*Decarbonize*
Loose bearings or pistons or other mechanical cause	*Check and repair*
K. Engine overheats	
Cooling system:	
Lack of water	*Top-up and check for leaks*
Fan belt loose or broken	*Check and adjust or replace*
Radiator clogged by insects	*Clean*
Cooling system clogged internally	*Clean with a cooling system cleaner of a reputable make and flush out according to maker's instructions. Inspect radiator hoses and replace if in bad condition*
Thermostat stuck or faulty	*Check and replace if necessary*
Ignition improperly timed	*Check and correct. Attend to possibly stuck advance mechanism*
Lean or rich mixture	*Check fuel system; see* **D**
Excessive carbon deposit	*Decarbonize*
Obstructed exhaust system	*Check and repair or replace*
Cylinder-head gasket of the incorrect type	*Replace*

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THE OLYSLAGER MOTOR MANUALS

This manual is one of a new series which will eventually cover all popular cars. The following have already been published:

AUSTIN A30 and A35 Saloons, Countryman, Pick-Up and Van from 1951

AUSTIN A40 Mark I and II from 1958

AUSTIN A55 Mark II and A60 Saloons and Countryman Estate Cars from 1959

AUSTIN A70 Hampshire, Hereford, Countryman and Pick-Up from 1949

AUSTIN MINI 850 Saloon, Countryman, Van and Pick-up from 1959

AUSTIN-HEALEY SPRITE Mark I and II from 1958

CITROEN 2CV A, AZ, AZL, AZLM, AU, AZU, AZUL, AP, AZP, BJ Bijou, Sahara 4 x 4, from 1949

FIAT 500, 500D and Giardiniera, Saloons, Convertibles and Estate Cars from 1957

FIAT 600, 600D and Multipla, Saloons, Convertibles and Estate Cars from 1955

FIAT 1100 and 1200 Saloons, Convertibles and Estate Cars from 1957

FORD ANGLIA/PREFECT/POPULAR/ESCORT/SQUIRE 100E models from 1953, Thames Van 300E models from 1954

FORD ANGLIA 105E/PREFECT 107E from 1959

FORD CONSUL/ZEPHYR SIX/ZEPHYR ZODIAC Mark I 1951-1956

FORD CONSUL/ZEPHYR and ZODIAC Mark II from 1956

FORD TAUNUS 17M P2 and P3, Saloons, Estate Cars and Vans from 1957

HILLMAN MINX Series I, II, III, IIIA, IIIB, from 1956, Hillman Husky Series I, II, from 1958, and Easidrive

MERCEDES-BENZ 180a, 180b, 190, 190b, from 1957

MERCEDES-BENZ 219, 220S, 220E, from 1956

M.G. Magnette Mark III and IV Saloons from 1959

MORRIS MINI-MINOR 850 Saloon, Mini-Traveller, Mini-Van and Mini-Pick-Up from 1959

MORRIS MINOR 1000 Saloon, Convertible and Estate Car, Morris Series III, Quarter-ton Van and Pick-Up from 1956

MORRIS OXFORD Series V and VI Saloons and Traveller Estate Cars from 1959

OPEL Olympia, Rekord, Car-a-Van and Delivery Van from 1953, and Opel 1200 from 1959

PEUGEOT 203, 203L, 203U from 1956, Peugeot 403 from 1955

RENAULT DAUPHINE R1090, Dauphine-Gordini R1091, Floride/Caravelle R1092 and Ferlec Automatic Clutch, from 1956

RILEY 1·5 Saloons from 1957

RILEY 4/68 and 4/72 Saloons from 1959

SIMCA ARONDE Saloons, Coupes, Estate Cars and Vans from 1954, and Simcamatic

SINGER GAZELLE Series I, II, IIA, III, IIIA, IIIB from 1956

TRIUMPH HERALD and HERALD 'S' from 1959

TRIUMPH TR2, TR3, TR3A Sports Roadster, Hardtop Coupe from 1953

VAUXHALL VELOX/CRESTA Series PA Saloons and Estate Cars from 1957

VAUXHALL VICTOR F Models Series 1 and 2, Saloons and Estate Cars from 1957

VOLKSWAGEN Cars from 1954, Kharmann-Ghia and Utility Vehicles from 1955

WOLSELEY 1500 Saloons from 1957

WOLSELEY 15/60 and 16/60 Saloons from 1958

Forthcoming Titles:

AUSTIN A40, A50 and A55 Mark I

MORRIS OXFORD Series III & IV

LANDROVER Series II and IIA

STANDARD VANGUARD & SIX

M.G. MGA 1500 and 1600

FORD CONSUL/CLASSIC/CAPRI

TRIUMPH HERALD 1200

SUNBEAM RAPIER

HUMBER HAWK & SUPER SNIPE

VAUXHALL VICTOR FB

P. OLYSLAGER MOTOR MANUALS 35

RILEY 4/68 4/72

SALOONS All models from 1959