

**P. OLYSLAGER MOTOR MANUALS 91**

# **BMC 1100**

**ADO 16**

**from 1962**

**AUSTIN 1100 MG 1100 MORRIS 1100**

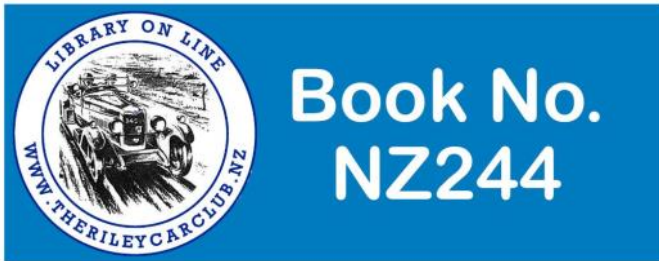
**RILEY KESTREL WOLSELEY 1100**

**VANDEN PLAS PRINCESS 1100**



**Book No.  
NZ244**





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# **Handbook for the BMC 1100**

**AUSTIN 1100**

**MORRIS 1100**

**MG 1100**

**RILEY KESTREL**

**VANDEN PLAS PRINCESS 1100**

**WOLSELEY 1100**

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**PIET OLYSLAGER MSIA MSAE**

**English language edition.**

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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**

**THIS MANUAL** is intended to supplement (not to replace) the instruction book issued with the vehicle by the manufacturer. It contains more detailed information on the maintenance and repair of BMC 1100 (ADO.16) cars without being, or pretending to be, a fully comprehensive workshop manual.

The first sections of the book contain general information essential for both owner driver and mechanic. They give full details about the models covered so that the reader does not have to refer to many different publications in order to find correct model designations, serial numbers, major modifications, prices, dimensions, lubrication, maintenance, and other information.

The section "Repair Data" has been compiled and presented on the assumption that the reader knows something about repair work. Elementary procedures have therefore been omitted and the space has been devoted to more advanced information. Readers who are not qualified to carry out repairs and adjustments are strongly advised to leave them to official BMC dealers or distributors whose mechanics possess special equipment and are fully informed about the latest modifications and design changes. Often it will be more economical to replace a component by either a new or a factory-reconditioned unit rather than attempt to repair it. In all cases of doubt it will pay to consult a dealer.

All the important dimensions, tolerances and other specifications are presented in convenient tabular form at the end of the book, followed by an engine fault finding chart.

PIET OLYSLAGER, MSIA, MSAE



Fig. 1. Austin 1100 four-door saloon, 1963-67



Fig. 2. MG 1100 four-door saloon, 1962-67

# **BMC 1100**

**ADO 16**

**AUSTIN 1100**

**MORRIS 1100**

**MG 1100**

**RILEY KESTREL**

**VANDEN PLAS PRINCESS  
1100**

**WOLSELEY 1100**

## **General**

### **INTRODUCTION**

The BMC 1100 ADO.16 was first introduced by the British Motor Corporation on 15th August, 1962, as the Morris 1100 two- and four-door saloon.

In October of the same year these models were joined by the MG 1100 two- and four-door versions, which featured the traditional MG front grille and more luxurious trim. Technically, the main difference is the twin SU carburettor equipment (single SU on Morris 1100).

The two-door version of the Austin, Morris and MG are only produced for certain export markets (e.g. U.S.A. and Denmark).

The next version to be introduced in the ADO.16 range was the Austin 1100, in September 1963, which differed from the Morris 1100 mainly in having a typical Austin front grille (with eight 'wavy' bars), and a different fascia panel.

The Vanden Plas Princess 1100 was announced at the 1963 London Motor Show, representing the ultimate in small car luxury. Mechanically similar to the twin-carburettor MG 1100, its interior is hand-finished in English hide and walnut. Standard equipment is more comprehensive than on the other ADO.16 models.

The last two marques to be introduced in this series were the Riley Kestrel and the Wolseley 1100, both announced at the 1965 London Motor Show. Mechanically, these models are identical to the MG version, featuring twin carburettors and a higher compression ratio. Externally they are easily distinguishable by their traditional Riley and Wolseley front grilles, the latter incorporating the illuminated Wolseley badge.

From 1966, the single-carburettor versions have been optionally available with automatic transmission. In 1967 this feature was also introduced on the other models.

A modified version of the Morris 1100 is produced in Italy by Innocenti; it is known as the IM3, has the twin-carburettor engine, different front end styling, a more vertical steering wheel position and several other refinements. Innocenti also produce the Austin 1100 under licence, known as the Innocenti Austin I4. It is only slightly different from the British version. The latest Innocenti variant is the IM3S, announced in July 1966. It features the twin-carburettor engine, a three-spoke steering wheel, special wheels and interior trim and several external modifications.

In March, 1966 (Geneva Motor Show) BMC introduced estate car versions of the Austin and Morris 1100's. An estate car conversion had been available from Crayford Engineering Co., since 1964.

### **DESCRIPTION**

The ADO.16 is the logical extension of Alec Issigonis's ADO.15 'Mini' theme. Like their smaller brothers, the 1100's have an 'east-west' engine and front-wheel drive, allowing 80 per cent of the car's length to be used for passengers and luggage.



**Fig. 3. Morris 1100 four-door saloon, 1962-67**



**Fig. 4. Riley Kestrel four-door saloon, 1965-67**



The transverse-mounted engine is a version of the BMC 'A' Series unit, and has a 'no loss' pressurized cooling system with separate expansion tank. As on the ADO.15, clutch, gearbox and final drive/differential are built in unit with the engine.

Suspension is by means of the Moulton Hydrolastic liquid-and-rubber system, which made its debut on this model. Rubber cone springs (or 'displacers') are interconnected front to rear by fluid-filled pipes and hydraulically damped; these are used in conjunction with transverse wishbone linkages at the front and trailing arms, an anti-roll bar and two auxiliary torsion bars at the rear.

The unitary construction body incorporates body shell, floor, bulkhead and wing valances. Front suspension, engine and transmission are carried in a rubber-mounted sub-frame, as is the rear suspension.

The Lockheed brake system incorporates disc brakes on the front wheels and a pressure-limiting valve is fitted in the hydraulic line to the rear wheel drum brakes.

Steering is by rack and pinion. The disc wheels are fitted with 5.50-12 tubeless tyres.

The Vanden Plas Princess 1100 version's standard equipment includes twin fog lamps, reversing lamp, adjustable front seat squabs, oil pressure gauge and ammeter. Optional extras for this model include sliding roof, and electrically heated rear window. Standard equipment of the other marques varies from model to model; the Riley Kestrel features a rev-counter.

#### **Estate Cars**

An estate car conversion for the saloon was introduced by Crayford Engineering Co. (C.A.D. Ltd.) of Tatsfield, Kent, in 1964. As can be seen in Fig. 9, the back panel is divided into two parts, hinged at top and bottom (the bottom half opens first). The back seat folds forward and the fuel filler pipe is re-routed. The only new parts used are a cast light alloy surrounding to the standard rear window and hinges for doors and rear seats. No alterations are made to the suspension system, discouraging overloading in the tail. The maximum permitted load on the rear floor is 561 lb.

The Austin 1100 Countryman and Morris 1100 Traveller estate cars were introduced by BMC at the Geneva Motor Show on 10th March, 1966.

These models feature two passenger doors, a lift-up torsion-bar-balanced tail door, a two-way fold-flat rear seat squab and sliding rear side windows.

Although the characteristics of the Hydrolastic suspension have been altered to suit the higher load-carrying capacity, there is no self-levelling valve device nor a quick means of headlamp adjustment to compensate for laden conditions.

#### **AP Automatic Transmission**

This automatic transmission has been designed within the Automotive Products Group of Companies and developed mutually by them and BMC to suit the special requirements of the Mini and 1100 range. The special features of the transmission are as follows:

A central floor-mounted gear lever can be used to select either fully automatic operation of the gearbox or to make individual changes between any of the four forward gears. With the gears selected individually, full engine braking effect can be obtained on second, third, or fourth gear, with a 'free-wheel' operating on first gear.

On fully automatic operation, the gearbox makes use of four forward speed ranges. If a lower gear is required for rapid overtaking or greater acceleration, a 'kick-down' on the accelerator immediately produces the change.



**Fig. 5. Vanden Plas Princess 1100 four-door saloon, 1963-1967**

To suit the needs of the expert driver, fast, clutchless gearchanges can be made manually with the control lever, even at full throttle if required.

A torque converter provides a smooth getaway from rest in conjunction with any of the four forward gear ratios.

See also page 84.

Austin and Morris 1100 models fitted with the AP automatic transmission are fitted with the high-compression cylinder head (as on the twin-carburettor models) and the SU carburettor is of the HS4 instead of the HS2 type (1.5in instead of 1.25in diameter). The object of these modifications is to equal the performance of the 'manual' models by overcoming the power losses in the torque converter.

#### **Summary of Models:**

##### **Austin 1100**

A/AS10

A/AW10

Four-door Saloon (September 1963 onwards)

Three-door 'Countryman' (March 1966 onwards)

##### **MG 1100**

G/A2S3

G/AS3

Two-door Saloon (October 1962 onwards)<sup>1</sup>

Four-door Saloon (October 1962 onwards)<sup>2</sup>

<sup>1</sup>October 1962: G/G2S1.

<sup>2</sup>October 1962: G/GS1.





Fig. 6. Wolseley 1100 four-door saloon, 1965-67

Morris 1100	
M/A2S1	Two-door Saloon (August 1962 onwards) <sup>3</sup>
M/AS1	Four-door Saloon (August 1962 onwards) <sup>4</sup>
M/AW1	Three-door 'Traveller' (March 1966 onwards)
Riley Kestrel	
R/AS1	Four-door Saloon (October 1965 onwards)
Vanden Plas Princess 1100	
V/AS1	Four-door Saloon (October 1963 onwards)
Wolseley 1100	
W/AS1	Four-door Saloon (October 1965 onwards)

## IDENTIFICATION

### Engine Number:

The engine number is stamped on a plate secured to the right-hand side of the engine, above the dynamo. The actual serial number is prefixed by various letter and numbers presenting, in code, the power unit specification.

The prefix is divided into three groups indicating the engine capacity and model, gearbox and ancillary equipment, and compression ratio.

<sup>3</sup>August–October 1962: M/G2S1.

<sup>4</sup>August–October 1962: M/GS1.



**Fig. 7. Innocenti Austin I4 four-door saloon, 1965-67**



**Fig. 8. Innocenti Morris IM3 four-door saloon, 1964-66**

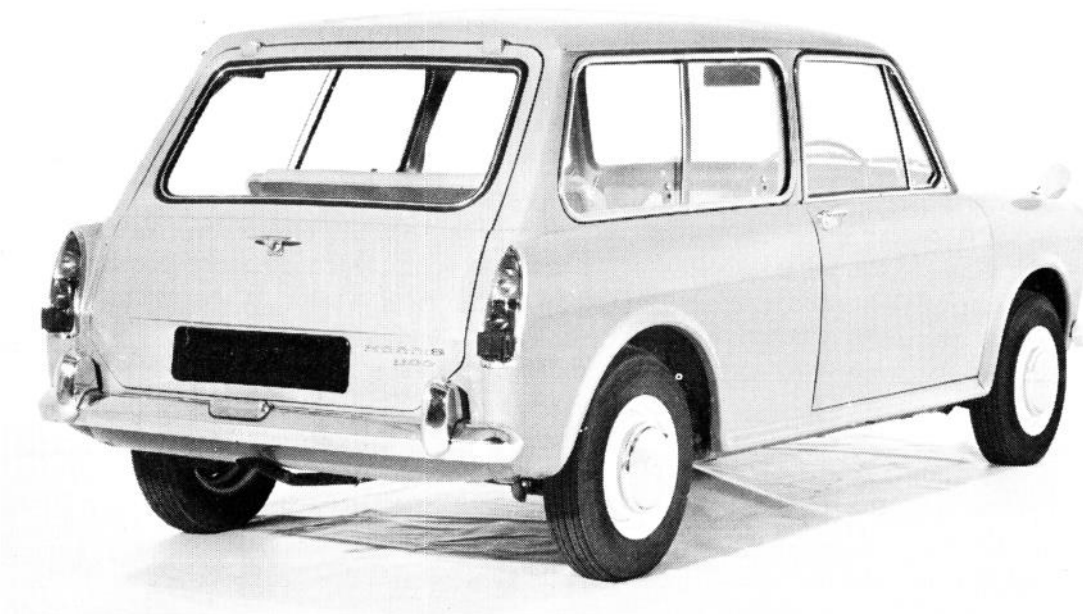
*Prefix Group 1* (a number and one to three letters):

Examples:

10AMW	—	Austin and Morris 1100
10AH	—	ditto, with positive crankcase ventilation
10GR	—	MG 1100
10GRB	—	ditto, with positive crankcase ventilation, and Wolseley 1100
10R	—	Riley Kestrel
10V	—	Vanden Plas Princess 1100



**Fig. 9. Austin-Crayford 1100 Estate Car (conversion), 1965-66**



**Fig. 10. Morris 1100 Traveller Estate Car, 1966-67**

*Prefix Group 2* (one letter for each ancillary fitted)

A — Automatic gearbox  
 U — Central gear change  
 SA — Close-ratio gearbox  
 TA — Standard-ratio gearbox

*Prefix Group 3* (one letter):

H — High compression ratio  
 L — Low compression ratio

Example of complete engine number: 10AMW-TA-H-12345

#### **Commission Number:**

This number is stamped on a plate which is fixed to the right-hand wing valance, just above the battery.

#### **Car (or Chassis) Number:**

The car number is stamped on a plate mounted on the bonnet lock platform. The actual serial number is prefixed by the car model series designation, as outlined under 'Summary of Models' on page 6.

Suffix 'L' denotes left-hand drive.

*Car Serial Numbers (approximate, and for guidance only):*

	<i>Morris*</i>	<i>MG</i>	<i>Austin*</i>	<i>Riley</i>	<i>Vanden Plas</i>	<i>Wolseley</i>
August '62 (starting)	101	—	—	—	—	—
October 1962	8000	2100	—	—	—	—
January 1963	21000	8400	—	—	—	—
April 1963	41000	—	—	—	—	—
September 1963	74000	—	101	—	—	—
January 1964	117500	34700	29800	—	120	—
September 1964	190200	60000	—	—	900	—
January 1965	214000	67300	139900	—	2540	—
January 1966	297375	95725	239560	3930	9830	8430
January 1967	367990	117395	325130	9835	14360	14910

\*Saloons only

#### **Transmission Casing Number:**

This number is stamped on the casing, below the starter motor.

## **MODIFICATIONS**

NOTE: For modifications of a purely technical nature see under *Repair Data*.

**1962:** Thinner front seat squabs were introduced on the MG in December, in order to provide more leg room in the rear compartment.

**1963:** During 1963 the following modifications and improvements were made: Rubber floor mats with carpet finish, instead of moulded carpets. New type of windscreen-washer pump; repositioned jets and water reservoir. Modified clutch-plate hub of reduced length (in order to reduce tendency of clutch judder). Mud shields fitted to rear brakes; larger front caliper brake pads. Modified air-cleaner intake silencer, to eliminate carburettor icing. MG fascia panel given walnut finish.

**1964:** Early in 1964 the twin-carburettor engines were fitted with larger inlet valves. In September a new diaphragm spring type clutch was introduced. The gear lever was modified and the heater improved. Crushable sunvisors and a plastic-framed rear-view mirror were introduced for added safety.

**1965:** Heater became standard on Austin and Morris De Luxe models (March).

In October the 1966 models were announced with some detail changes. A combined direction indication and headlamp flasher with improved mechanism, which

had already been introduced on the Riley, Vanden Plas and Wolseley models, was now also fitted on the Austin, MG and Morris variants. By redesign of the heater louvres, all 1100's now have improved interior air and heat distribution and new heavy gauge exhaust systems to give greater resistance to corrosion. Automatic transmission and reclining front seats were announced for introduction as options during 1966. All BMC cars are now fitted with wax-type thermostats which are claimed to be more reliable with pressure cooling systems than the bellows-type. **1967:** In August the automatic transmission became available for all models (originally only available on Austin and Morris 1100 Saloons). A 1275-cc. engine became standard equipment on all twin-carburettor models (not covered by this manual). In October the 1968 models were announced. They incorporated various improvements and were designated 1100 Mk. II models. Austin/Morris Saloons became De Luxe Saloons and De Luxe Saloons became Super De Luxe Saloons.

## PRICES

UK prices are home retail ex-works prices, inclusive of purchase tax and to the nearest £1. Saloons are four-door models.

	Aug 1962	Jan 1963	Jan 1964	Jan 1965	June 1965	June 1966	Aug 1966	Aug 1967	Oct. 1967*
	£	£	£	£	£	£	£	£	£
Austin 1100	—	—	593	594	594	614	631	658	672
De Luxe	—	—	611	612	644	644	655	689	696
Automatic	—	—	—	—	—	735	748	781	764
Countryman	—	—	—	—	—	699	711	745	745
MG 1100	—	713	713	714	742	742	755	788	788
Morris 1100	675	593	593	594	594	604	631	658	672
De Luxe	695	611	611	612	612	644	655	689	696
Automatic	—	—	—	—	—	735	748	781	764
Traveller	—	—	—	—	—	699	711	745	745
Riley Kestrel	—	—	—	—	—	781	795	828	828
Vanden Plas									
Princess 1100	—	—	895	896	926	926	942	975	975
Wolseley 1100	—	—	—	—	—	754	767	801	801
Crayford estate car									
conversion <sup>1</sup>	—	—	—	79	79	79	79	—	—
De Luxe <sup>1</sup>	—	—	—	115	115	115	115	—	—

<sup>1</sup>Extra for Princess 1100 conversion: £20

\*Prices for Mk. II models.

## INSTRUMENTS AND CONTROLS

Figs. 11 to 16 show the differences in lay-out of facia panels between models.

The following controls are common to all models and placed in the same position: Dip-switch (on floor, left of clutch pedal), clutch pedal (not on models with automatic transmission), brake pedal, accelerator, gear lever (selector lever on models with automatic transmission), parking brake lever (between front seats), horn button (on steering wheel hub), direction-indicator switch/headlamp flasher (on steering column) and heater controls (centrally located under parcel shelf). Windscreen wiper switches are of the 'self-parking' type. The bonnet lock control is situated under the facia panel on all models except Austin and Morris, where the bonnet is unlocked at the front.

Switch and warning light positions differ and are as follows:



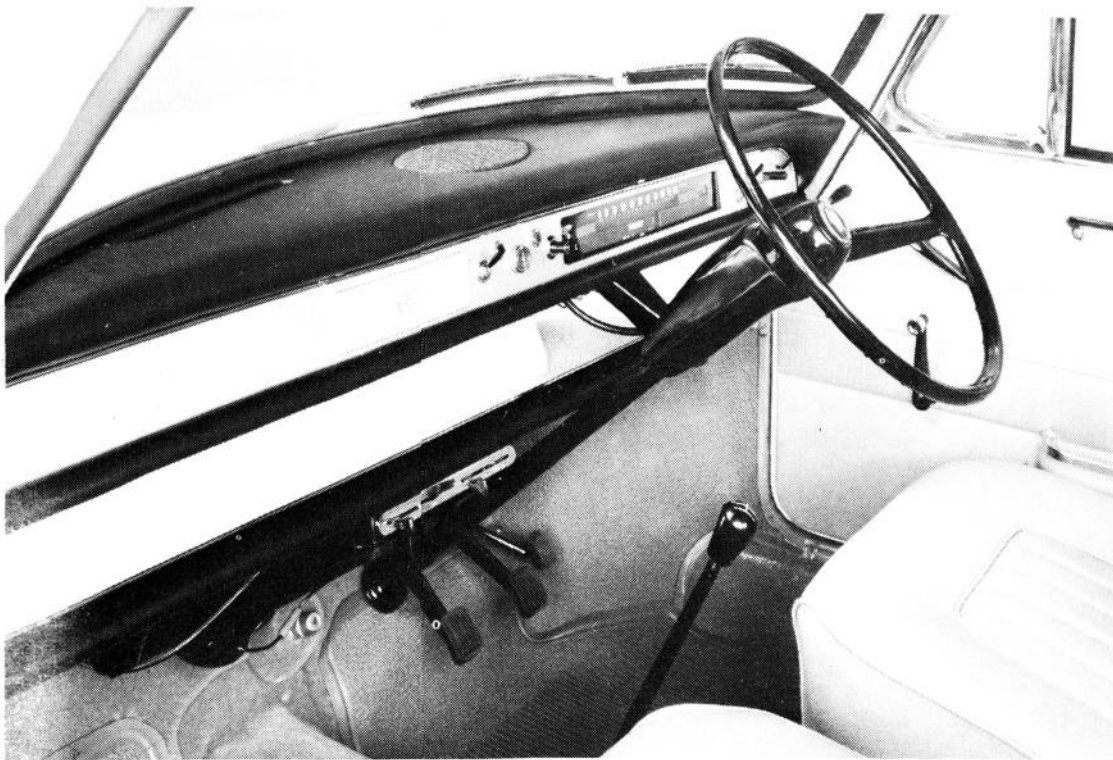


Fig. 11. Austin 1100, facia

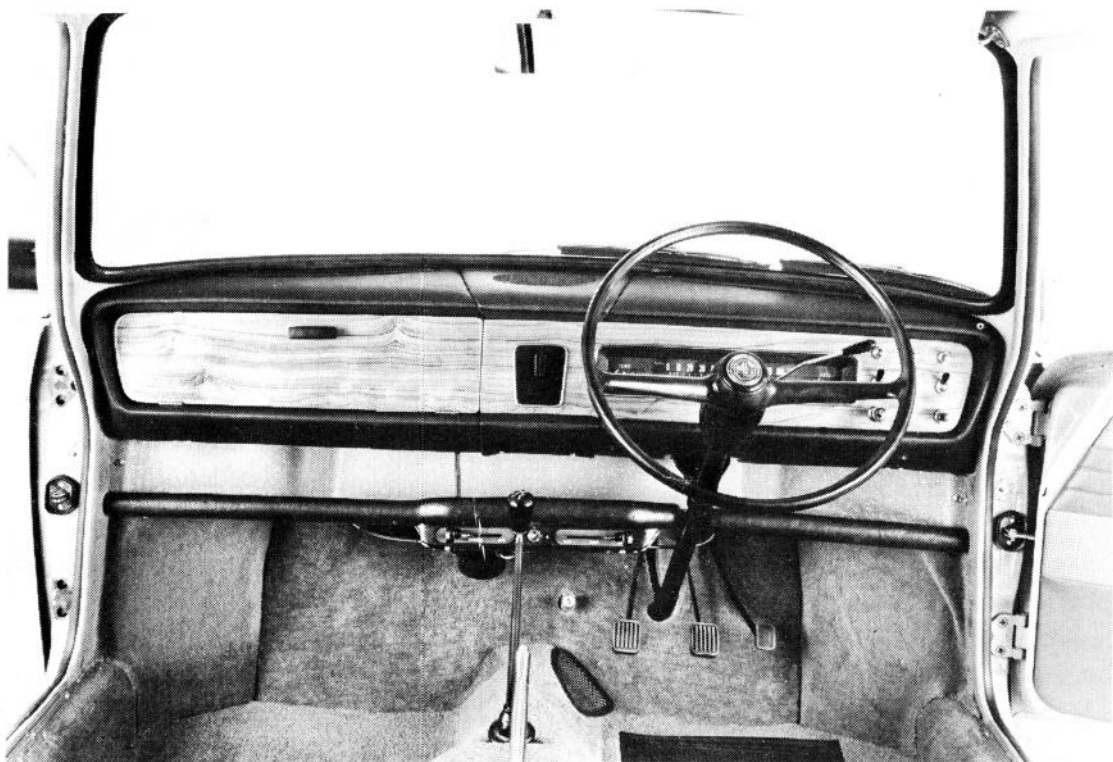


Fig. 12. MG 1100, facia



**Fig. 13. Morris 1100, facia**

**Austin 1100 (Fig. 11):**

Centre, left to right: Light switch, ignition/dynamo warning light, ignition/starter switch, oil pressure warning light, choke control.

Extreme right, left to right: main beam warning light (top) and oil filter warning light (bottom), windscreen wiper switch, windscreen washer control, panel light switch.

**NOTE:** On left-hand drive models the above are in reverse.

**MG 1100 (Fig. 12):**

Extreme right, left to right, top row: oil filter, oil pressure and main beam warning lights; centre row: windscreen-wiper, ignition/starter, and light switches; bottom row: choke control, ignition/dynamo warning light, windscreen-washer control. The panel light switch is situated below the ignition/dynamo warning light.

**NOTE:** On left-hand drive models the above positions are in reverse.

**Morris 1100 (Fig. 13):**

Top of instrument cluster, left to right: oil filter, ignition/dynamo, main beam, and oil pressure warning lights.

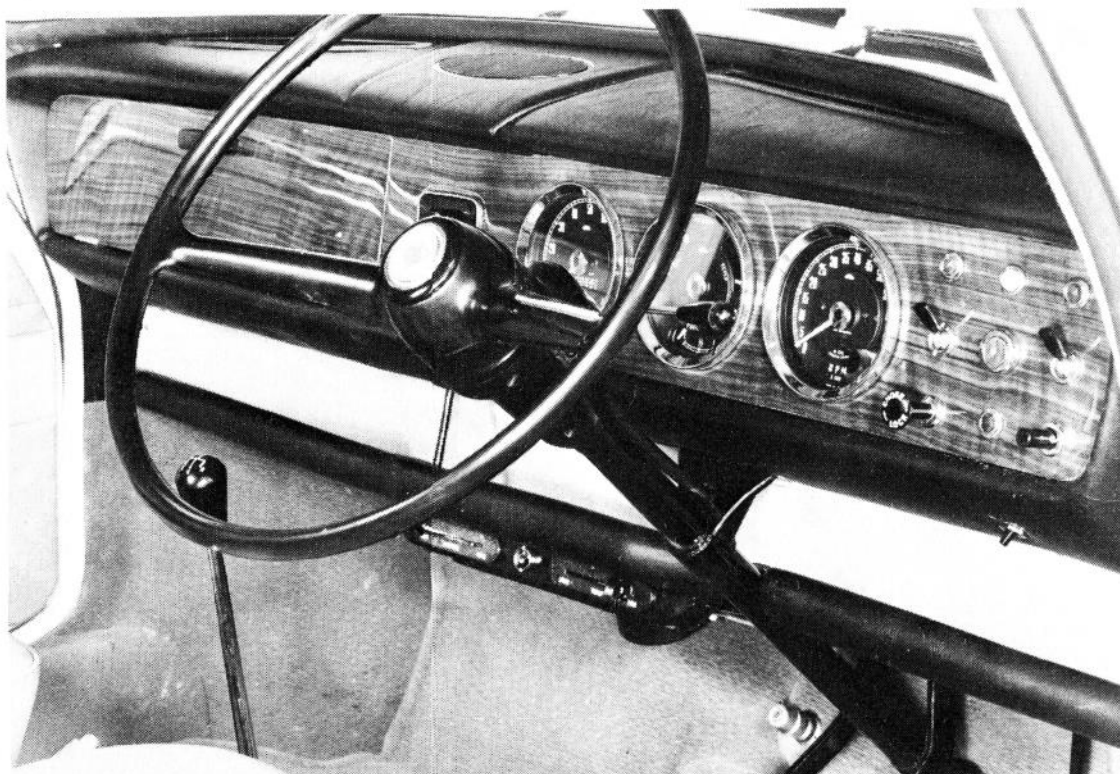


Fig. 14. Riley Kestrel, facia

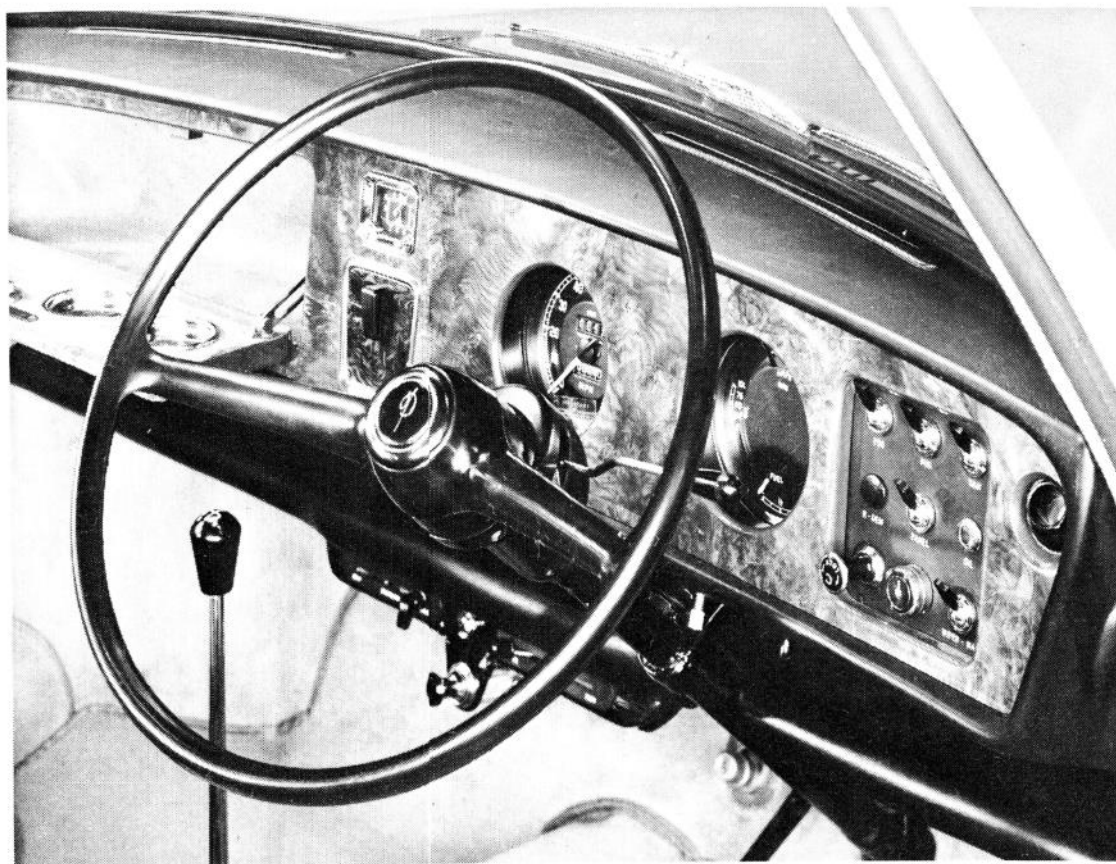


Fig. 15. Vanden Plas Princess 1100, facia



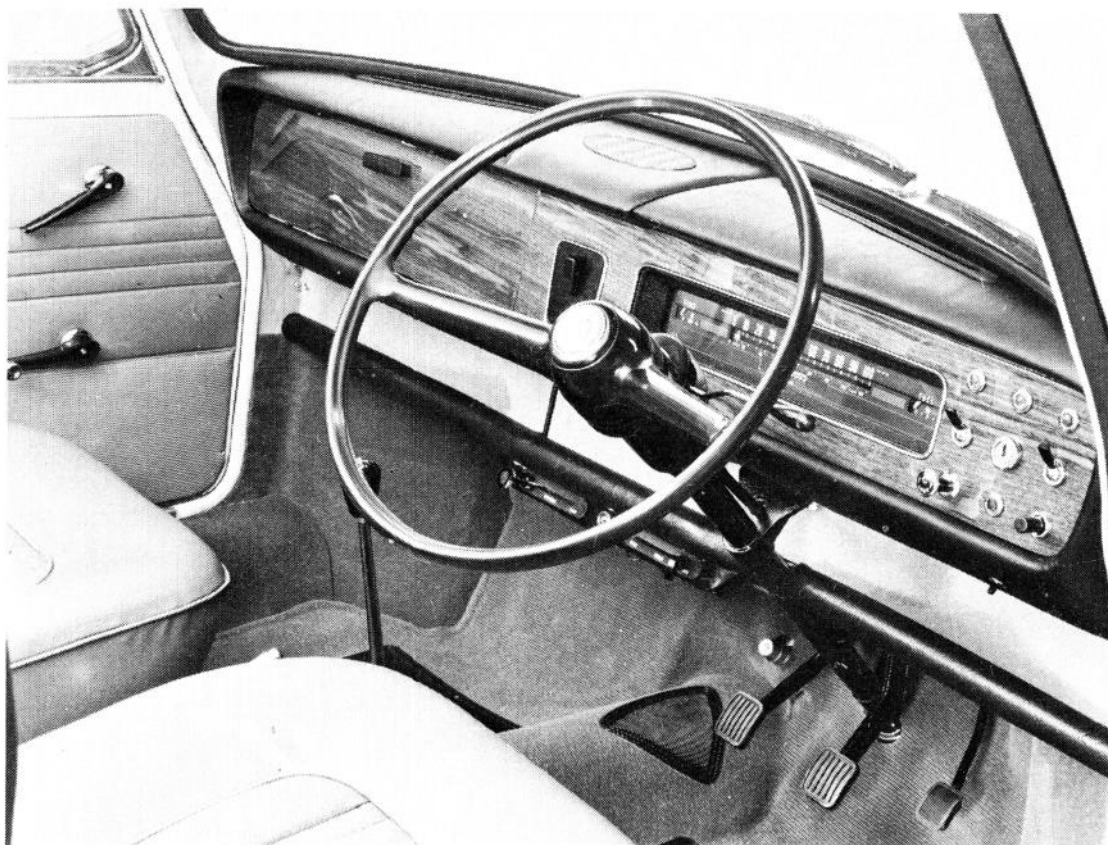


Fig. 16. Wolseley 1100, facia

Bottom of instrument cluster, left to right: choke control, ignition/starter switch, light switch, panel light switch, windscreen-washer control, windscreen wiper switch. NOTE: This lay-out applies to both right- and left-hand drive models.

**Riley Kestrel (Fig. 14):**

The lay-out of the switches and warning lights is the same as on the MG 1100. The rev counter is standard equipment on the Riley Kestrel.

**Vanden Plas Princess 1100 (Fig. 15):**

Extreme right (left on left-hand drive cars), left to right, top row: two fog lamp switches, main light switch; centre row: rear window demister switch (if fitted), panel light switch, lubrication warning light; bottom row: choke control, ignition/starter switch, windscreen wiper/washer control. Main beam and ignition/dynamo warning lights are incorporated in the speedometer/mileage recorder unit. All warning lights and controls are clearly marked, except for the trip mileage recorder reset knob, which is situated below the facia (push upwards and turn anti-clockwise to set to zero). A cigarette lighter is fitted centrally below the heater fan switch.

**Wolseley 1100 (Fig. 16):**

The lay-out of the facia panel of the Wolseley 1100 variant is similar to that of the MG.

## Dimensions and Weights

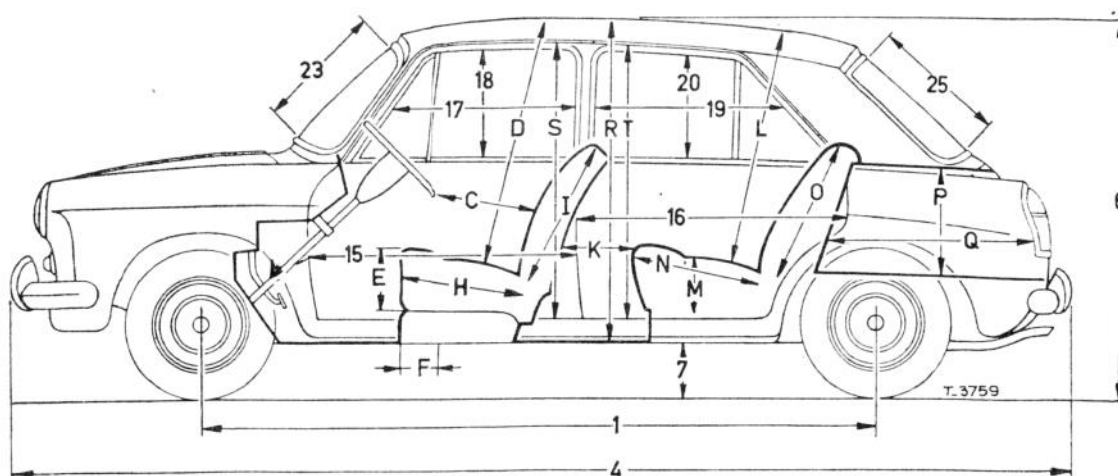


Fig. 17. Dimensions

### EXTERIOR DIMENSIONS

	<i>inches</i>
1 Wheelbase:	93½
2 Track, front:	51½
3 Track, rear:	50⅞
4 Overall length:	146¾
5 Overall width:	60⅜
6 Overall height:	53
7 Ground clearance:	6 (Estate Car 6½)
8 Turning circle:	34 ft 9 in
15 Width of front door opening:	37
16 Width of rear door opening:	36½
17 Width of front door windows:	24
18 Height of front door window:	14½
19 Width of rear door window:	24¼
20 Height of rear door window:	14¼
23 Height of windscreen:	18½
25 Height of rear window:	19

### INTERIOR DIMENSIONS (Saloon, with front seat in central position)

	<i>inches</i>
A Pedal to front seat:	19
B Steering wheel to seat:	4¾
C Steering wheel to seat back-rest:	17¾
D Height over front seat:	37¾
E Height of front seat:	14½
F Maximum adjustment of front seat:	4½
H Depth of front seat:	19¼
I Height of front seat back-rest:	19¾
K Front seat back-rest to rear seat:	8¼
L Height over rear seat:	36

M Height of rear seat:	13½
N Depth of rear seat:	17
O Height of rear seat back-rest:	20¾
P Height of luggage compartment:	13
Width of luggage compartment:	43½
Q Depth of luggage compartment:	32½
R Maximum interior height:	45½
S Height of front door opening:	35
T Height of rear door opening:	34½

### **WEIGHTS** (manufacturer's information)

	<i>Kerbside weight</i> (approx.)	<i>Max. towing weight</i>
<i>Four-door saloons;</i>		
Austin 1100:	1829lb	1344lb
MG 1100:	1852lb	1344lb
Morris 1100:	1834lb	1344lb
Riley Kestrel:	1852lb	1344lb
Vanden Plas Princess 1100:	1989lb	1344lb
Wolseley 1100:	1852lb	1344lb

## **Technical Specifications**

### **ENGINE**

	<i>Single carb.<sup>1</sup></i>	<i>Twin carb.</i>
Model:	10AMW, AH	10GR(B), R, V
Type:	four-stroke petrol, water-cooled	
Number of cylinders:	four	
Valve arrangement:	overhead, pushrod-operated	
Bore and stroke (in):	2.543 x 3.296	
(mm):	64.58 x 83.72	
Cubic capacity (cu in):	67	
(cc):	1098	
Compression ratio:	8.5 : 1 <sup>2</sup>	8.91 : 1 <sup>3</sup>
Maximum bhp at rpm (gross):	50 at 5100	59 at 5500
(net):	48 at 5100	55 at 5500
Maximum bmep at rpm (lb/sq in):	135 at 2500	138 at 2750
Maximum torque at rpm (lb ft):	60 at 2500	61 at 2750
Mean piston speed at max. bhp (ft/min):	2805	3025
Top gear mph at 1000 rpm:	14.92	
Carburettor(s):	SU HS2	

### **TRANSMISSION** (manual)

Clutch:	single dry plate, 7½ in
Gearbox:	four-speed (2nd, 3rd, 4th synchromesh)
Gearbox ratios to 1:	1.00, 1.412, 2.172, 3.627, R.3.627
Final drive and ratio:	helical gears, 4.133 : 1 (62/15)
Overall gear ratios to 1:	4.99, 5.83, 8.98, 14.99, R.14.99

<sup>1</sup>Automatic transmission models have high-compression cylinder head and SU HS4 carburettor. <sup>2</sup>7.5 : 1 available. <sup>3</sup>8.1 : 1 available.

## CHASSIS

Wheel size:	4J x 12
Tyre size:	5.50—12 or SP 145—12
Brake lining area:	51.6sq in
Front disc diameter:	8in

## ELECTRICAL EQUIPMENT

Electrical system:	12-volt
Battery:	43 Ah (20-hour rate)
Earthing:	positive (+)
Ignition:	battery and coil

## THEORETICAL ROAD SPEEDS

	<i>rpm</i>	<i>first gear</i> ( <i>mph</i> )	<i>second gear</i> ( <i>mph</i> )	<i>third gear</i> ( <i>mph</i> )	<i>top gear</i> ( <i>mph</i> )	<i>mean</i> <i>piston</i> <i>speed</i> ( <i>ft/min</i> )
(a)	1000	4.1	6.9	10.6	14.9	550
(b)	2500	10.3	17.2	26.5	37.2	1375
(b)	2750	11.3	19.0	29.1	41.0	1512
(c)	5100	20.9	34.9	54.1	76.0	2805
(c)	5500	22.5	38.0	58.3	82.0	3025

(b) = engine speed at max. torque; (c) = engine speed at max. bhp.

## PERFORMANCE FIGURES

NOTE: These figures are approximate and should be considered to be fair averages.

	<i>Single carb.</i>	<i>Twin carb.</i>
Maximum speed (mph):	80	89
Cruising speed (mph):	70	75
Cruising range (miles):	300	300
Maximum speed in gears (mph), first:	26	30
second:	42	45
third:	65	70
Acceleration (sec.), 0–30 mph:	5.7	5.1
0–60 mph:	21.9	18.9
Touring fuel consumption (mpg):	35	35

## Lubrication and Maintenance

### RUNNING-IN

During the first 500 miles do not exceed 45 mph in top gear or corresponding speeds in the lower gears. Do not maintain this maximum speed for long periods. Avoid long periods of idling, full throttle acceleration and over-revving of the engine. Never overload the engine, change down to a lower gear when necessary; the engine must be operated at normal rpm.

### GENERAL DATA

#### Engine:

Capacity of engine and transmission housing (including filter): 8½ Imp pints (10.2 US pints). Automatic transmission models (including filter): 13 Imp pints (15.6 US pints), refill: 10 Imp pints (12 US pints).

Oil viscosity: above 0°F (−18°C), SAE 20W/30 or SAE 10W/30; below 10°F (−12°C), SAE 10W/30. Oil dipstick: at right-hand side of engine.

Oil filler cap: on valve-rocker cover.

Oil change period: 6000 miles (3000 miles for models with automatic transmission).

Oil drain plug: the engine and transmission oil drain plug is located on the right-hand side of the transmission housing. This magnetic plug must be cleaned at every oil change.

Oil warning light: the warning light will glow continuously in case of lack of oil, low oil pressure or need of a new oil filter element. Later models have a separate oil filter warning light. (Not on models with automatic transmission).

**Oil filter (full-flow):** Change oil filter element every 6000 miles or when indicated by warning light. On models with automatic transmission the oil filter should be changed every 3000 miles. The engine oil filter is located at the right-hand side of the engine. Remove the filter bowl, extract the element and clean the bowl in petrol. Make sure that all washers and seals are in their correct positions. Fit new element; refill the bowl and refit it to the filter head.

**Breather control valve (if fitted):** The crankcase breather control valve as fitted to certain models needs servicing every 12,000 miles. It is situated adjacent to the oil filler cap, alongside the valve-rocker cover. Remove the spring clip and lift out the diaphragm and top control spring. Clean all parts thoroughly and flush in methylated spirits (do not use solvents such as trichlorethylene, acetone, benzene and cresol, as they will damage the diaphragm and the backfire-valve seat). Examine the valve interior, the control orifice, the diaphragm, and the control needle. Renew the diaphragm if necessary. Reassemble the valve, taking care to locate the spring centrally under the diaphragm.

**Air-cleaner (dry type):** Every 12,000 miles fit a new air-cleaner element (in dusty operating conditions this should be done at shorter intervals). Unscrew the wing nut on top of the cleaner, withdraw the cover, remove the old element, clean the container, insert a new element and refit.

**Carburettor(s) (SU):** Every 3000 miles top-up the damper reservoir(s) with engine oil (SAE 10W/30).

Unscrew and remove each damper unit and pour oil into the hollow piston rod until the level is  $\frac{1}{2}$  in from the top.

Every 12,000 miles the carburettor chamber(s) and piston(s) should be cleaned. Dismantle and clean the main inside bore of the suction chamber and the outside diameter of the piston with a clean rag moistened in fuel. Reassemble with a few spots of thin oil on the piston rod only. Refill damper reservoir.

**Water pump:** Lubricate every 12,000 miles.

Remove the plug from the water-pump housing and add a small quantity of grease.

**Cooling system:** Capacity  $6\frac{3}{4}$  Imp pints (8.2 US pints), including 1 pt for the heater. The cooling system is pressurized and fitted with an expansion tank. Regular topping-up is not necessary, but a check should be made periodically to ensure that there has been no loss of coolant due to leakage. When refilling the system after draining, fill with water to the top of the filler neck and replace the cap. Run the engine for a short period. Switch off and allow the engine to cool. Remove cap and top-up again. Carry out this operation three times to ensure that the cooling system is full.

**NOTE:** *Never remove filler cap when the engine is hot.*

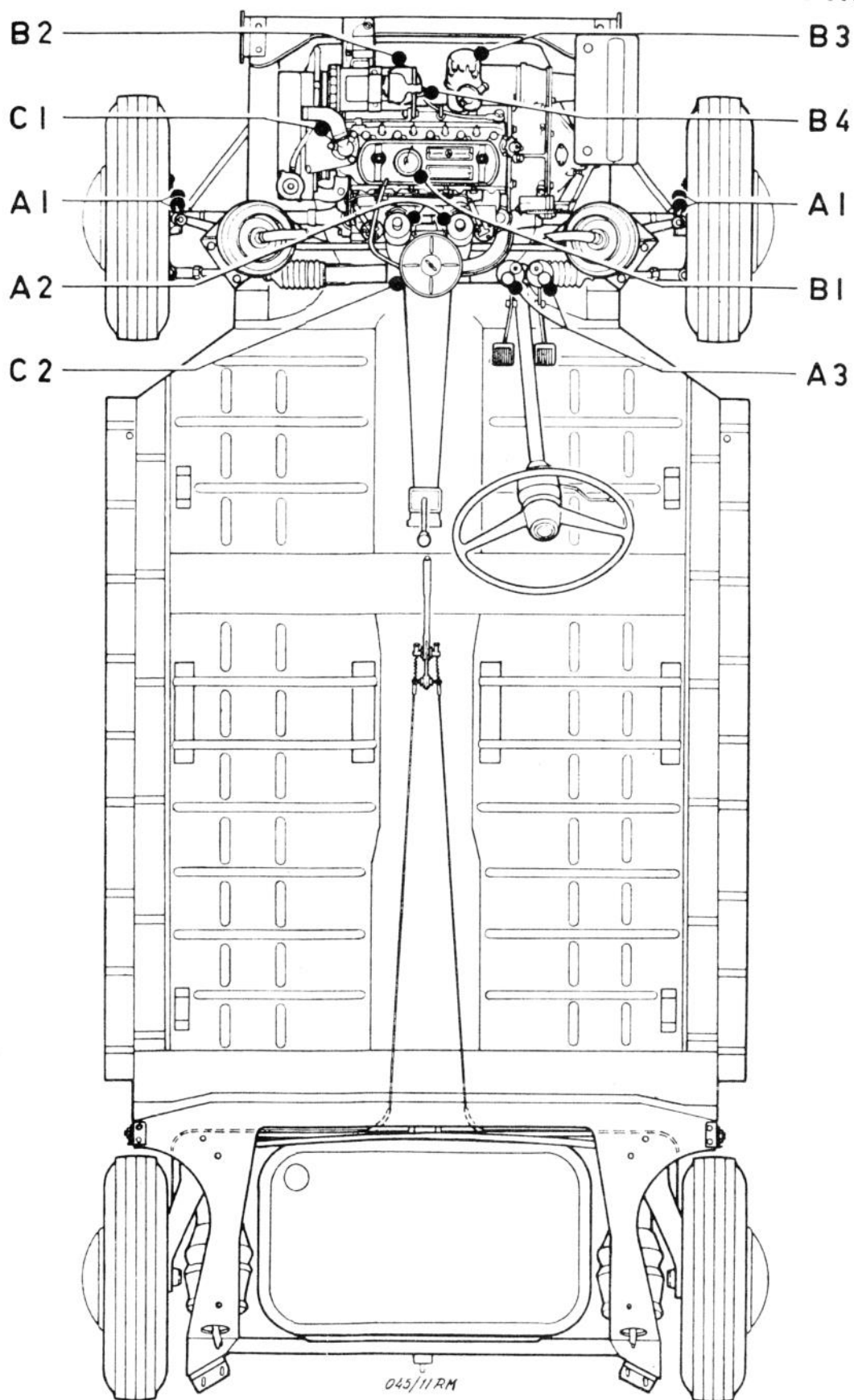


Fig. 18. Lubrication chart (twin-carb model shown)



**Frost precautions:** Under winter driving conditions the cooling system must be protected against frost by a good-quality anti-freeze solution. Before the anti-freeze solution is added, the cooling system should be drained and flushed through. Use only Bluecol anti-freeze or a solution conforming to specification B.S. 3151 or B.S. 3152.

**Battery:** The battery is located at the right-hand side under the bonnet. The positive terminal is earthed. Keep the terminals clean. Check battery electrolyte level; if necessary, top-up with distilled water to just above the top of the separators. Never add acid.

**Brake system:** The brake and clutch supply reservoirs are located in the engine compartment on the driver's side. Check the level and top-up if necessary to approximately  $\frac{1}{4}$  in below the bottom of the filler neck. Use Lockheed Disc Brake Fluid Series II. When temperatures are below  $-30^{\circ}\text{F}$  ( $-34^{\circ}\text{C}$ ) the system should be drained and refilled with Lockheed Super Heavy Duty Brake Fluid or a fluid conforming to Specification SAE 70 R3.

**Grease nipples:** There are only four grease nipples and they are situated on the upper and lower steering swivel joints. It is advisable, when lubricating, to jack-up the front of the car to take the load off the joints.

**Hydrolastic system:** The Hydrolastic suspension system does not require periodical attention. The servicing of the system should be carried out only by authorized BMC service stations, who have special equipment for this purpose. The fluid used is marketed solely by BMC, under their Part No. 97H 2801.

### **TYRE PRESSURES (cold)**

Saloon, front:	28lb/sq in (SP tyres: 32lb/sq in)
rear:	24lb/sq in (SP tyres: 28lb/sq in)

### **ROUTINE MAINTENANCE**

**Daily;** Check engine oil level, fuel tank, lights and tyres.

**Weekly;** Check tyre pressures and battery electrolyte.

#### **A. Every 3000 miles or three months**

A1 Steering swivel joints: lubricate with grease gun (4 nipples).

A2 Carburettor(s): top-up damper reservoir(s) with engine oil.

A3 Brake and clutch fluid reservoirs: check fluid level, top-up if necessary.

Engine/Transmission: on models with automatic transmission drain sump (when hot) and refill, clean magnetic drain plug and renew oil filter element. Cooling system: check water level (when cold), top-up if necessary.

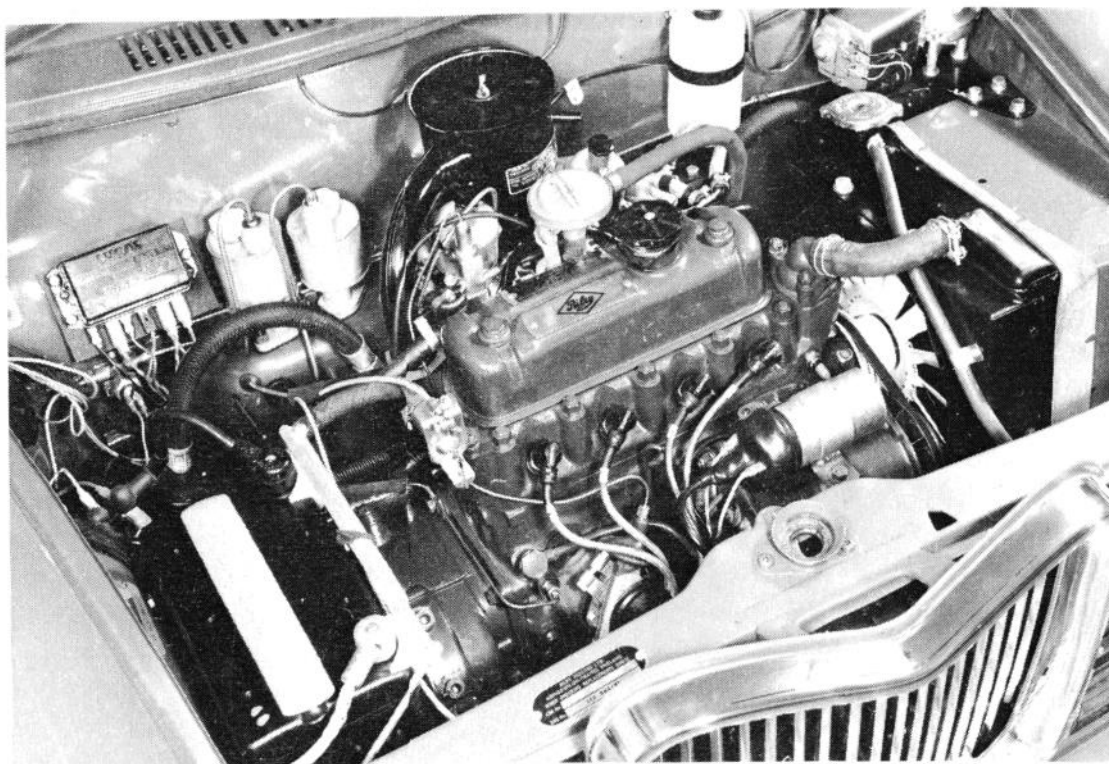
Brake system: check rear brakes, adjust if necessary. Inspect brake lines and pipes.

#### **B. Every 6000 miles or six months**

A1 Engine/transmission sump: drain (when hot) and refill. Clean magnetic drain plug. (See also under 'A. Every 3000 miles').

B2 Engine oil filter: wash out bowl, replace element, check for leaks (at least every 6000–8000 miles, or earlier when indicated by the facia panel warning light).

B3 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. Check functioning of automatic advance mechanism. Check breaker points, clean and adjust if necessary.



**Fig. 19. Typical under-bonnet view (Riley Kestrel shown)**

**B4** Dynamo: lubricate rear end bearing with a few drops of engine oil (through oil hole).

Bodywork: lubricate door locks and hinges.

Engine: check valve rocker clearances, adjust if necessary.

Ignition system: clean, check and adjust spark plugs.

Cooling system: check condition and tension of fan belt.

Clutch: check clearance at return stop of operating lever, adjust if necessary.

Transmission: check tightness of drive-shaft joint nuts; check condition of outer joint rubber gaiters.

Steering: check wheel alignment, adjust if necessary.

Brake system: inspect front disc brake pads for unequal wear.

Suspension: check tightness of all nuts and bolts.

Electrical: check battery cell specific gravity readings.

### **C. Every 12,000 miles or twelve months**

**C1** Water pump: remove plug and lubricate sparingly with grease.

**C2** Air-cleaner: clean housing, fit new paper element (under dusty operating conditions at shorter intervals).

Engine: service breather control valve (if fitted).

Fuel system: clean carburettor suction chamber(s) and piston(s), lubricate piston rod(s) sparingly with engine oil, refill damper.

Ignition system: fit new spark plugs.

Steering and suspension: check all moving parts for wear.

Brake system: inspect brake linings and blow out rear drums.

### **Periodically**

Change round road wheels.

Check and adjust headlight beam setting.



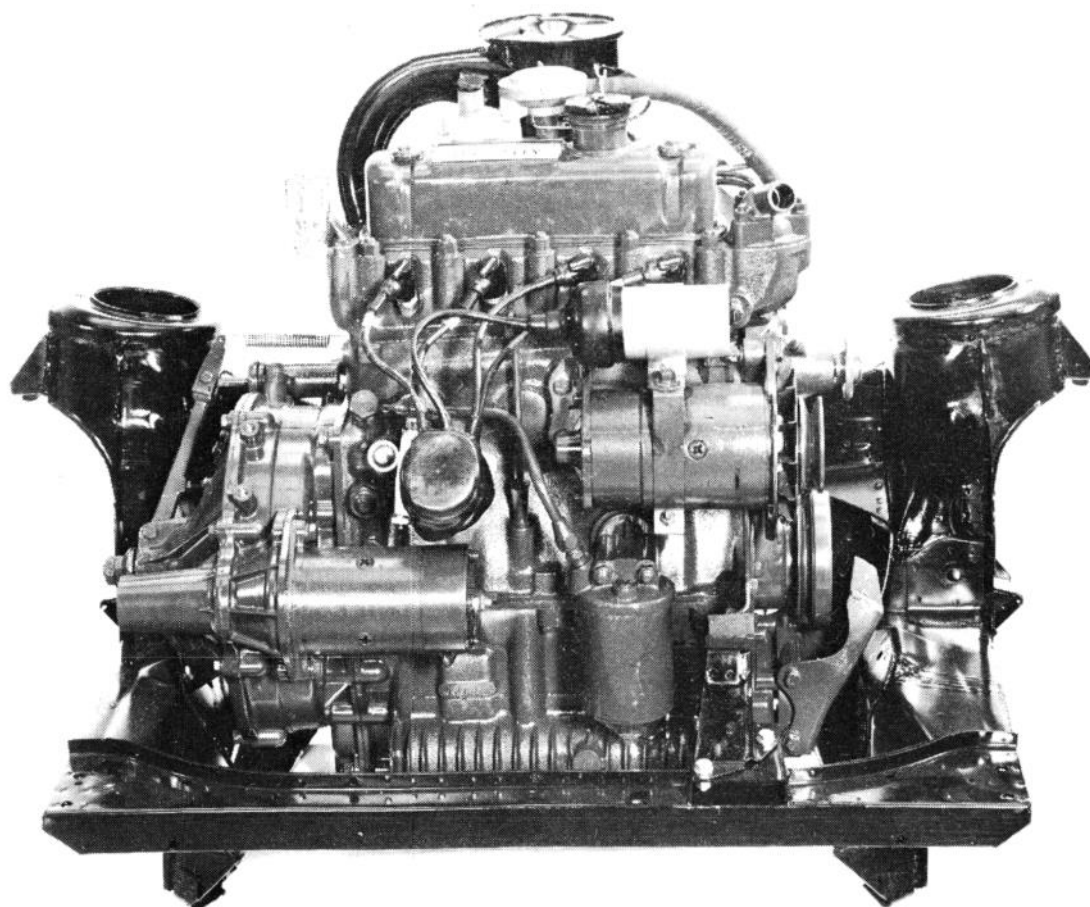


Fig. 20 Typical power unit and sub-frame assembly (Wolseley 1100 shown).

## Repair Data

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

### ENGINE

NOTE: As this engine unit is of rather unusual layout, it is essential to have a clear understanding of the terms 'left', 'right' and 'front', as used in this description.

The front of the engine is the radiator end.

The rear of the engine is the flywheel end.

The carburettor side is the left-hand side of the engine, as seen from the flywheel end.

#### Description:

Water-cooled, four-cylinder in line ohv petrol engine, built in unit with single dry plate clutch and four-speed gearbox, which is incorporated in the engine crankcase.

The transverse engine is front-mounted by means of flexible rubber mountings. The front-wheel drive is obtained from the differential by short drive-shafts. The engine unit can be removed together with the sub-frame or, alternatively, lifted out of the car separately.

Engine cooling is obtained by a radiator placed longitudinally in the engine compartment (90° angle with the engine axis) with a water pump of the impeller type and a 16-blade fan, which is mounted at the front end of the cylinder block; the water pump and generator are driven from the crankshaft pulley by means of a single V-belt. This V-belt is adjusted in the conventional manner by pivoting the generator away from or towards the engine as necessary.

The cast-iron cylinder block incorporates the upper half of the crankcase; no separate cylinder liners are used.

When the cylinder bores are worn beyond rebore limits, new dry liners can be pressed in which should then be honed to the required finished size.

The crankshaft is a steel forging and runs in three main bearings; the main bearings are replaceable steel-backed half-bearing shells, lined with lead/bronze, lead/indium-plated bearing material. The crankshaft end-float is taken by semi-circular steel-backed thrust washers, lined with lead/bronze, fitted at each side of the centre main bearing. Unlike crankshafts of conventional engine units, where the flywheel is bolted onto a flange at the rear end of the crankshaft, this crankshaft has a straight journal, the end of which is tapered. The straight journal accommodates the primary pinion of the transmission drive; the tapered portion of the journal serves for the rigid mounting of the clutch and flywheel assembly, which is kept in place by means of a heavy central bolt in the crankshaft. (See also 'Clutch'.)

The connecting rods are steel forgings of I-beam section and are equipped with replaceable steel-backed lead/bronze, lead/indium-plated bearing shells. The small-ends of the connecting rods are fitted with bronze piston-pin bushes. The big-ends are offset. The wide bearing shoulders on the connecting rods are turned away from the nearest main bearing.

The pistons are made of light alloy with one straight and two tapered compression rings and one oil control ring, all fitted above the fully-floating piston pin, which is kept in place in the piston by means of circlips.

The camshaft runs in three replaceable bearing bushes and is located in the left-hand side of the crankcase; the drive is taken from the crankshaft by means of a simplex-roller chain.

The camshaft end-float is taken by means of a thrust flange, located immediately behind the camshaft sprocket. The chain tension is controlled by a ring-type tensioner; two circular rubber rings, fitted in grooves at each side of the camshaft sprocket, thrust the chain links on the sprocket wheel outward, thus maintaining the necessary chain tension. The overhead valve mechanism is driven by means of hollow steel valve tappets and solid steel push-rods.

The steel valve rockers are fitted on a hollow steel rocker-shaft, which rests in four supports, the rearmost being connected to the oil channel in the cylinder head. The cast-iron cylinder head has integral valve seats and replaceable valve guides.

valve-seat inserts are available for purposes of reconditioning. The inlet valve heads have a larger diameter than the exhaust valve heads; this also applies to the valve stem diameters.

The valves are fitted with double valve springs with constant pitch, conventional valve-keepers and valve-keeper retaining clips; rubber seals on the valve stems prevent oil from entering the combustion chambers.

The intake and exhaust manifolds (on single-carburettor engines) form a single unit with hot-spot; this is fitted to the left-hand side of the cylinder head. On two-carburettor engines the cast-iron exhaust manifold and the light-alloy intake manifold are separate units, without hot-spot.

Full-pressure engine lubrication is obtained by a vane-type or rotor-type oil pump which is located in the rear end of the crankcase, and driven from the rear of the camshaft by means of a mortise and tenon coupling.

Engine, gearbox and differential are lubricated with the same engine oil, the transmission housing serving as oil sump. From the pump the oil is fed *via* an external oil pipe, to a full-flow oil filter, which is fitted with a relief valve.

From the oil filter oil enters the main oil gallery, which is drilled longitudinally in the right-hand side of the crankcase. Oil is fed to the main and camshaft bearings through separate drillings in the cylinder block; the big-end bearings are lubricated in the usual way *via* oil passages in the crankshaft. The first and fourth big-end bearings are lubricated from the front and rear main bearings respectively: the second and third big-end bearings from the centre main bearing. The oil, under reduced pressure, lubricates the valve mechanism *via* the front camshaft bearing, from which oil is also fed to the timing chain and sprockets. The push-rods and valve tappets are lubricated by the oil flowing down from the cylinder head and by splash. Cylinder lubrication is obtained by the oil squirting out of the oil holes in the wide shoulders of the connecting rods and by splash.

Ignition is by means of battery and coil; the ignition distributor, equipped with vacuum and centrifugal advance mechanism, is driven from the camshaft; the drive consists of a helical gear machined on the camshaft and a corresponding helical gear on the distributor drive shaft.

The fuel system employs an electrically-operated SU fuel pump which feeds the fuel to the semi-down draught SU-carburettor(s). The fuel tank is located in the rear of the vehicle, under the luggage compartment.

The air-cleaner is of the dry type and has a replaceable filter element.

The positive crankcase ventilation system consists of a tube connecting the valve-rocker cover with the air-cleaner cover, thus causing the crankcase fumes to be drawn into the carburettor(s).

#### *Removal from the car;*

The engine can be removed from the car together with the sub-frame; *this can only be done when special equipment for evacuating, filling and pressurising of the suspension system is available.*

It is also possible to hoist the engine on its own out through the bonnet aperture.

- (1) Drain water and oil; disconnect the earth terminal from the battery. Disconnect the wiring of the generator, the starter motor, the ignition coil, oil pressure unit and the water temperature transmitter unit.

Remove the horn.

- (2) Remove the carburettor(s) and air-cleaner(s). Disconnect the heater control valve cable, the hoses from the heater control valve and the return pipe.
- (3) Remove the overflow hose from the radiator; disconnect the clutch hose from the supply pipe on the bulkhead. Remove the exhaust system, disconnect the speedometer cable. Remove the dust boot from the gearshift lever, remove the

two retaining plate screws and withdraw the lever. Disconnect the tachometer cable, if fitted.

Evacuate the fluid from the suspension system and disconnect both hoses from the connecting pipes on the bulkhead. Be sure to cap the pipes and hoses to prevent dirt entering the system. Disconnect both front brake hoses and disconnect the steering tie-rods from the steering arms. Support the engine under the transmission casing and the gear-shift extension housing, and remove on both sides the three bolts and nuts securing the sub-frame. Remove the sub-frame tower mounting brackets from each side of the bulkhead after having marked their exact locations. Lift the body from the sub-frame assembly and the engine.

#### *Installation;*

Installation is a reversal of the above procedure. Re-charge the suspension system; this requires the use of special equipment.

*If required, the engine may be removed from the sub-frame as follows;*

- (1) Disconnect the drive shafts at the drive flanges.
- (2) Support the cross-member and lift the engine approx. one inch; unscrew the two bolts securing the engine to the sub-frame and lift the engine.

#### **Dismantling and reassembling the engine:**

##### *Dismantling;*

After having removed the sub-frame the engine can be dismantled as follows:

Remove the generator with the ignition coil, the starter motor, the oil-filter assembly with the oil pipe, the water pump with the fan. Remove the carburettor(s) and the manifold assembly by loosening the attachment nuts—working outward from the centre. Remove the valve-rocker cover and the valve-rocker shaft with the valve rockers and withdraw the pushrods (keep these in the order in which they were fitted). Remove the cylinder-head nuts in the proper sequence (see page 30) and lift the cylinder head from the cylinder block; remove the cylinder-head gasket. Remove the tappet covers with their gaskets and lift out the tappets, keeping them in their respective order to ensure their replacement in the same bores. Remove the clutch cover plate and extract the flywheel and clutch assembly by first bending back the lock-washer tab and slackening off the flywheel retaining bolt three or four threads. Break the seating of the assembly on the crankshaft taper with service tool 189304, together with the adaptor set 18G304M.

*NOTE: When pulling the flywheel from the crankshaft the oil behind the flywheel oil-seal will run out over the clutch driven plate, unless the flywheel is kept in a strictly vertical position whilst withdrawing it. If this point is not observed, it may be difficult to determine whether the clutch linings were contaminated with oil whilst the vehicle was in service. Turn the crankshaft to T.D.C. for cylinders 1 and 4 to prevent the "C"-plate from dropping behind the oil seal.*

Finally, extract the flywheel completely with the aid of the three studs from the adaptor set; screw the studs through the recessed holes in the clutch spring plate onto the flywheel. Fit the plate of the tool 18G304 over the studs and install the three nuts on the studs in such a manner that the plate remains parallel with the flywheel. Insert the centre extractor bolt and withdraw the flywheel and the clutch as an assembly after having removed the central flywheel retaining bolt. Mark the positions of the bolts and stud nuts securing the flywheel housing to the cylinder block and transmission case so they can be installed in their original positions. Slide the protecting sleeve 18G570 over the clutch-plate splines prior to withdrawing



the flywheel housing; keep the sleeve firmly in position to avoid damage to the oil seal.

Withdraw the attaching bolts from the flange of the transmission case. Lift the engine with a suitable hoist and separate the engine from the transmission. Remove the distributor and distributor clamp plate; screw a 5/16 in UNF bolt in the tapped hole provided in the distributor drive shaft and pull out the shaft.

Bend back the tab on the crankshaft pulley lock washer; remove the pulley retaining bolt and carefully lever the pulley, with damper assembly, from the crankshaft. Remove the timing cover and the concave oil thrower plate. Unlock and remove the camshaft sprocket retaining nut. Lever both sprocket wheels together with the timing chain step by step from their respective shafts, taking care not to lose the Woodruff keys. Remove the triangular camshaft retaining plate and carefully withdraw the camshaft. Loosen and remove the engine front plate with the gasket. Remove the oil pump after having removed the three attachment bolts. If necessary, the camshaft bearing bushes can be extracted with service tool 18G124A in combination with adaptor 18G124K.

Extract the retaining 'C' washer and backing washer, and withdraw the primary crankshaft gear together with the front and rear thrust washers. Check the crankshaft end-float to determine if renewal of the semi-circular thrust washers is necessary.

*NOTE: Check the marking of main and connecting-rod bearing caps, and make new markings if necessary to ensure correct reassembly.*

Remove the connecting-rod bearing caps and shells, keeping the shells with their respective bearing caps for proper replacement, and push the piston connecting-rod assemblies upward into the cylinder bores until the piston tops are flush with the cylinder-head mating face. Remove the upper bearing shells out of the connecting rods. Remove the three main bearing caps, together with the bottom half-bearing shells and the semi-circular thrust washers fitted to the centre main bearing.

Carefully lift out the crankshaft and remove the upper half main bearing shells. The pistons with connecting rods may now be pushed upward and out of the cylinders. Carefully clean and inspect all parts for wear or damage; particular attention should be paid to the oil-seals and mating faces of joining components. If the vehicle has covered a considerable mileage, all oil-seals should be renewed, no matter what their condition may be.

#### *Reassembly;*

*NOTE: Pistons, piston pins and connecting rods are available for service as matched sets only.*

Each piston top is stamped with a figure enclosed in a diamond which indicates the piston size grading; the cylinder block is also marked with identical numbers adjacent to the cylinder bores. When installing standard and oversize pistons, always ensure that each piston and its cylinder bore is marked with the same classification number. Pistons are available in standard size and in 0.010 and 0.020 in oversizes. The actual diameter of the cylinder bore in which the piston is to be fitted is enclosed in an ellipse and stamped in the piston top; the requisite piston clearance (see *Specifications*) being allowed for in the machining of the pistons.

Carefully clean the piston-ring grooves and install the piston rings in their respective grooves. When installing new piston rings, first remove the glaze from the cylinder bores with a special de-glazing hone. The piston-ring gap must be measured after squarely inserting the piston ring approximately one inch into the

- A Rotor type pump
- B Vane type pump
- 1 Screw
- 2 Cover
- 3 Inner rotor
- 4 Outer rotor
- 5 Pump body
- 6 Pump

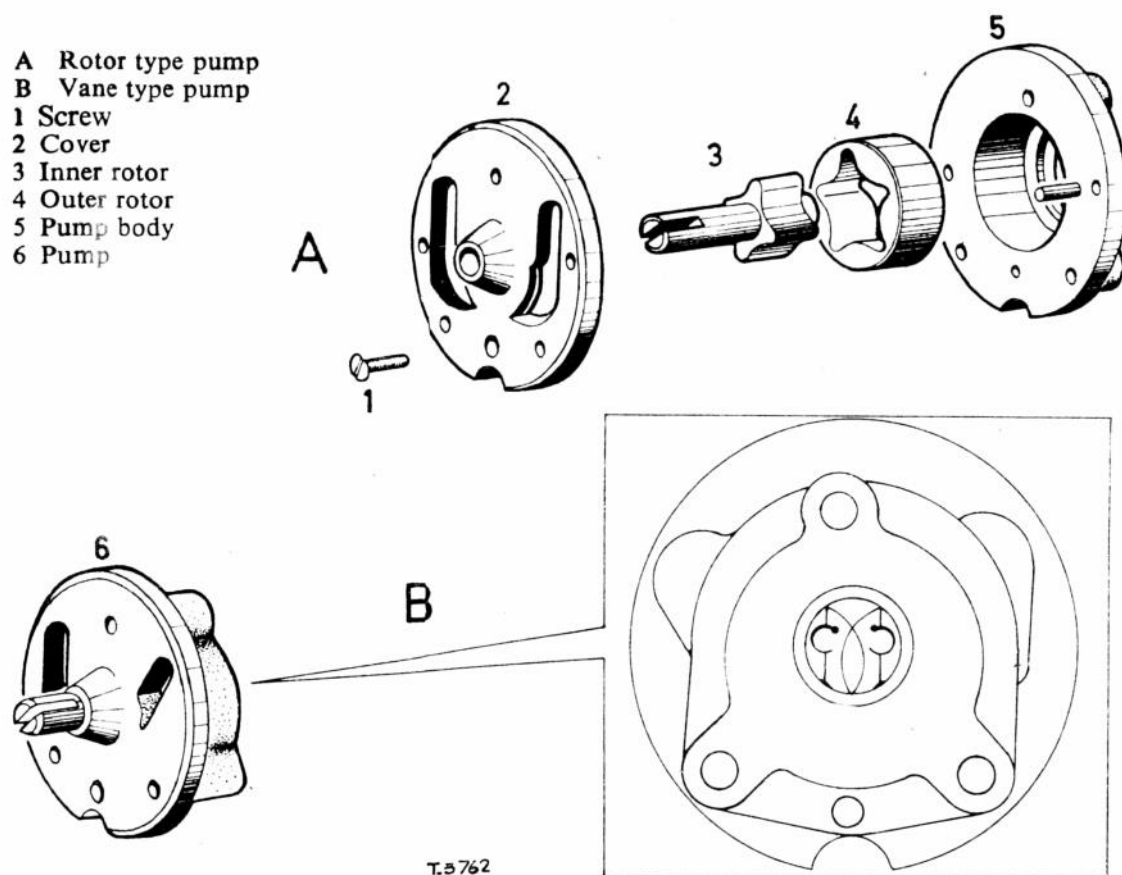


Fig. 21. Oil pump, exploded view

cylinder bore; the best way to do this is to push the ring into the bore with the aid of a piston.

When installing piston rings on the pistons, remember that the second and third rings are tapered and must be fitted with the narrow side upward; this side is identified by the stamped-in letter 'T'. It is essential that each connecting rod and piston assembly should be placed in its own bore and that the piston-ring gaps should be positioned at 90° to each other. Lubricate the pistons and rings, as well as the cylinder bores, and insert the pistons with connecting rods into the cylinder bores with the aid of a piston-ring compressor. The big-end bearing caps should face the camshaft side of the engine; this must be observed prior to inserting the piston and connecting-rod assemblies into the cylinders. Do not push the pistons all the way down into the bores but keep the piston tops flush with the cylinder-head mating face.

Place the cylinder block upside down and install the upper main bearing half-shells and the proper semi-circular thrust washers (without the locating tabs). Lightly coat the bearing surfaces with engine oil and fit the lower bearing shells and caps. Fit the semi-circular thrust washers (with locating tab) on both sides of the centre main bearing. It is extremely important that the soft sides of these four thrust washers face the crankshaft shoulders.

With the crankshaft in position, fit the main bearing cap attaching bolts with new locking plates and gradually tighten the bolts to 60lb ft and bend the locking plates over. Install the upper half big-end bearing shells in the connecting rods proper; lightly coat the bearing surfaces with engine oil and carefully push the

pistons and connecting-rod assemblies down until the bearing halves rest on the crankpins. Install the big-end bearing lower half-shells in their respective bearing caps, coat the bearing surfaces with engine oil and install the caps with the locking plates and bolts. Tighten the bolts to 35lb ft and check that the crankshaft can be freely rotated. Install the engine front plate with a new gasket. Oil the camshaft and insert it, taking care not to damage the camshaft bearings. Install the triangular camshaft locating plate and tighten the three attaching bolts. Install the oil pump with paper gasket so that the suction and/or delivery ports will not be blanked off. Tighten the oil-pump securing bolts to 9lb ft.

To prevent the ingress of dirt into the engine during further assembly, it is advisable to install the transmission case at this stage of assembly.

If a new drive-gear train was fitted, the end-float of the idler gear must be checked and if necessary corrected before the transmission is fitted; this is effected as follows: Thoroughly clean the casing joint faces and fit a new flywheel housing gasket. Install the idler gear with the chamfered bore of the thrust washer against the gear face. Smear some high melting point grease on the first motion-shaft roller bearings to prevent them being dislodged as they enter the bearing outer race in the flywheel housing. When installing the flywheel housing, no force should be used. Tighten the securing stud nuts to 18lb ft and check the end-float of the idler gear, which should be between 0.003 and 0.008in. Any discrepancy should be corrected by adding or removing thrust washers which are available in thicknesses ranging from 0.132 to 0.139in. Remove the flywheel housing with the gasket and install the transmission case. When lowering the engine onto the transmission casing, make sure that the front bearing cork seal remains in position.

Gradually tighten the securing studs and nuts to the proper torque, as follows:

Studs $\frac{3}{8}$ in dia UNC	=	8lb ft
„ $\frac{5}{16}$ in dia UNC	=	6lb ft
Stud nuts $\frac{3}{8}$ in dia UNF	=	25lb ft
„ „ $\frac{5}{16}$ in dia UNF	=	18lb ft

*NOTE: Do not use sealing compound of any kind. The proper and gradual tightening of the attaching studs and stud nuts is extremely important to ensure proper tooth contact of the drive gears and to obtain a perfect oil-tight joint.*

The paper gasket of the flywheel housing, used for the above checking operation, should not be used again for final assembly.

Install the crankshaft timing chain sprocket with the adjustment shims and then the camshaft timing chain sprocket. Push the crankshaft and the camshaft toward the rear of the engine to eliminate end-float, and check the alignment of the sprocket-wheel teeth in relation to one another; this can be done with a straight-edge. Any discrepancy may be corrected by adding or removing the necessary shims behind the crankshaft sprocket. Now remove both sprockets again and turn the crankshaft until the Woodruff key-way in its front protruding part is exactly at TDC; then turn the camshaft until its key-way is approximately in the 'one o'clock' position. Place both sprockets into the timing chain with the markings on their front faces opposite each other; place this assembly onto the respective shafts and see that the markings remain facing each other and coincide with the centre line through both shafts. (It may be necessary to turn the camshaft by a fraction to properly align the key-way.)

Secure the camshaft sprocket with its lock washer and retaining nut. Slide the oil thrower ring, with its concave side outwards, onto the crankshaft. If the special tool for centralisation of the timing chain cover oil-seal is not available, this may

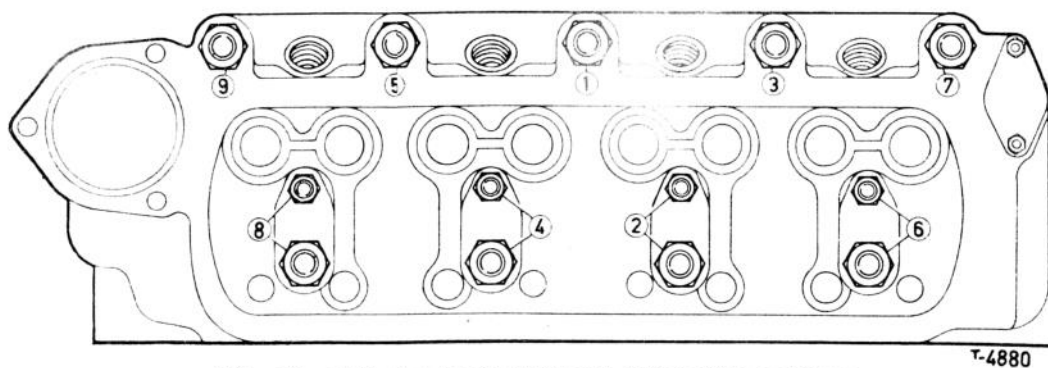


Fig. 22. Cylinder-head stud nuts, tightening sequence

be done with the hub of the crankshaft pulley. Insert the lubricated pulley boss in the seal with a turning movement and fit the cover, together with a new gasket, onto the crankshaft, using the centralizing tool or pulley. Gradually tighten the cover attaching bolts.

Install the crankshaft primary gear with the thrust washer and measure the distance between the rear face of the primary gear and the adjoining shoulder on the crankshaft; this clearance can be adjusted by fitting a thrust washer of the required thickness with the chamfered bore facing the crankshaft. The thicknesses and corrective values of the shims are mentioned in *General Data*. Install the flywheel and clutch assembly and tighten the heavy central retaining bolt to 110–115 lb ft. Carefully install the flywheel housing and be sure to place the bolts in their original bores; tighten the bolts and nuts to 18 lb ft. Install the valve tappets in their respective bores. New valve tappets are a selective fit; when coated with light engine oil they should slide down their bores by their own weight. Install the tappet covers with new cork gaskets. Place the head gasket over the cylinder-head studs; the gasket should not be coated with sealing compound or grease of any kind. Note that the head gasket is marked 'FRONT' and 'TOP' for correct installation. Carefully lower the cylinder head into position. Insert the pushrods, replacing them in the positions from which they were removed. Replace the valve-rocker assembly and fit all securing nuts finger tight. Gradually tighten the cylinder-head nuts, a turn at a time, in the sequence given on Fig. 22 to 40 lb ft and the rocker stud nuts to 25 lb ft. Adjust the valve clearances. Further assembly of the engine is effected in reverse order of dismantling. See page 31 for ignition timing. After installation in the vehicle, do not forget to fill the engine with oil of the recommended grade, and the cooling system with water.

**Cylinder head:** NOTE: *If on an assembled engine the valve rocker shaft only is to be removed, it should be noted that all cylinder-head nuts should be loosened in the proper sequence (see Fig. 22). It is therefore essential that the cooling system be drained prior to removing the valve rocker shaft.*

To dismantle the valve rocker shaft, withdraw the split-pins, the flat washer and the spring washer from the end of the shaft and slide the rockers, supports and springs from the shaft. Remove the plug from the forward end of the shaft and clean out the oil-way. Early engines have forged valve rockers with replaceable bronze bushes; later engines are fitted with pressed steel valve rockers with non-replaceable bushes. Removing and installing valve rocker bushes of forged-type rockers must be done with service tools 18G226 and 18G226A.

Bushes and rockers are very easily ruined by using improvised drifts.

When pressing in new bushes, make sure that their oil holes coincide with the



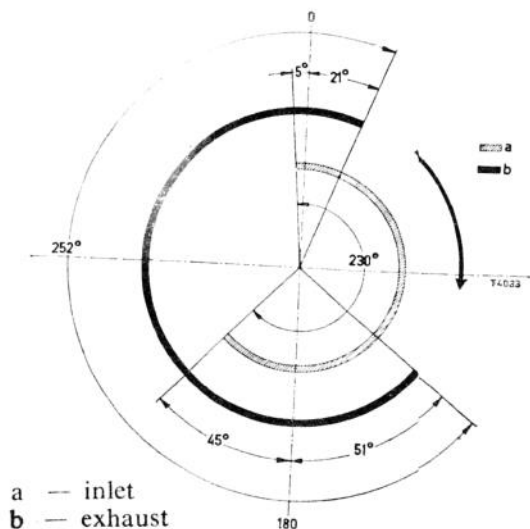


Fig. 23. Timing diagram

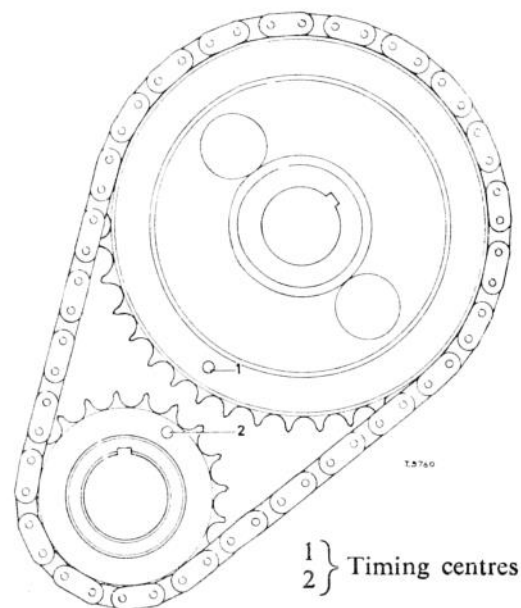


Fig. 24. Timing marks

oil drillings in the valve rockers. After having removed the valve-keeper retaining clips, the valves, with the valve springs and spring retainers, may be removed with the aid of a valve spring compressing tool, allowing the valve keepers to be removed. Keep the valves in their original order. The rubber O-ring valve stem seals should always be renewed and fitted in the groove in the valve stem, directly below the valve keepers. When new valve guides are to be pressed in, the old guide must be pressed out towards the combustion chamber; the new guide is then pressed in from the combustion chamber until the chamfered top part of the guide protrudes 19/32 in above the valve spring seating.

**Cylinder liners:** When cylinder liners are worn beyond rebore limits, new dry cylinder liners can be fitted. This operation must be carried out with special equipment, including an 8-ton press and a set of suitable pilots. New liners are pressed in with a force of 3 tons; the old liners require 5–8 tons of pressure to be removed. After pressing in, the new liners must be machined and honed to the dimensions given in *General Data*.

**Camshaft bearings:** If necessary, the camshaft bearings can be replaced; this necessitates the use of service tool 18G124A and B and adaptors 18G124K and M. When installing new bearings be sure to keep the oil holes in line with the oil drillings in the block. After installation of new bearings, these should be reamed with a special reamer set.

**Valve timing diagram:** The valve timing should be checked with a valve clearance of 0.021 in.

After checking the valve timing, be sure to re-adjust the valves to their normal working clearance.

**Valve seat inserts:** If the valve seat inserts become so badly worn or pitted that with normal workshop cutting and refacing no satisfactory result could be obtained, new valve seat inserts can be fitted. The seatings in the cylinder head must be machined to the dimensions given in Fig. 25. The new inserts should have an interference fit of 0.0025 to 0.0045 in and must be pressed and not driven into the cylinder head.

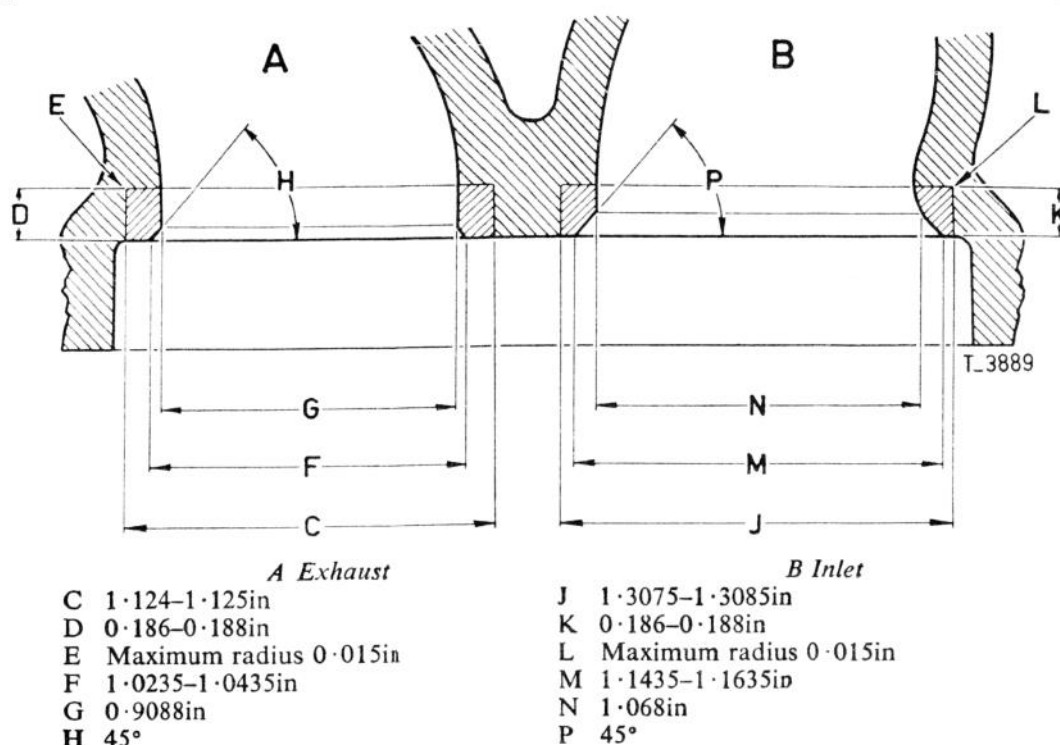


Fig. 25. Valve seat dimensions

**Starter ring gear:** If the starter ring gear needs replacement it can be removed by splitting the gear between two teeth with the aid of a sharp chisel; to facilitate this operation small holes may be drilled through the ring gear, after which the final break may be done with a chisel. Make certain that the new ring gear and its seating on the flywheel are free from burrs and are perfectly clean. Heat the ring gear to a temperature of 300 to 400°C (572 to 752°F); at this temperature the colour of the ring gear turns to light blue. Do not exceed this limit or the temper of the teeth may be affected. Place the heated ring gear squarely onto its seating with the chamfer on the teeth towards the flywheel boss; upon cooling down, the ring gear will shrink to a tight fit on the flywheel.

**Ignition:** Ignition is by means of battery and coil. The ignition distributor is equipped with vacuum and centrifugal advance mechanism. After having removed the distributor cap and disconnected the primary lead, the distributor can be withdrawn by removing the two retaining bolts. The distributor drive spindle can easily be withdrawn by screwing a  $\frac{5}{16}$  in UNF bolt into the tapped end of the distributor drive spindle.

Before installing the distributor, the engine should be set at T.D.C. by aligning the notch in the crankshaft pulley outer flange with the largest timing pointer fitted to the timing cover, just below the pulley. Hold the drive spindle with the slot in a horizontal position, the larger off-set uppermost, above its bore. As the helical drive gears engage, the slot in the spindle will turn in a clockwise direction, until its slot is approximately in the two o'clock position. Install the distributor, secure it with the two retaining bolts and loosen the clamp pinch bolt. Turn back the crankshaft approximately 90° contrary to its normal rotation, then smoothly turn it in normal rotating direction until the notch in the crankshaft pulley outer flange coincides with the 3° B.T.D.C. mark (5° B.T.D.C. for twin-carburettor engines), as indicated by the timing pointers on the timing cover. These timing

pointers consist of four points, the largest of which represents T.D.C. and each subsequent pointer represents 5 crankshaft degrees of advance.

Connect the primary distributor lead and the vacuum line. Connect a 12-volt test lamp between the primary terminal and earth and turn the knurled vernier adjustment nut on the distributor housing until the scale protrudes half way. Install the rotor, the tip of which should be pointing towards the spark plug segment for No. 1 cylinder, inside the distributor cap. Switch on the ignition and slowly turn the distributor in an anti-clockwise direction until the contact points fully close and consequently the test lamp goes out; now slowly turn the distributor housing in a clockwise direction, whilst keeping the rotor turned clockwise as far as it will go (in order to take up the slack in the drive) until the contact points just commence to open and the test lamp lights up. Secure the distributor in this position by tightening the clamp pinch bolt.

Do not forget to switch off the ignition.

The setting can afterwards be adjusted without loosening the clamp pinch bolt, by turning the knurled adjustment nut in the required direction. The markings on the distributor housing, adjacent to the nut, A and R, stand for Advance and Retard respectively.

#### **Fuel pump:**

##### *Removal:*

The electrically-operated SU fuel pump is located beneath the luggage compartment floor; on early models on the left-hand side, on later models on the right-hand side of the vehicle. Before removing the fuel pump, be sure to disconnect the battery earth lead; when removing the pump the flexible hoses remain on the pump connections. The pump can then be removed from within the luggage compartment by lifting the floor and unscrewing the retaining screws.

##### *Installation:*

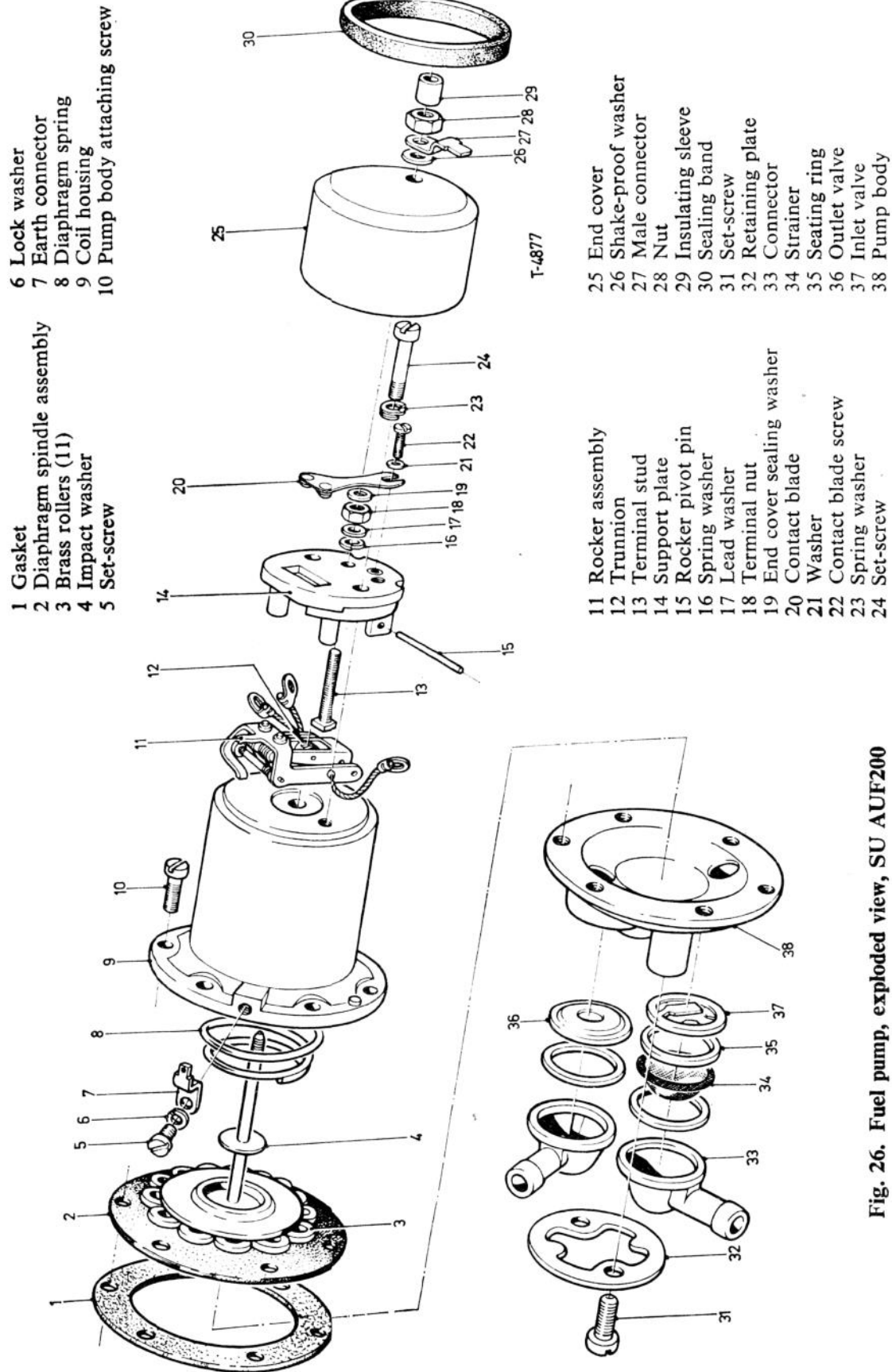
Installation is a direct reversal of the removal procedure.

##### *Dismantling:*

Before dismantling the pump, its exterior should be thoroughly cleaned to avoid contamination of the vital parts. First remove the insulating sleeve, the terminal nut and the connector with its shakeproof washer. Remove the end-cover after having removed the tape seal (if any). Withdraw the condenser from its clip (if fitted) and remove the screw holding the contact-blade to the support plate. Withdraw the coil housing attaching screws with a thick-bladed screwdriver to prevent damaging the screw heads.

Remove the earthing screw and separate the coil housing from the pump body. Next, turn the exposed diaphragm in an anti-clockwise direction until the spring tension pushes the diaphragm away from the coil housing, taking care not to lose the eleven brass rollers. The diaphragm and its spindle form one unit and should not be separated. Remove the terminal nut from the support plate, followed by the lead washer, which in most cases must be cut to allow removal. Remove the support plate-to-coil housing securing screws and remove the earth terminal tag and the condenser retaining clip (if fitted). Tilt the support plate and withdraw the terminal stud from the tag. The support plate, together with the rocker mechanism, may now be removed.

Push out the tempered steel pin securing the rocker mechanism to the support plate. The line connections, filter and valve assembly of the AUF 200 fuel pump can be removed after removal of the two screws securing the spring clamp plate holding the inlet and outlet nozzles.



**Fig. 26. Fuel pump, exploded view, SU AUF200**

The two valve assemblies of the SP fuel pump can be taken out after unscrewing the inlet union and withdrawing the filter.

Assembly should be preceded by thorough examination of all parts, particularly those mentioned below:

Inspect the fuel pump body for cracks, damaged joint faces and threads. Examine the plastic valve assemblies for distortion, wear or damage; this can best be done by blowing or sucking with the mouth. Check that the valve retaining tab is positioned to retain the valve in the recess but allows a valve lift of approximately  $\frac{1}{16}$  in. If the valve seats are pitted, the pump body must be replaced.

Check that the coil housing vent is unobstructed. Carefully examine the general condition of the rocker mechanism, replacing those parts that show signs of wear, damage or distortion.

The following parts should always be renewed: fibre and cork washers, gaskets and O-rings; worn or damaged rollers, damaged bolts and unions.

*Assembling:*

NOTE: *The hardened steel pin securing the rocker assembly to the support plate should be replaced only by a genuine SU part, if necessary.*

Place the support plate upside down and attach the rocker assembly by means of the hardened steel pin. Position the centre toggle in such a manner that when the inner rocker spindle is tensioned against the rear of the contact point, the centre toggle spring is above the spindle carrying the rollers.

The importance of a completely free-moving rocker mechanism cannot be over-emphasised; any bent parts should be straightened with suitable needle-nosed pliers.

Further assembly of the rocker mechanism is a reversal of the dismantling procedure; the contact blade, however, should not be installed at this stage. The support plate retaining screws should not be overtightened or damage to the plate will result.

Place the diaphragm spring, larger diameter first, into the housing. Before fitting the diaphragm, make sure the small neoprene washer is fitted to the armature recess. The diaphragm should not be installed with gasket sealing compound of any kind. Install the diaphragm assembly and screw its spindle into the threaded hole of the centre rocker trunnion until the rocker will not throw-over; not further.

Install the eleven brass rollers by turning up the diaphragm edge and dropping the rollers into the coil recess; during this operation the pump should be held with the rocker end downwards, thus preventing the rollers from dropping out.

Firmly push in the diaphragm spindle whilst unscrewing the diaphragm and pushing repeatedly until the rocker just 'throws-over'; now unscrew the diaphragm until the nearest holes in the diaphragm and pump housing line-up, and then turn four holes further. To prevent the rollers falling out, press the centre of the armature whilst fitting the retaining fork (SU tool) at the rear of the rocker mechanism.

Fit the outlet valve assembly of the AUF 200 pump in the recess marked 'outlet'; place a joint washer on top of the valve and install the outlet connection.

Install the inlet valve of the AUF 200 pump, tongue-side downwards, in the recess marked 'inlet'; place a joint washer, the filter (domed side up) followed by a second joint washer and fit the inlet connection. Position both connections as required; install and tighten down the clamping plate.

The valve assemblies of the SP fuel pump are fitted as follows:

Place the filter in the inlet union recess and screw it, together with the fibre washer, into the pump body. Place the outlet valve assembly, spring downwards, into the recess, making sure that it sits squarely on the seating; secure the assembly



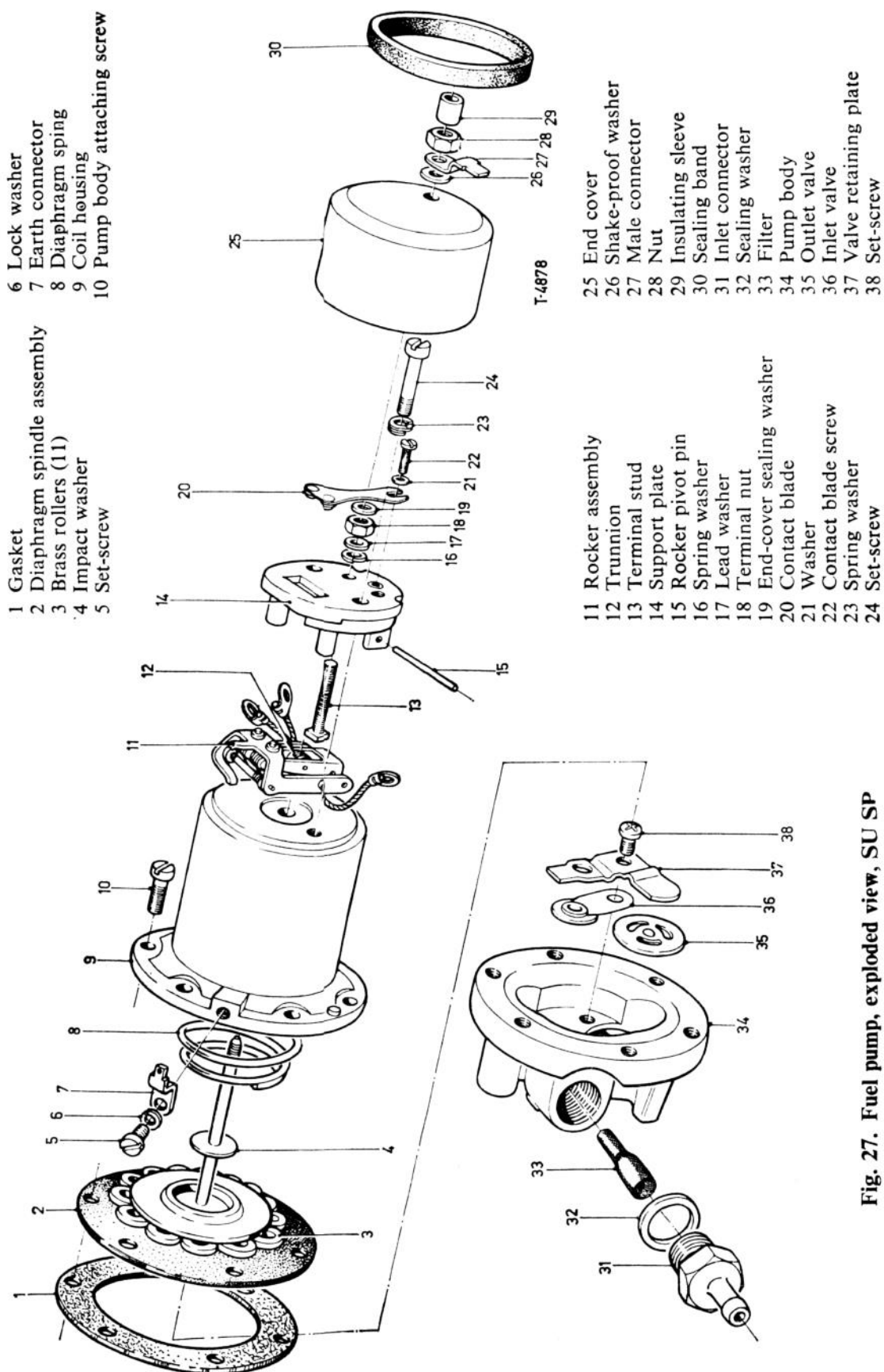


Fig. 27. Fuel pump, exploded view, SU SP

with the clamping plate. Ensure that the valve disc is properly centralized on its seating.

Place the coil housing on the pump body and align the six holes. Carefully remove the retaining fork, bearing in mind that a displaced roller will cut the diaphragm. Tighten the securing screws evenly in a diagonal sequence. Fit the contact blade and the coil lead to the support plate; if a condenser is fitted, its tag should be clamped under the coil lead tag. Adjust the contact blade so that when closed the contact points on it are a fraction above the rocker points and when the contact points just commence to open or close, one set of points wipe across the centre line of the other in a symmetrical manner. Some adjustment is possible by means of the slotted securing hole in the contact blade.

Ensure that when the outer rocker is pressed toward the coil housing, the contact blade rests on the thin edge or ridge protruding just above the main face of the support plate; if not, swing the blade clear of the support plate and bend it downward to such an extent that when installed, it rests lightly against the ridge. Do not over-tension the blade.

*Adjustment:*

*Earlier type rocker mechanism:*

Check the contact points gap by carefully holding the contact blade against the projected rib on the support plate; do not press on the contact-blade tip. Then check if a 0.030in feeler gauge will pass between the fibre rollers and the surface of the coil housing. If required, the tip of the blade can be bent to obtain the requisite gap.

*Later type rocker mechanism (modified):*

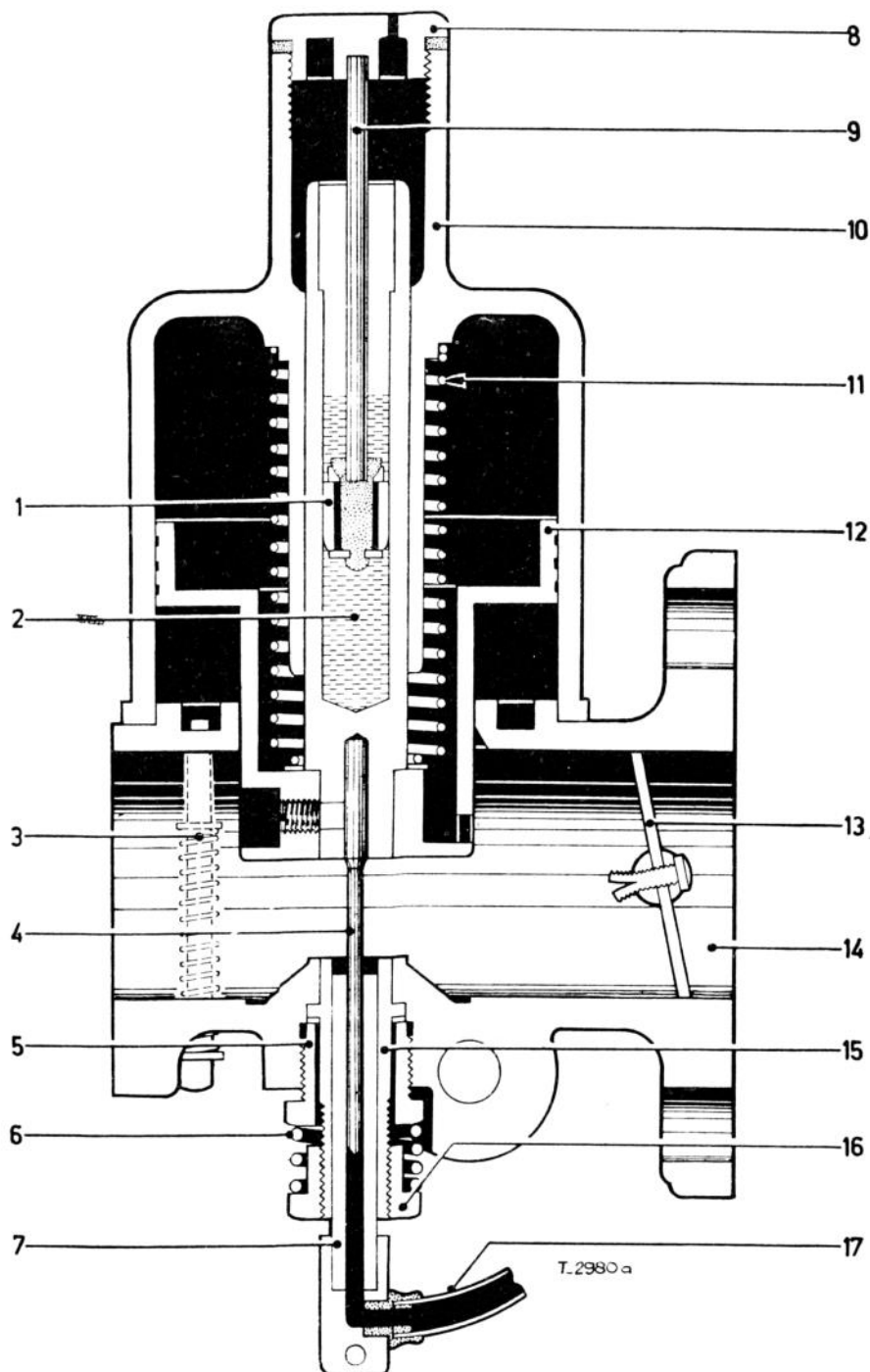
Check the gap produced by the lift of the contact blade above the top of the support plate; if necessary the stop finger beneath the support plate can be bent to obtain the requisite gap of  $0.035 \pm 0.005$ in. Measure the gap between the rocker finger and the coil housing with a feeler gauge; if necessary the stop-finger can be bent to obtain the requisite gap of  $0.070 \pm 0.005$ in.

Further assembly is a reversal of the dismantling procedure.

**Carburettor(s):** SU carburettors are of the variable throat type; the fuel is metered by a tapered needle in the jet. The needle is secured to the sleeve which determines the amount of throat opening; the position of the sleeve and needle are controlled by the vacuum piston (the upper part of the sleeve), according to throttle valve opening.

A schematic view of the construction is shown. Normally, the piston, the sleeve and the needle are in the bottom position when the throttle is closed, but for the sake of clarity these parts are shown in a raised position. The piston is a free fit in the vacuum chamber with a very small 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 and vacuum chamber at all times.

When the engine is not running, the piston and needle assembly fall to the bottom by their own weight and rest on the bridge in the throat. (The HS2 carburettor is equipped with a soft assist spring on top of the vacuum piston.) With the engine running, the sleeve forms a restriction to the airstream; 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. The raised needle determines the amount of fuel emerging from the jet; thus the correct air/fuel mixture is automatically established. When starting



- |                          |                                |
|--------------------------|--------------------------------|
| 1 Damper piston assembly | 10 Vacuum chamber              |
| 2 Damper oil reservoir   | 11 Vacuum piston assist spring |
| 3 Piston lifting pin     | 12 Vacuum piston assembly      |
| 4 Jet needle             | 13 Throttle valve              |
| 5 Jet retainer nut       | 14 Carburettor body            |
| 6 Spring                 | 15 Jet retainer                |
| 7 Jet assembly           | 16 Jet adjusting nut           |
| 8 Damper piston cap      | 17 Fuel line                   |
| 9 Damper piston stem     |                                |

Fig. 28. Carburettor, schematic view (HS2, typical)

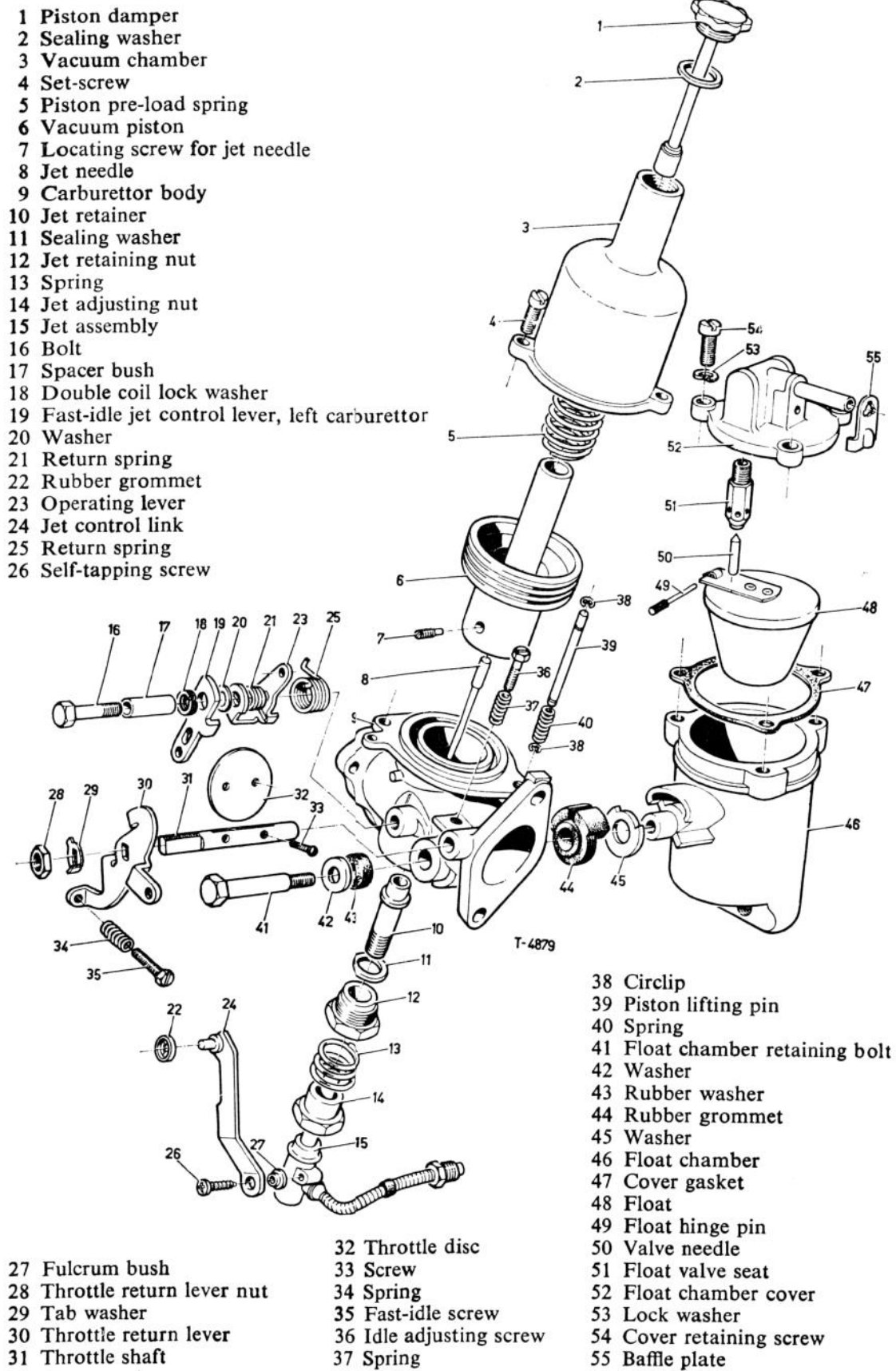
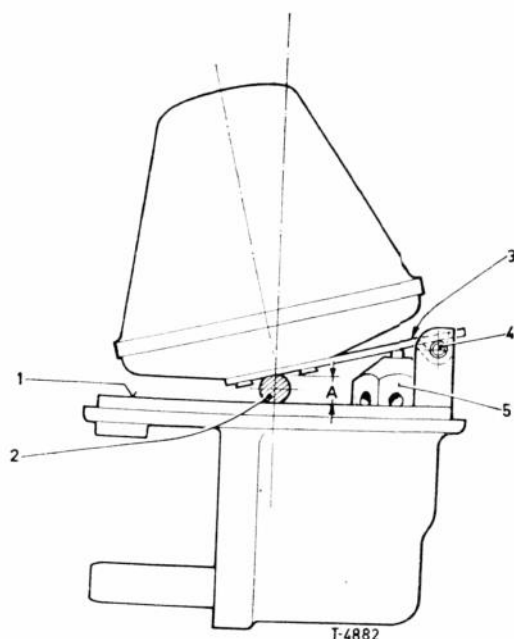
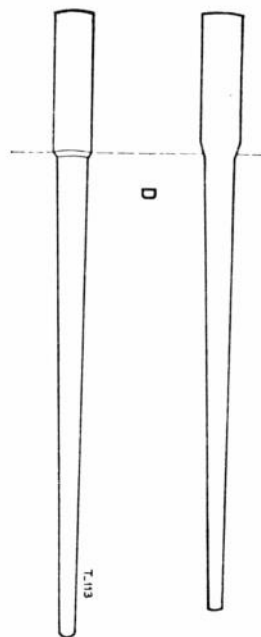


Fig. 29. Carburettor, exploded view (HS2, typical)



- 1 Machined lip of float chamber cover
- 2  $\frac{1}{8}$  to  $\frac{3}{16}$  in bar
- 3 Float arm
- 4 Float hinge pin
- 5 Float needle and seat assembly

**Fig. 30. Checking float setting**



**Fig. 31. Carburettor, jet needles**

a cold engine, the mixture may be enriched by pulling down the jet; the mouth of the jet will now be in line with a thinner portion of the needle, thus supplying a richer mixture. The jet is mounted in a jet retainer bush and is fed with fuel by a flexible nylon tube connected to the base of the float chamber.

*Fitting jet needles and centring the jets:*

When fitting the needle, the portion of the needle that is marked with the dotted line must be flush with the vacuum piston sleeve (see Fig. 31). When assembling the carburettor, it is imperative to make sure that the jet and needle are correctly centred. This is done by screwing the adjustment nut all the way up; then lift the piston and needle assembly and listen for it to fall freely with an audible 'click'. If no click is heard, the needle is fouling the jet, which will have to be re-centred. This is done by loosening and retightening the jet retainer. Re check whether the piston will now fall with an audible 'click'; if necessary, repeat loosening and retightening the jet retainer until the jet is centred correctly.

*Checking the float setting:*

When the float needle is seated, a  $\frac{1}{8}$  in to  $\frac{3}{16}$  in round bar should be an easy sliding fit between the float hinge arm and the edge of the float chamber cover.

*Adjustment:*

Make sure that the vacuum chamber and piston of the carburettor are clean, the needle properly fitted and the jet correctly centred. Check the damper for correct oil level and top-up if necessary, then proceed as follows:

- (1) Ensure that the idle adjustment screw is holding the throttle partly open and that the jet adjustment nut is not screwed all the way up.

(An average setting to start with is obtained by turning the idle adjustment



screw down one full turn from the fully closed position and the jet adjusting nut one-and-a-half turns down from top position.)

- (2) Make sure the jet seats against the adjusting nut; if necessary, re-adjust or disconnect the choke cable.
- (3) Warm-up the engine and set the throttle to an idling speed of about 500rpm.
- (4) While the engine is idling at approximately 500rpm, check the mixture by lifting the piston approximately 1/32in by means of the spring-loaded piston lifting spring.  
If, when the piston is lifted, the engine speed increases, the mixture is too rich and the jet adjusting nut must be screwed up one-sixth of a turn; if the speed decreases, the mixture is too lean and the jet adjusting nut must be screwed down one-sixth of a turn.
- (5) Continue adjusting the carburettor until, when the piston is lifted, no increase, or a very slight increase followed by a decrease in speed is noticed. The mixture is then correct and the engine should run regularly.
- (6) Reconnect and adjust the choke cable. Adjust the fast idle to about 1000rpm when the choke control is pulled out to the limit of its free travel, without moving the jet.
- (7) Recheck idle speed and mixture.

*Adjustment and synchronization of two carburettors;*

Make sure that the vacuum chambers and pistons on both carburettors are clean, needles properly fitted and the jets correctly centred. Check the dampers for correct oil level and top-up if necessary, then proceed as follows:

- (1) Remove air-cleaner and air-duct, and slacken the clamping bolt on the throttle interconnecting rod to enable each throttle to be set independently. Ensure that the idle-adjustment screws are holding the throttles partly open and that the jet adjustment nuts are not screwed all the way up. (An average setting to start with is obtained by turning the idle-adjustment screws down one full turn from the fully closed position, and the jet-adjusting nuts one-and-a-half turns down from the top position.)
- (2) Make sure the jet seats against the adjusting nut; if necessary, re-adjust or disconnect the choke cable.
- (3) Warm-up the engine, set the throttles to give an idling speed of approximately 500rpm.
- (4) Listen to the hiss of air at each carburettor air-intake (the use of a piece of tubing of about  $\frac{3}{8}$ in diameter, one end held to the ear and the other to each air-intake in turn will make it easier to compare the sound of both carburettors).
- (5) Adjust both idle-screws until the hiss is equal on both units and the idle speed is approximately 500rpm.
- (6) Now turn off the ignition and with a downward pressure on the rear throttle arm, tighten the throttle connector-rod clamping screw.
- (7) Start the engine. While the engine is idling at approximately 500rpm, check the mixture of each carburettor in turn by lifting the piston approximately  $\frac{1}{8}$ in with a penknife blade or a thin screwdriver inserted in the air intake, or by means of the built-in piston lifting pin.

NOTE: Do not lift the piston with a finger, since a finger forms a too large obstruction of the air-intake; it will alter the mixture and lead to false conclusions.

- (8) If, when the piston is lifted, the engine speed increases, the mixture is too rich and the jet adjusting nut must be screwed up one sixth of a turn. If the speed

decreases, the mixture is too lean and the nut should be screwed down a sixth of a turn.

- (9) 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 mixture is then correct and the engine should run evenly.
- (10) Reconnect and adjust the choke cable. Adjust the 'fast-idle' adjustment screw on the connecting linkage between choke lever and throttle until the tip of the screw is just clear of the cam; the clearance should be about 1/64 in.
- (11) Refit the air-cleaner. Recheck idle speed and mixture.

**Water pump:** After removing the water pump it can be dismantled as follows:

Remove the bearing retaining wire through the hole in the top of the pump body. Gently tap the spindle rearwards and withdraw the assembly from the pump body. If necessary, withdraw the vane from the spindle with a suitable extractor. Carefully clean and inspect all parts; renew the seals.

Reassembly is done in reverse order of the dismantling procedure, noting the following: Before pressing the spindle with the bearing into position, make sure that the hole in the bearing is lined-up with the lubricating hole in the pump body. The clearance between the vane and the pump body should be 0.020–0.030 in.

## TRANSMISSION

**Clutch:** The single dry-plate type clutch is mounted on a splined hub of the primary gear on the rear of the crankshaft and forms a unit with the flywheel. The clutch is hydraulically actuated by means of a master cylinder and a clutch control cylinder (slave cylinder). When dismantling the clutch, all parts should be carefully marked in order to identify them for refitting in their original positions.

### *Dismantling:*

Release the clutch spring cover from the flywheel by compressing the clutch springs with service toolset 18G304M. Evenly tighten the three nuts of the tool until the complete load of the springs is taken from the three flywheel-to-clutch driving bolts.

Remove the bolts and gradually release the clutch springs. Clean and inspect all parts for wear or damage and replace them as necessary.

**NOTE:** *If the shoulders of the driving bolts show signs of wear or burrs, they must be replaced as a set of three; this also applies to the laminated driving straps on the flywheel.*

Clutch assemblies of certain earlier units were fitted with double clutch springs; the serial numbers of these engines are:

10 AMW-TA-H101 to and including 300

10 AMW-TA-H401 to and including 511

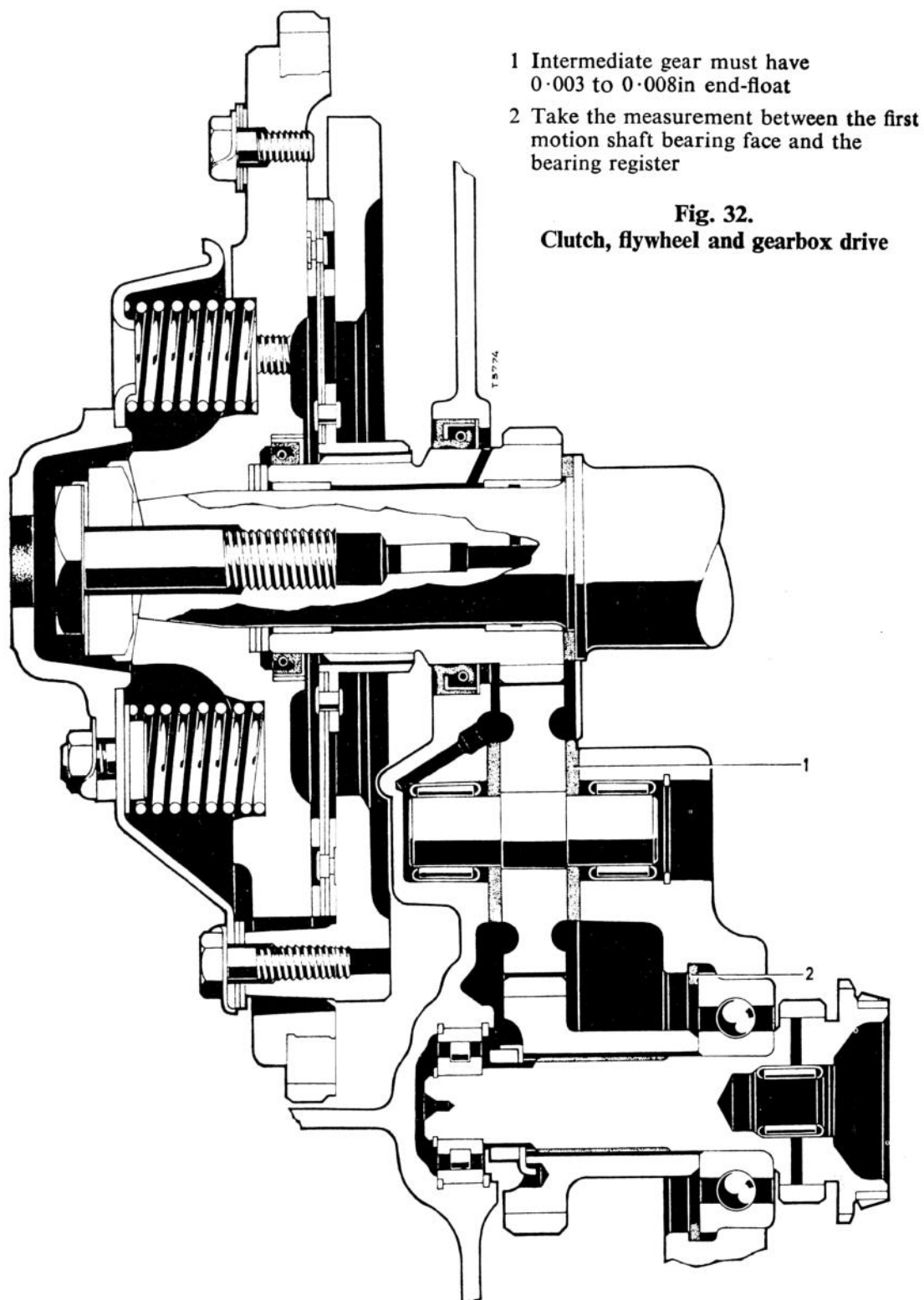
To dismantle and reassemble these clutches, three bolts and three nuts must be made up as shown in Fig. 33 and used in place of service tool 18G304M.

### *Reassembling:*

Reassembling is a reversal of the dismantling procedure. Use service tool 18G684 to ensure that the hub of the driven clutch plate is centralised and kept in place in relation to the flywheel hub during the assembling operation. Insert the tool through the hub of the clutch driven plate and the bore of the flywheel, and attach it with the set-screw and the retaining plate against the flywheel boss. Note that the three driving straps are laminated; each strap consists of two blades.

### *Adjustment:*

It is essential that a clearance of 0.020 in should be present between the clutch thrust bearing race and the thrust ring. As the clutch driven plate lining wears in



service this clearance should be checked and corrected at regular intervals; improper or delayed adjustment will eventually lead to clutch slipping.

The adjustment is carried out as follows:

Pull the clutch operating lever outward until the free-play is just taken up, and check the clearance between the lever and the head of the stop-bolt with a

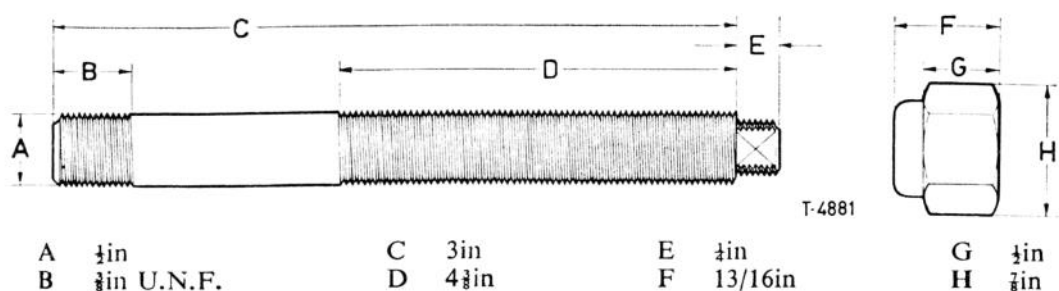


Fig. 33. Extractor stud, alternative to service tool 18G6304M

feeler gauge; if necessary, correct the clearance by turning the bolt in the desired direction. The shouldered stop which operates against the clutch-cover boss is set in production and normally requires no adjustment; clutch release lever free-play is adjusted as described above. If the throw-out plunger has been removed during overhaul, the stop must be reset. Turn the stop and its locknut away from the clutch cover as far as possible. Fully release the clutch and, while holding the pedal down, turn the stop against the clutch-cover boss. Release the clutch pedal; then tighten the stop one sixth of a turn (one 'flat' of the hexagon) and tighten the lock-nut.

**Gearbox/Differential:** The four-speed gearbox is housed in the engine sump and forms a single unit with the differential; second, third and top gear are synchronized (baulk-ring system). The differential is only partially located within the gearbox housing; the outer half of the differential casing is bolted onto the inner half which is part of the gearbox-housing casting.

Owing to the transverse arrangement of the engine/transmission unit, no conventional pinion and crownwheel are used; the drive from the final drive gear on the gearbox output shaft is transmitted to a large gear with helical teeth which is bolted onto the differential housing. The differential runs in two ball-bearings and this whole unit can be removed after the outer half of the differential casing has been taken off. The gearbox/differential unit can only be removed after the engine/transmission unit has been taken out of the vehicle.

#### *Removal and dismantling:*

Remove the engine and transmission unit from the vehicle and remove the clutch cover, the pressure-plate assembly, the flywheel and the pressure plate as a unit, as described under *Engine*. Remove the flywheel housing, taking care not to damage the lips of the oil-seal ring. In order to do this, slide a thin sleeve around the splines of the crankshaft gear and remove the housing. Separate the gearbox from the cylinder block. Remove the intermediate pinion, taking care not to lose the thrust rings on each side of the pinion.

Remove the bell-crank fulcrum pin and bell-crank. Remove the bell-crank to remote control shaft clamp bolt and withdraw the shaft. Remove the nylon cup and spring from the remote control shaft and the bell-crank lever. Remove the left- and right-hand drive flanges from the differential shafts.

**NOTE:** Do not use the transmission housing as a 'stop' for levering off the drive flanges or other parts, as the housing will be seriously damaged by such practice.

Remove both differential bearing covers and make a note of the shims. Unscrew the stud nuts and lift the differential casing as well as the differential assembly from the transmission housing.

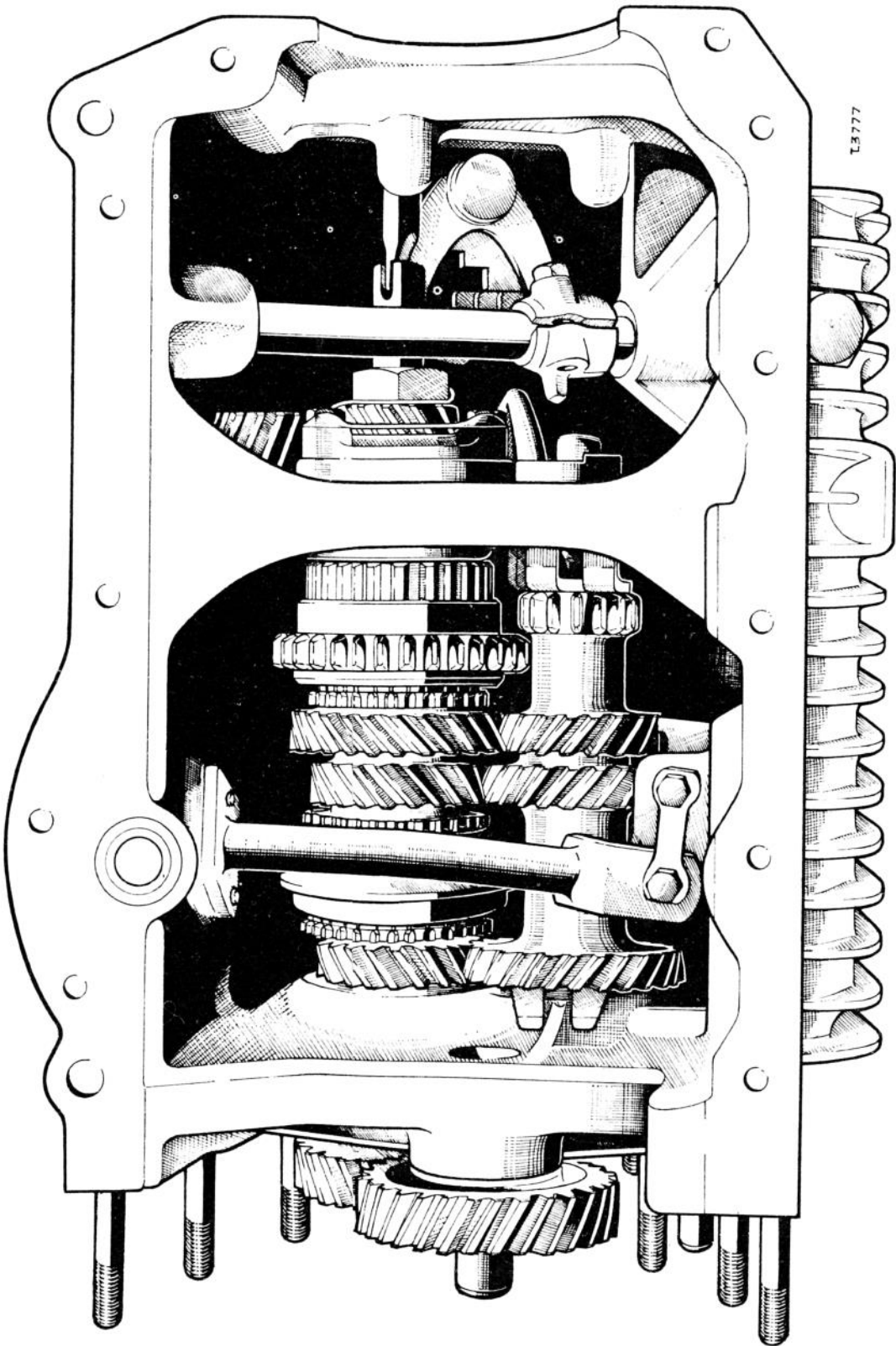


Fig. 34. Gearbox



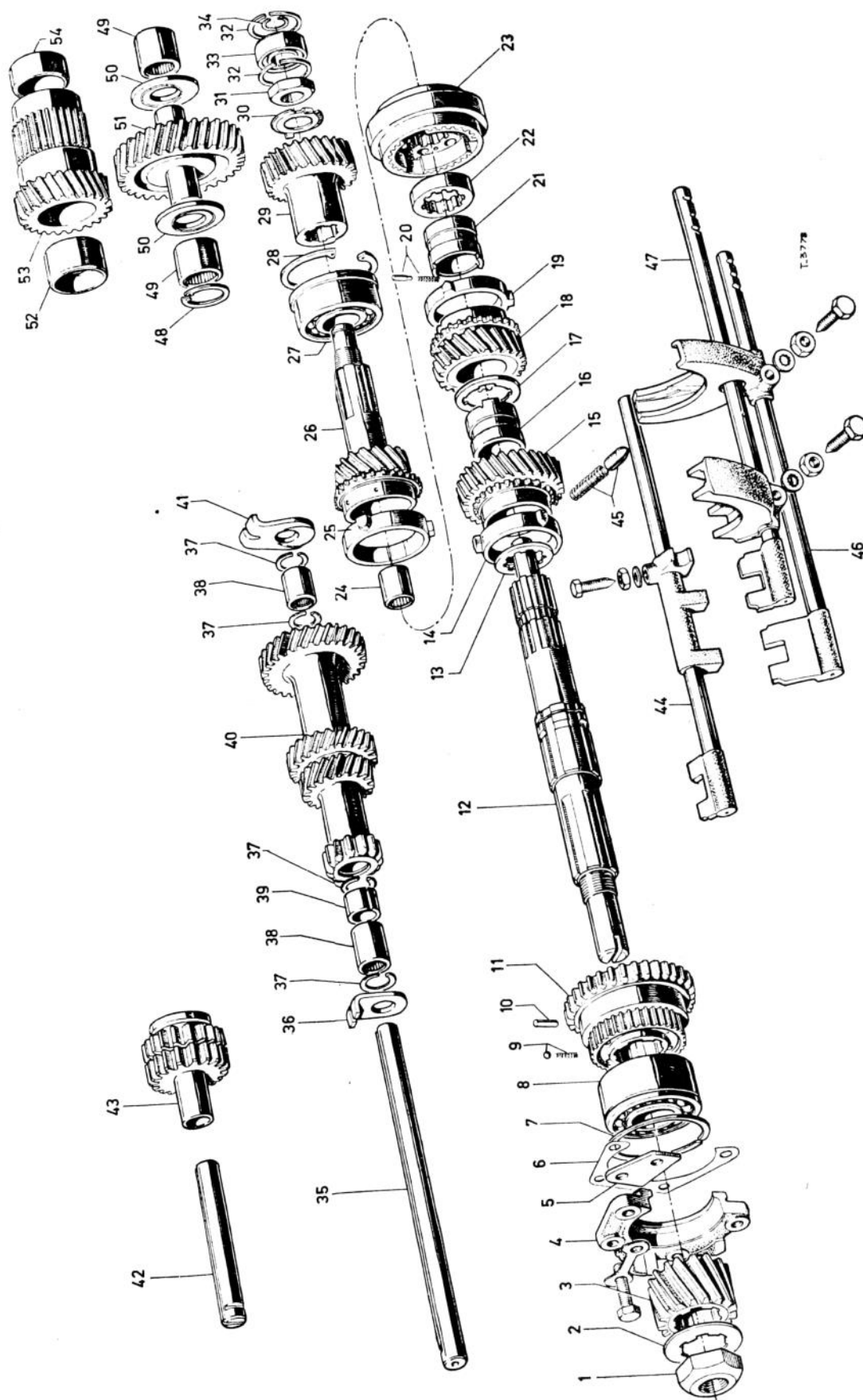


Fig. 35. Gearbox, exploded view

If necessary, the differential can be dismantled as follows:

- a Extract both differential bearings with the aid of tool No. 18G2.
- b Bend back the tabs of the locking plates and remove the driving-gear attaching bolts.

Mark the driving gear in relation to the differential housing in order that it can be installed in its original position.

- c Remove the driving gear from the differential housing and remove the differential side gear and thrust ring from its bore in the driving gear.
- d Drive out the tapered locking-pin and remove the differential pinion shaft, the differential pinions, the thrust rings and spacer; then remove the other differential side gear and its thrust ring.

Reassembly is a reversal of the dismantling procedure.

Remove the reverse gear, detent spring and plunger. Unscrew the selector-arm clamping bolt and remove the selector-shaft, taking care not to damage the oil-seal ring in the housing with the Woodruff key in the lower end of the shaft. Remove the speedometer-pinion housing screw, remove the housing and withdraw the pinion. Unscrew the two cap screws securing the speedometer drive shaft. Remove the gearbox end-cover. Remove the bolt securing the oil-pipe support to the gearbox as well as the two bolts through the pipe flange and the blind flange.

Disconnect the oil pipe from the strainer. Engage two gears to lock the mainshaft; remove the nut from the final drive gear end and slide the locking-washer and the gear off the shaft.

Withdraw the bearing retaining bolts from the gearbox partition and remove the retainer, together with the shims. Remove the circlip and roller bearing from the main drive gear; bend back the locking-plate and unscrew the nut on the end of the main driveshaft.

*Key to Fig. 35*

- |                                 |                                    |
|---------------------------------|------------------------------------|
| 1 Nut                           | 28 Circlip                         |
| 2 Washer                        | 29 Main drive gear                 |
| 3 Pinion                        | 30 Lock washer                     |
| 4 Bearing retainer              | 31 Nut                             |
| 5 Locating plate                | 32 Circlip                         |
| 6 Bearing shim                  | 33 Oil seal                        |
| 7 Circlip                       | 34 Circlip                         |
| 8 Mainshaft ball-bearing        | 35 Countershaft                    |
| 9 Ball and spring               | 36 Front thrust washer             |
| 10 Synchronizer plunger         | 37 Abutment ring                   |
| 11 First-speed gear             | 38 Needle roller bearing           |
| 12 Mainshaft                    | 39 Spacer bush                     |
| 13 Thrust washer                | 40 Countershaft gear cluster       |
| 14 Synchronizer ring            | 41 Rear thrust washer              |
| 15 Second-speed gear            | 42 Reverse idler shaft             |
| 16 Bush                         | 43 Reverse gear with bush          |
| 17 Interlocking ring            | 44 Reverse fork shaft              |
| 18 Third-speed gear             | 45 Fork plunger with spring        |
| 19 Synchronizer ring            | 46 Third/fourth-speed shifter fork |
| 20 Thrust washer peg and spring | 47 First/second-speed shifter fork |
| 21 Bush                         | 48 Circlip                         |
| 22 Thrust washer                | 49 Roller bearing                  |
| 23 Third/top synchronizer hub   | 50 Thrust washer                   |
| 24 Roller bearing               | 51 Intermediate pinion             |
| 25 Synchronizer ring            | 52 Front bush                      |
| 26 Main drive shaft             | 53 Primary crankshaft pinion       |
| 27 Ball-bearing                 | 54 Rear bush                       |

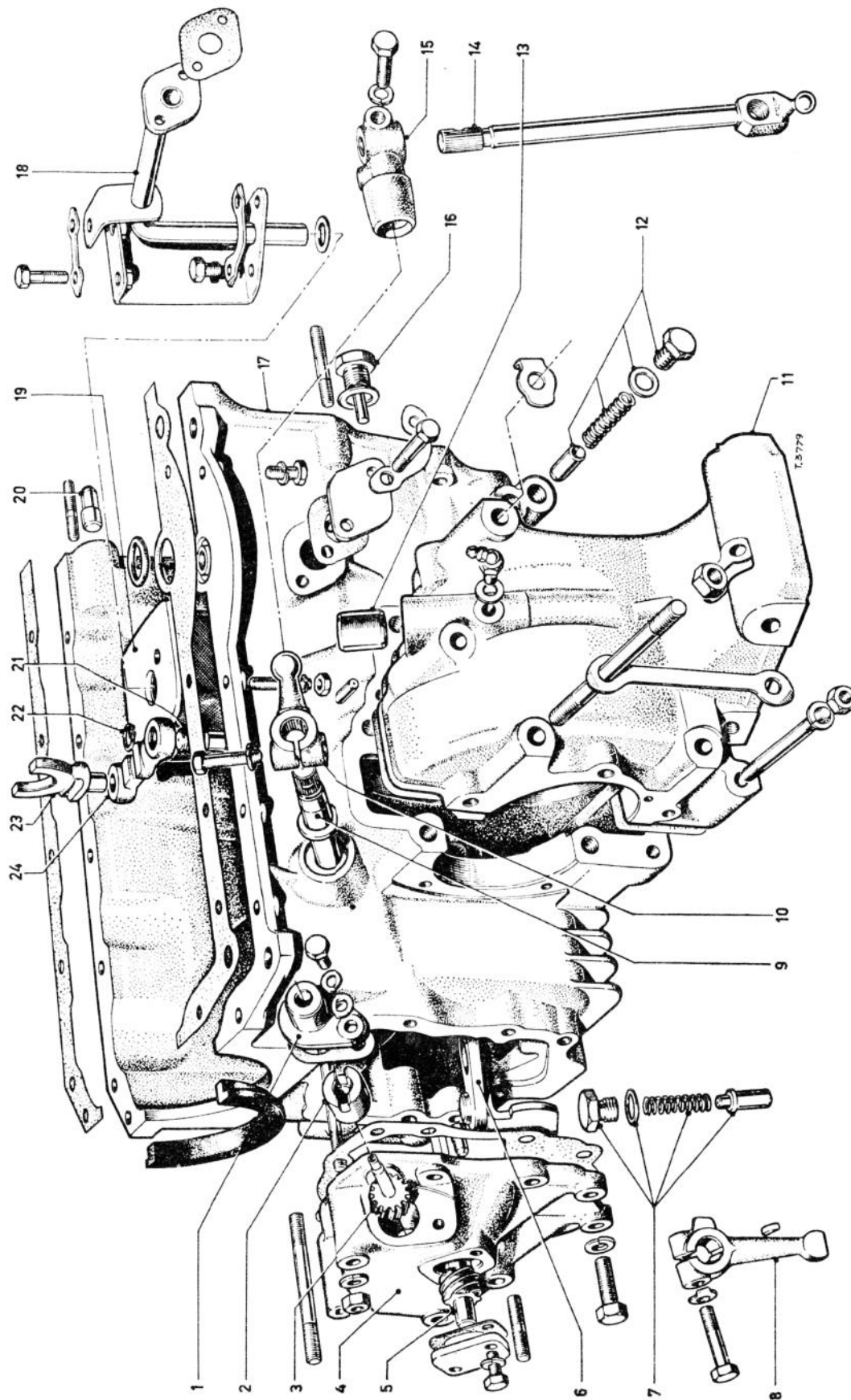


Fig. 36. Gearbox housing, exploded view

Remove the pinion from the main driveshaft. Remove the countershaft locking plates and those for the reverse idler shaft. Carefully tap the countershaft out of the housing and lift the gear cluster, together with the thrust rings, from the gearbox.

Unscrew the plugs in the gearbox housing and remove the interlock plungers and the spring.

Remove the mainshaft bearing circlip and withdraw the bearing from its bore.

Unscrew the lock-nut and bolt of the shifter fork for first/second gear; carefully remove the shifter-fork shaft and take the fork out of the gearbox.

Remove the mainshaft bearing from the partition as follows: tap the end of the mainshaft until sufficient clearance is obtained to interpose tool 18G613 between the first-speed pinion and the mainshaft bearing, the recessed face of the tool facing the bearing; tap back the mainshaft and thus dislodge the bearing from its bore. The bearing may now be prised off the shaft with the aid of two levers placed behind the circlip in the outer bearing race. When tapping on the mainshaft, take care not to damage the shifter forks. When the bearing has been removed, the mainshaft and related parts can be taken out of the gearbox. Remove the second bolt from the oil strainer support and remove the oil strainer.

Unscrew the lock-nut and bolt of the third/top gear shifter fork and remove the shifter-shaft and the fork. Remove the reverse gear idler shaft, the reverse idler pinion and the shifter fork. Remove the detent plunger and spring from the reverse gear shift lever and remove the lever.

If necessary, the mainshaft assembly can be dismantled as follows: Slide the first-speed pinion with synchronizer hub and baulk rings from the shaft; then slide the third/top speed synchronizer hub from the front part of the shaft. Remember that the flat side of the hub faces the third-gear idler pinion.

Remove the front thrust washer by depressing the spring-loaded plunger. Turn the ring until its splines register with those on the mainshaft; then slide the ring and the pinion from the shaft. Remove the plunger and the spring; remove the bearing bush and the locking ring from the third-gear idler pinion. Remove the second-gear idler pinion with its bearing bush. Should it be necessary to remove the sleeves from the second or third/top-gear synchro hubs, be careful not to lose the detent balls and springs located in each of these hubs. The best way is to wrap this assembly in a piece of cloth.

#### *Reassembly:*

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

#### *Key to Fig. 36*

- |  |                             |
|--|-----------------------------|
| 1 Speedometer driven gear bush adaptor | 13 Bush for operating shaft |
| 2 Bush                                 | 14 Gear-shift operating rod |
| 3 Speedometer driven gear              | 15 Shaft lever              |
| 4 Gearbox front cover                  | 16 Drain plug               |
| 5 Speedometer worm gear                | 17 Gearbox housing          |
| 6 Shifter-gate                         | 18 Oil suction pipe         |
| 7 Reverse detent plunger assembly      | 19 Oil strainer             |
| 8 Operating lever                      | 20 Dowel                    |
| 9 Shifter-shaft                        | 21 Operating lever pin      |
| 10 Shifter-shaft lever                 | 22 Circlip                  |
| 11 Differential housing                | 23 Reverse shifter fork     |
| 12 Plunger fork end                    | 24 Reverse operating lever  |

*Reassembly of the mainshaft:*

Reassembly of the mainshaft is a reversal of the dismantling procedure. Install the rear thrust washer and the plain half of the split bush with the plain side facing the thrust washer. Repeat this with the second-speed gear, the interlock-ring and the splined half of the centre bearing bush; engage the dogs of each half-bush with the central interlock ring. The bushes are an interference fit and if disturbed they should be replaced; heat the new bushes to a temperature of 180–200°C (356–392°F), after which the expansion allows them to be installed without force. Upon cooling down a 'shrink-fit' will be obtained.

Install the third-speed gear, plain side first, and insert the spring and the locking plunger. Depress the plunger and slide the thrust washer to cover the plunger. Turn the thrust washer until the plunger registers with the spline, thus locking the washer.

When assembled, the end-float of the second and third-speed gear should be 0.0035–0.0055 in. Install the top and third-speed synchronizer hub, the plain side of the hub facing the retaining washer. Install the first/second-speed hub and ensure that the cone side of the hub is turned in the same direction as the plain side of the first-speed gear teeth.

*NOTE: If the first and second-speed gear groups have been dismantled, particular attention should be paid to the position of the assembly in relation to its hub; incorrect assembly will result in first gear being impossible to engage. It is therefore essential that when fitting the gear to the hub, the plunger inside the hub coincides with the recessed tooth in the gear.*

*Reassembly of the gearbox:*

Fit the reverse gear shifter-lever fulcrum pin into its bore in the bottom of the gearbox housing; install the shifter lever and secure it to the fulcrum with a circlip. Position the reverse gear and shifter-fork so that the reverse shifter lever can be engaged; push the reverse gear shaft, plain end first, through the gearbox centre partition into the gear, leaving the slotted end protruding.

Insert the reverse gear shifter-shaft interlock spring and plunger; slide the shaft into the casing (from front to rear), picking up the reverse gear shifter-fork on its way through. Hold the third/fourth-speed shifter-fork in position; slide the shifter-fork shaft from the front into its bore, picking up the shifter-fork on its way through. Install the shifter-fork locating screws; make sure these engage the recesses in the shifter-shafts and secure the screws with the locking nuts.

Install the pick-up oil strainer with its two securing screws and nuts but do not yet tighten these. Smear a small amount of grease on the sealing ring located between the support and the strainer in order to facilitate sliding the oil suction pipe through, thus avoiding dislodging the sealing ring.

Pass the slotted end of the mainshaft assembly through its bore in the gearbox centre partition and engage the first/second-speed shifter-fork with the groove in the respective synchronizer hub.

Fit the ball-race to the main drive shaft and install the assembly in the gearbox. Install the mainshaft bearing in the gearbox centre partition and ensure that both shafts are properly aligned; now carefully tap both bearings into their bores. The mainshaft bearing in the centre partition is installed with the aid of tool 18G579, together with the distance pieces; the same tool (less the distance piece) is used for installing the main drive shaft bearing in the housing.

Install the circlip of the main drive shaft ball-bearing. Refit the shifter-fork, shifter-fork shaft for second and third speed and secure the fork with its locating



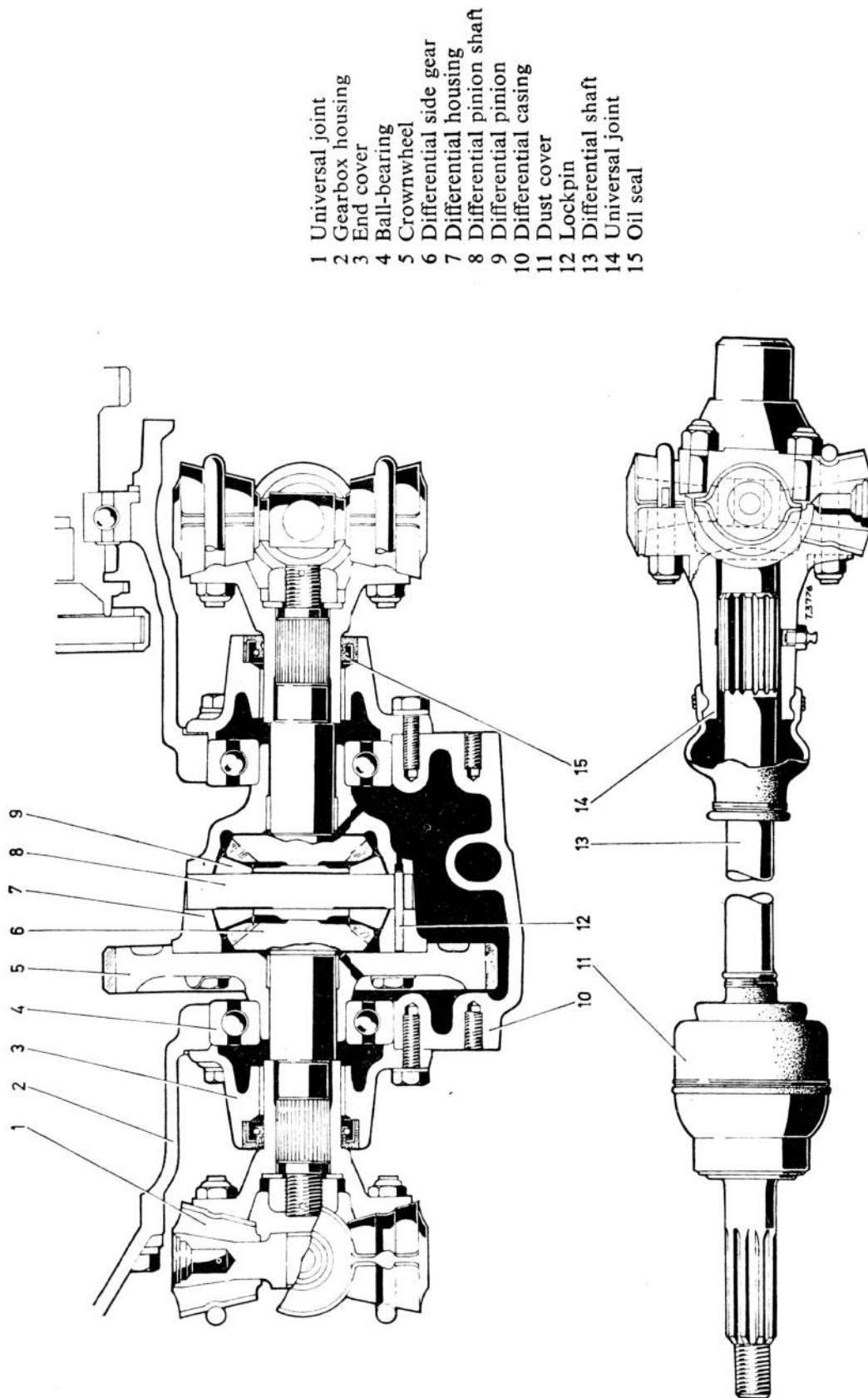


Fig. 37. Final drive

screw and lock-nut. Install the detent plungers and springs in the relative bores; be sure to place sealing washers under the heads of the retaining plugs.

Install the main drive pinion with the locking washers and the retaining nut on the front end of the mainshaft; secure the retaining nut by bending over the locking washer. Fit the main drive gear shaft drive pinion, taking care that the locating pegs on the locking washer engage the holes in the gear; tighten and secure the retaining nut. Install the countershaft assembly, placing a thrust washer at both ends of the shaft; the slotted end of the shaft should be facing the front. While fitting the countershaft, its thrust washers can be kept in place with tool 18G471. The installed countershaft should have an end-float of between 0.002 and 0.006 in; any correction can be made with the aid of adjustment shims available in thickness ranging from 0.121 in to 0.132 in. Install the mainshaft bearing retaining plate, fitting any shims necessary to take up clearance between the bearing and the plate.

Remove the foremost oil strainer support securing bolts and slide the oil suction pipe into position, being careful not to dislodge the sealing rubber. Replace the two paper gaskets between the oil-pipe flange, the outer blind plate and the housing, after which the strainer support attaching bolt is tightened. Do not forget to bend the locking plates over the support bolt heads. Install the shifter interlock arm followed by the gearbox front cover with its gasket. Install the speedometer drive gear; engage its dog with the slot in the mainshaft and secure it with the cover-plate, paper gasket and two screws. Refit the reverse detent plunger, the spring and the screw plug to the gear-shift operating rod.

Install the gear-shift operating rod, taking care not to damage the oil-seal with the Woodruff key in the lower portion of the rod. If necessary, install a new oil-seal, with tool 18 G 573. Slide the shifting-rod further down into the gearbox, picking up the interlocking arm on its way through, until the rod rests in the lower bearing in the gearbox housing.

Position the interlocking arm so that its set-screw hole coincides with the recess in the rod; fit the pinch-bolt and lock it by bending over the locking washer.

If the intermediate pinion in the flywheel housing needs to be replaced, the area surrounding the bearing must be firmly supported during the pressing-in operation. The new intermediate pinion bearing can be fitted to the flywheel housing and the transmission housing with the aid of tool 18G582, the collar of which is used to determine the depth to which the bearing is to be pressed into the flywheel housing. Pressing in this bearing to the fullest extent would mean obstruction of the oil supply hole in the bearing bore. The collar is not to be used for pressing the bearing into the gearbox housing.

Fit the roller bearing to the end of the main drive shaft. Prior to refitting the transmission assembly to the engine crankcase, the end-float of the intermediate pinion assembly should be checked and if necessary corrected in the following manner:

Fit a new flywheel housing gasket and install the intermediate pinion with the chamfered bore of its thrust washers facing the pinion face. Assemble the flywheel housing to the gearbox after having applied a small amount of high-melting-point grease to the mainshaft bearing rollers to prevent them dislodging as they enter the bearing outer race in the flywheel housing. *Never use force when installing the flywheel housing.*

Tighten the attaching stud nuts to the specified torque and check the intermediate pinion end-float; this should be between 0.003 and 0.008 in. Any discrepancy may be justified by adjustment shims, available in thicknesses ranging from 0.132 to 0.139 in.

*NOTE: The flywheel housing-to-transmission paper gasket used for the above checking operation must be discarded and should not be used for final assembly.*

Place the assembled differential housing in the gearbox housing, slightly biased towards the flywheel end. Install the differential carrier with its gaskets, screw down the nuts in order that the bearing is held in place, but do not tighten them. Refit the right-hand bearing cover with its gasket and a new oil-seal if necessary; fit the bolts and tighten them equally in order to keep the bearing firmly against the outer race of the bearing. As all the bolts are tightened, the differential will be moved away from the flywheel end of the engine. If necessary, renew the oil-seal in the left-hand bearing cover and refit the bearing cover without a gasket. Screw in the bolts just sufficiently to bring the cover into even contact with the bearing outer race; overtightening will distort the cover flange. Measure the clearance between the cover flange, differential carrier and gearbox housing with the aid of feeler gauges at several points; if a difference in distance is measured, it means that bolts are tightened unevenly and the differential is not correctly located, in which case the bolt tension must be adjusted. If a feeler gauge cannot be inserted between the cover and the housing, add a shimpack of 0.008 in between the bearing outer race and the cover.

The thickness of the compressed cover gasket is 0.007 in and the bearing preload is 0.001–0.002 in; therefore, the clearance between the cover and the housing should be 0.008–0.009 in. Any deviation from this clearance should be corrected by fitting shims between the bearing and the cover. Remove the cover and fit the correct number of shims and the gasket; refit the cover and tighten down the bolts evenly. Tighten the differential carrier bolts. Install the drive flanges on the drive shafts. Tighten the castellated nuts and fit new split-pins. Ensure that both drive shafts move freely, as binding or tightness on one shaft will cause the steering to pull to that side.

Slide the shifter lever onto the splined end of the gearshift operating rod and ensure that the recess in the rod is perfectly lined-up with the hole in the lever boss. Fit the set-screw. Insert the remote control shaft lever from the bottom upwards into the gearshift extension and make it engage the splined bore of the lever.

*Make sure the set-screw recess in the shaft is in alignment with the bore in the lever boss before attempting to insert the set-screw.*

Install the bell-crank lever.

## CHASSIS

**Chassis:** The body is of unit construction, with detachable sub-frames at front and rear. For sub-frame dimensions refer to Fig. 38.

**Front suspension:** Independent front suspension of the Hydrolastic type. The Hydrolastic system consists of two front and two rear liquid-filled elements. Each front element is interconnected with the rear element on the same side. The Hydrolastic elements are made of pressed steel and rubber; they consist of a lower and an upper chamber housing, a conical spring of compressed rubber and a rubber diaphragm which is actuated by a piston connected to the suspension wishbone. When a front wheel contacts an irregularity on the road, the piston pushes up the diaphragm and some of the fluid is displaced from the bottom chamber to the top chamber. Due to the increased pressure and the displacement of the fluid, the rubber spring deflects and this causes the fluid to be discharged through the inter-connecting pipe and into the rear suspension element.

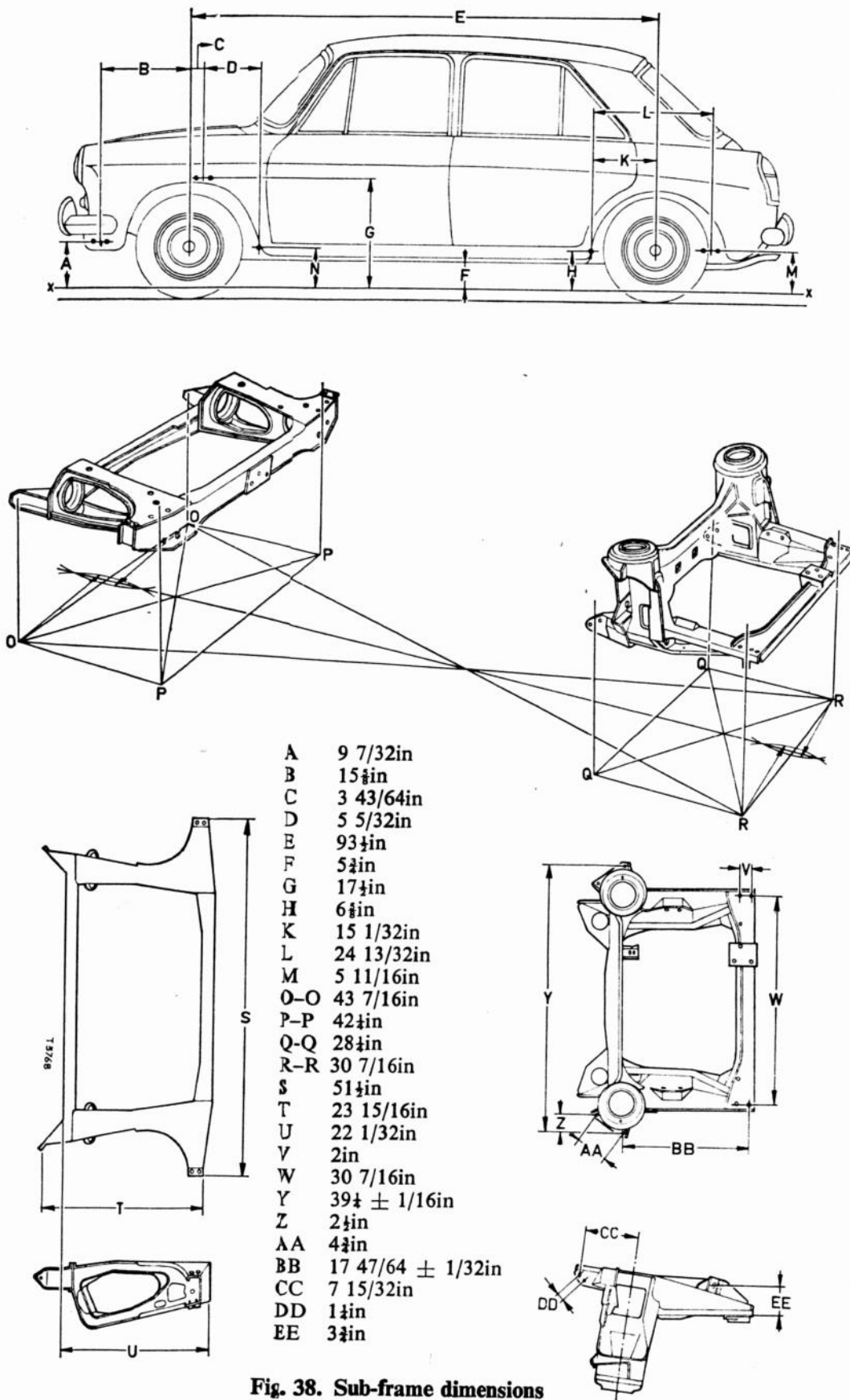


Fig. 38. Sub-frame dimensions

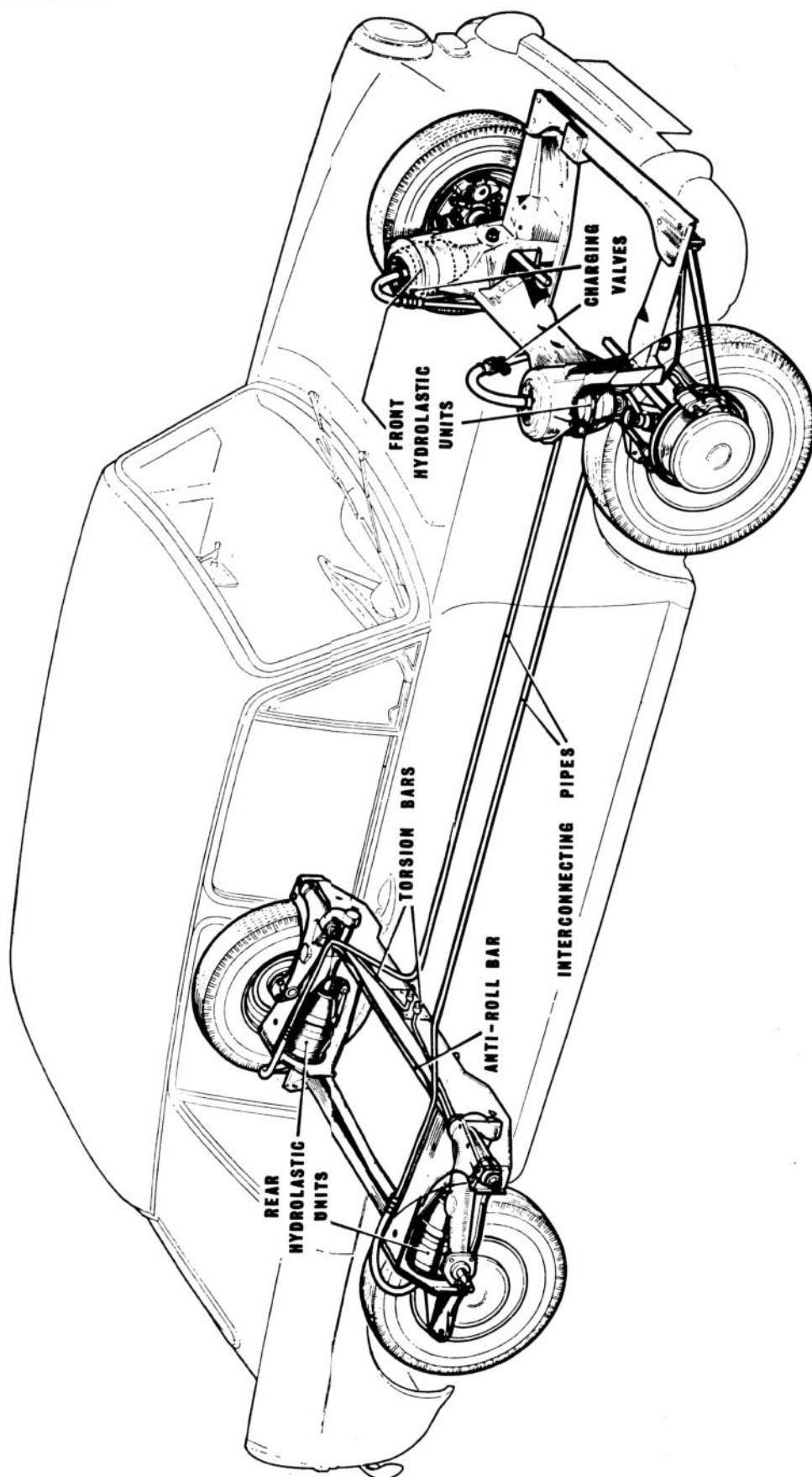


Fig. 39. Ghost view of Hydroelastic suspension system, showing the suspension units and interconnecting pipes



This forces the rear diaphragm to react against the piston and thus causes the car to be raised at the rear. When the rear wheels negotiate an irregularity, fluid passes in the opposite direction. The purpose of the interconnected front/rear spring elements is to reduce pitch and bounce.

The fluid used in the suspension system is a mixture of water and alcohol, with an anti-corrosion additive.

The front wheels are suspended by upper and lower wishbones of unequal length and the rear wheels by trailing arms. At the rear the suspension is assisted by two torsion bars and an anti-roll bar. The suspension units have a shock-absorbing action which explains the absence of separate dampers.

*NOTE: In order to carry out any repairs or overhaul of the suspension units, special equipment is necessary; without this equipment no dismantling or replacement of parts should be attempted.*

**Front wheel alignment:** Caster, camber and steering axis inclination are set during production and cannot be altered. If the front wheel suspension has been damaged, check the alignment against the following specifications:

Caster:	6°
Camber:	$\frac{1}{2}$ ° positive
Steering axis inclination:	10°
Toe-out:	$\frac{1}{8}$ in
Toe-out on turn, with inner wheel at 20°:	outer wheel 19°

- 1 Drive-shaft collar
- 2 Wheel-hub flange
- 3 Brake disc
- 4 Brake dust cover
- 5 Oil-seal (outer)
- 6 Wheel bearing (outer)
- 7 Steering swivel housing
- 8 Lockplate
- 9 Cup washer
- 10 Rubber pad
- 11 Cup washer
- 12 Plain washer
- 13 Locating rod
- 14 Nut with cup
- 15 Lockplate
- 16 Lockplate
- 17 Dust boot
- 18 Ball-pin retainer
- 19 Ball pin with shim and lock washer
- 20 Steering arm
- 21 Grease nipple
- 22 Distance bush
- 23 Wheel bearing (inner)
- 24 Spacer
- 25 Oil-seal (inner)
- 26 Drive shaft, outer end
- 27 Pivot shaft
- 28 Distance collar
- 29 Seal ring
- 30 Ball-bearing
- 31 Arm
- 32 Ball-bearing
- 33 Seal ring
- 34 Spacer ring

} Upper suspension  
arm assembly

#### Key to Fig. 40

- 35 Pivot-shaft tube
- 36 Spring
- 37 Lower ball pin
- 38 Lock washer
- 39 Shim
- 40 Ball-pin retainer
- 41 Dust boot
- 42 Lower suspension arm
- 43 Drive-shaft joint
- 44 Rubber boot
- 45 Retainer
- 46 Drive shaft
- 47 Displacer unit
- 48 Sleeve
- 49 Ring (if fitted)
- 50 Washer
- 51 Roller joint seal
- 52 Roller joint foot
- 53 Retaining pad
- 54 Locating bush
- 55 Roller joint seat
- 56 Retainer
- 57 Seal
- 58 Retainer
- 59 Locating bush
- 60 Washer
- 61 Lower suspension arm bush
- 62 Lower suspension arm pivot pin
- 63 Ring
- 64 Retaining plate

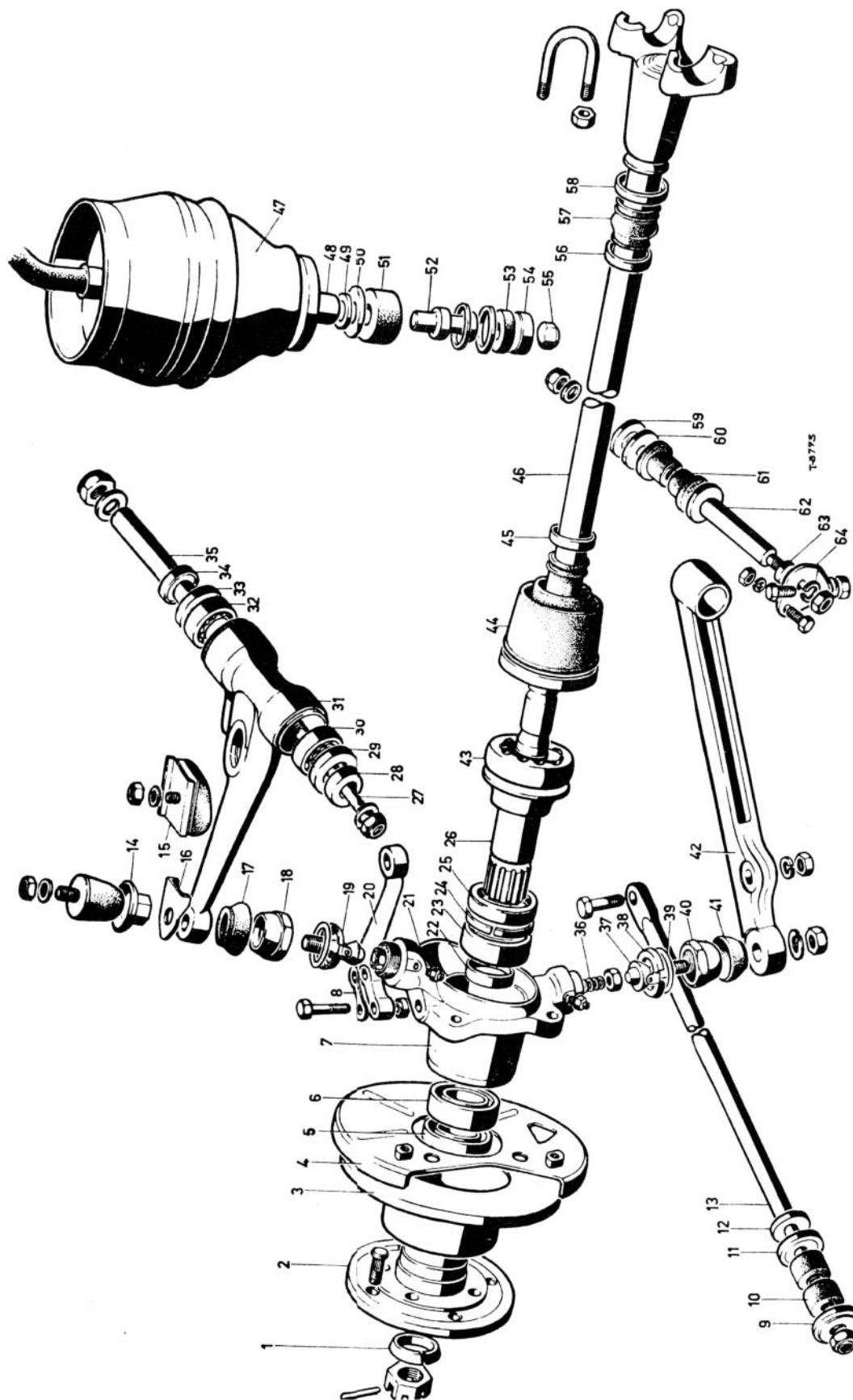


Fig. 40. Front suspension, exploded view



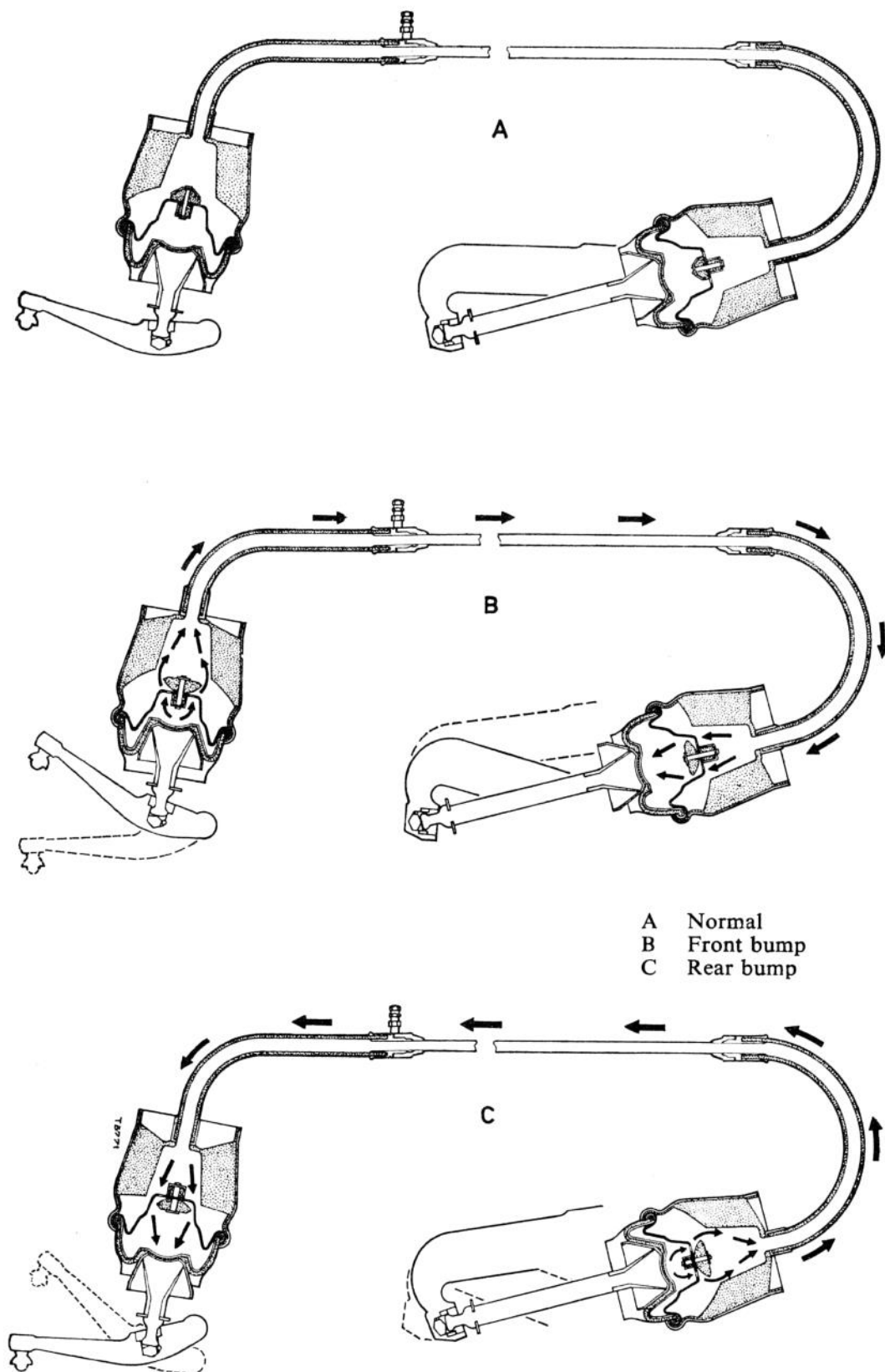


Fig. 42. Suspension motion diagram

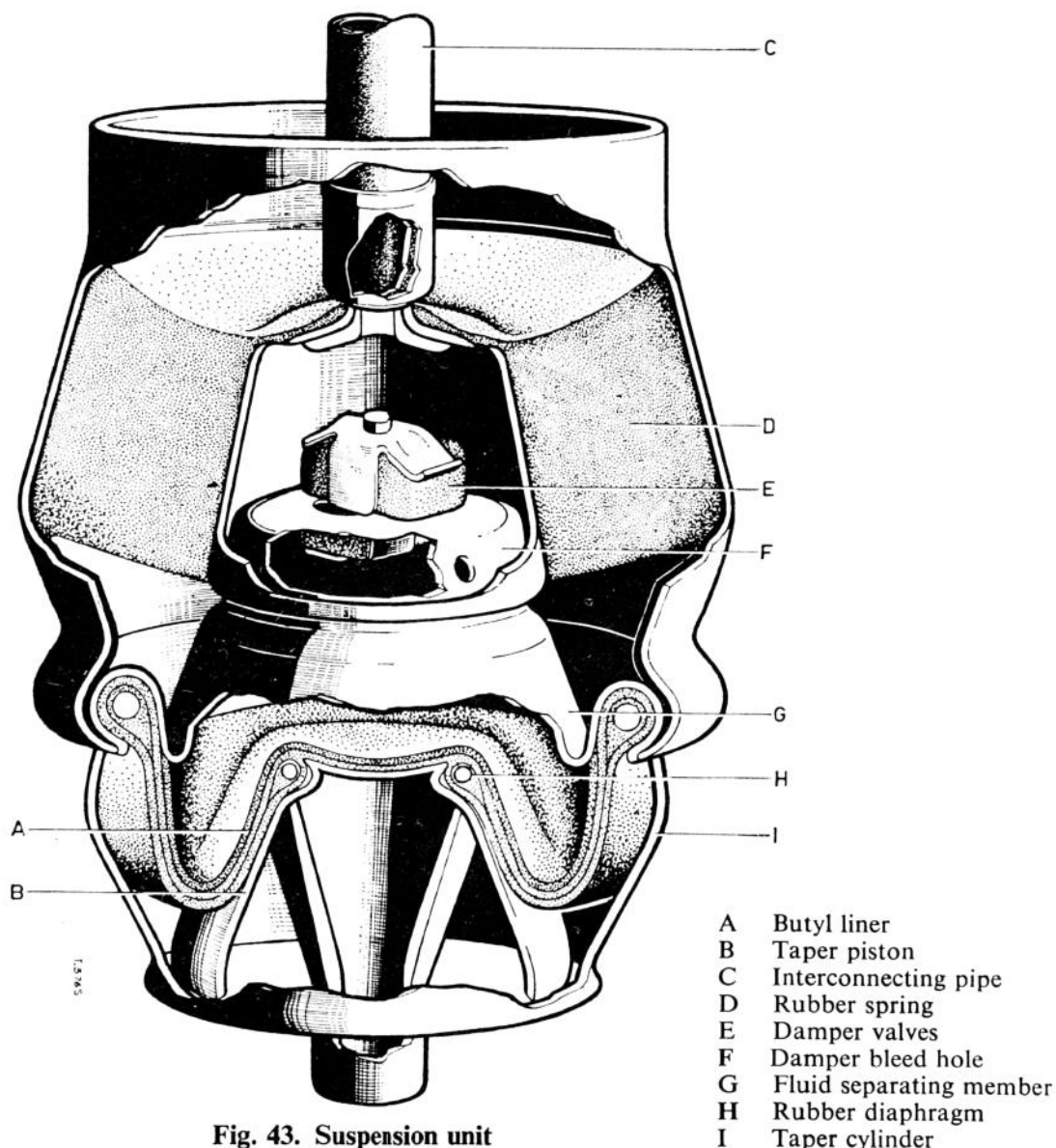


Fig. 43. Suspension unit

**Rear suspension:** Independently sprung rear wheels on trailing arms, auxiliary torsion bars and an anti-roll bar. The rear suspension can be removed as a unit, together with the rear sub-frame. The rear suspension can only be removed after depressurising the suspension system; this can only be carried out when special equipment is available.

**Wheel hubs and bearings:** The front and rear hubs run on non-adjustable ball-bearings. If bearings are to be replaced, ensure that they are fitted with the side marked 'Thrust' towards the bearing spacer.

**Steering gear:** The steering gear is of the rack-and-pinion type.

*Removal:*

Remove the bolts securing the column bracket to the fascia.

Remove the clamp bolt securing the column to the pinion shaft and remove the column from the shaft. Jack-up the front of the vehicle, place it on stands and remove the front wheels.



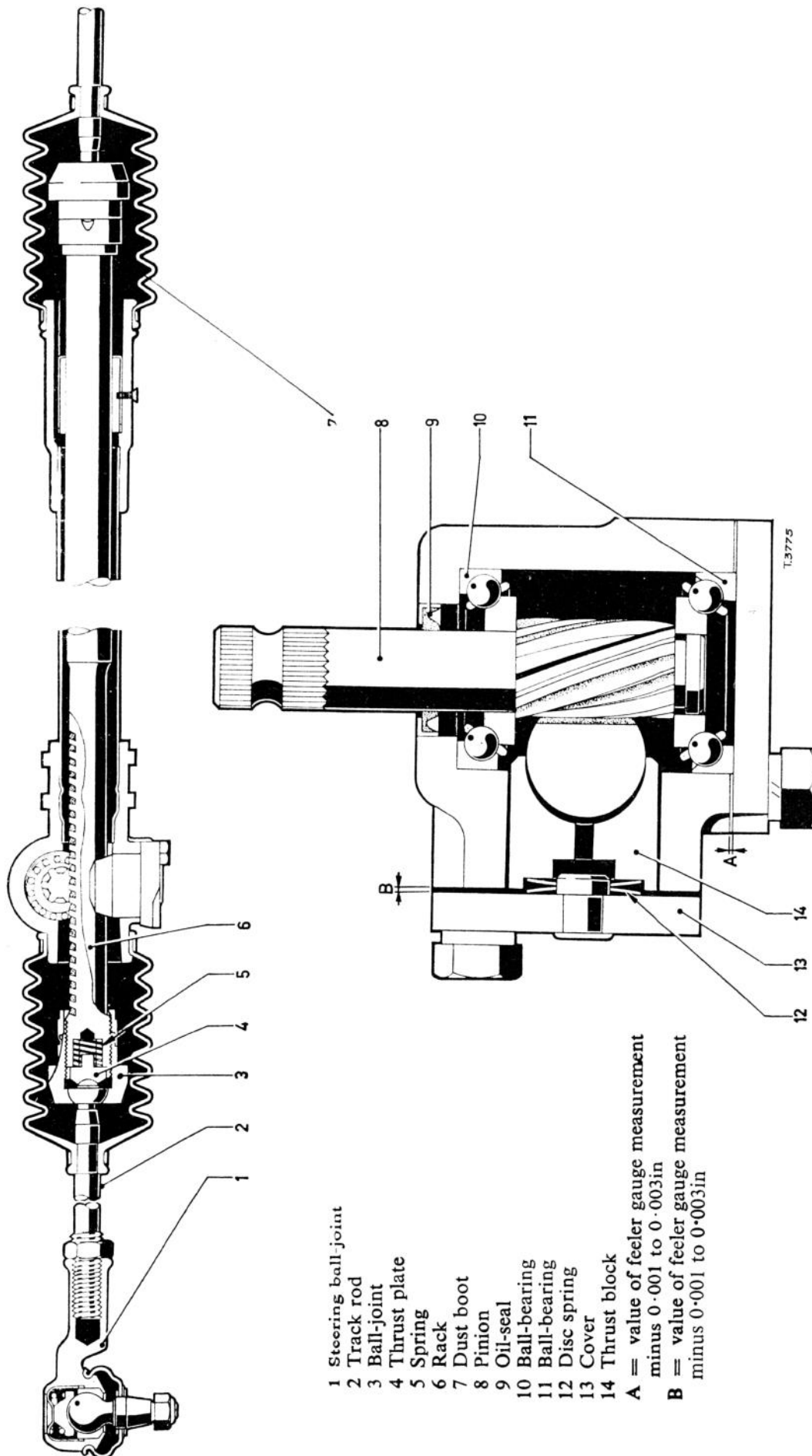


Fig. 44. Steering gear, rack and pinion

Disconnect the tie-rod ball-joints.

Support the engine from above and remove the bolts securing the sub-frame..

Working from the inside, remove the 'U'-bolts securing the rack housing to the toe-board.

Lower the engine sufficiently to remove the rack assembly from the toe-board and withdraw it towards the driver's side from the vehicle.

Installation is a reversal of the removal procedure.

**NOTE:** *Do not disconnect any part of the suspension units.*

*Dismantling:*

Remove the nuts retaining the ball-ends on the steering track rods and remove the ball-end assemblies. Remove the clips from the rack housing and track rods; drain the oil and remove the rubber dust boots.

Remove the damper cover plate and the shims. Remove the spring and the yoke. Remove the bolts retaining the pinion-shaft lower bearing and remove the plate and the shims. Remove the lower thrust washer bearing and bearing race and withdraw the pinion.

Carefully tap the upper pinion bearing and the thrust washer out of the housing. Remove the oil-seal. Clear the lock washers of the slots in the locking ring and the ball housing; unscrew the ball-joint housing. Remove the rack from the rack housing. Remove the felt bush. Clean and check all parts for wear and renew those that are worn.

*Assembling:*

Install a new felt bush to the end of the rack housing after having soaked it in SAE 140 EP oil. It is important that the felt bush is secured with the self-tapping screw through the rack housing.

Install the pinion upper bearing and insert the steering rack; refit the pinion and the lower pinion bearing.

Install the lower bearing cover without the packing shims and measure with a feeler gauge the clearance between the cover and the housing (distance 'A' in Fig. 44). Overtightening the cover bolts may cause incorrect measurement.

Remove the cover and reinstall the packing shims to the thickness of 'A' above, minus 0.001–0.003 in to obtain the required bearing pre-load. Refit the cover, preferably with a gasket sealing compound.

Screw the ball-housing lock-ring onto the rack and to the limit of the thread (use a new locking-ring). Insert the seat spring, the seat, the tie-rod and the ball-housing; tighten the assembly until the tie-rod is pinched. Screw the locking-ring toward the ball-housing and check if the tie-rod is still pinched. Loosen the ball-housing one eighth of a turn so that the tie-rod is entirely free to articulate. Re-lock the ball-housing by tightening the locking nut to a torque of 33 to 37 lb ft. Ensure that the ball-housing does not rotate whilst tightening the locking nut. Install the damper assembly and lock-up the assembly by tapping the tabs of the locking-ring into the slots in the ball-housing and the rack.

A pull of 4 to 6.5 lb with a spring balance attached to the steering ball-end should be required to articulate the tie-rods.

**Key to Fig. 45**

1 Lockplate	5 Piston	10 Cylinder	14 Brake disc
2 Cylinder (outer half of caliper)	6 Brake pad	(inner half of caliper)	15 Deflector plate
3 Inner seal	7 Piston	11 Plug	16 Deflector plate bracket
4 Seal	8 Seal	12 Bleeder screw	
	9 Inner seal	13 Spring	

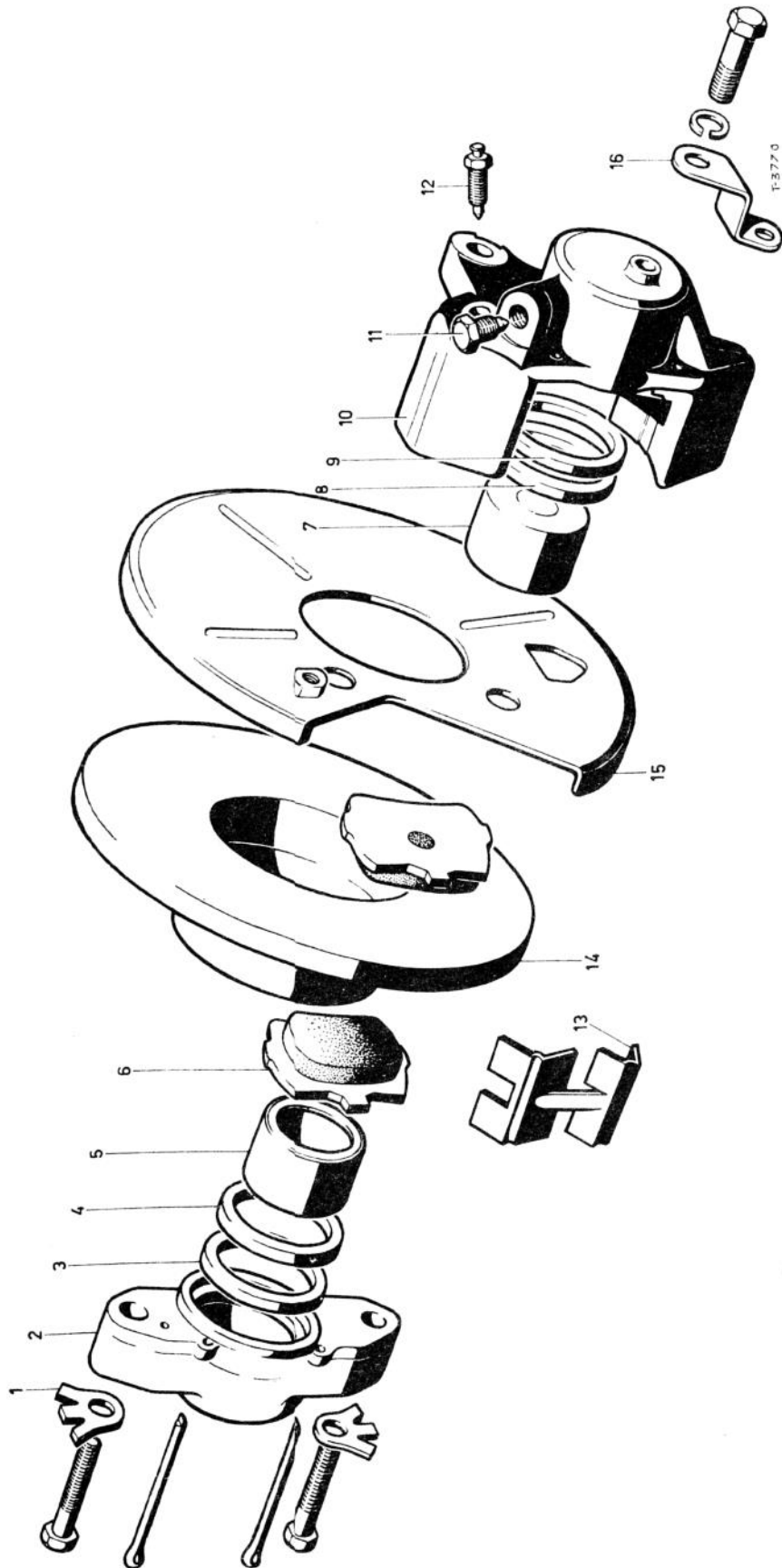
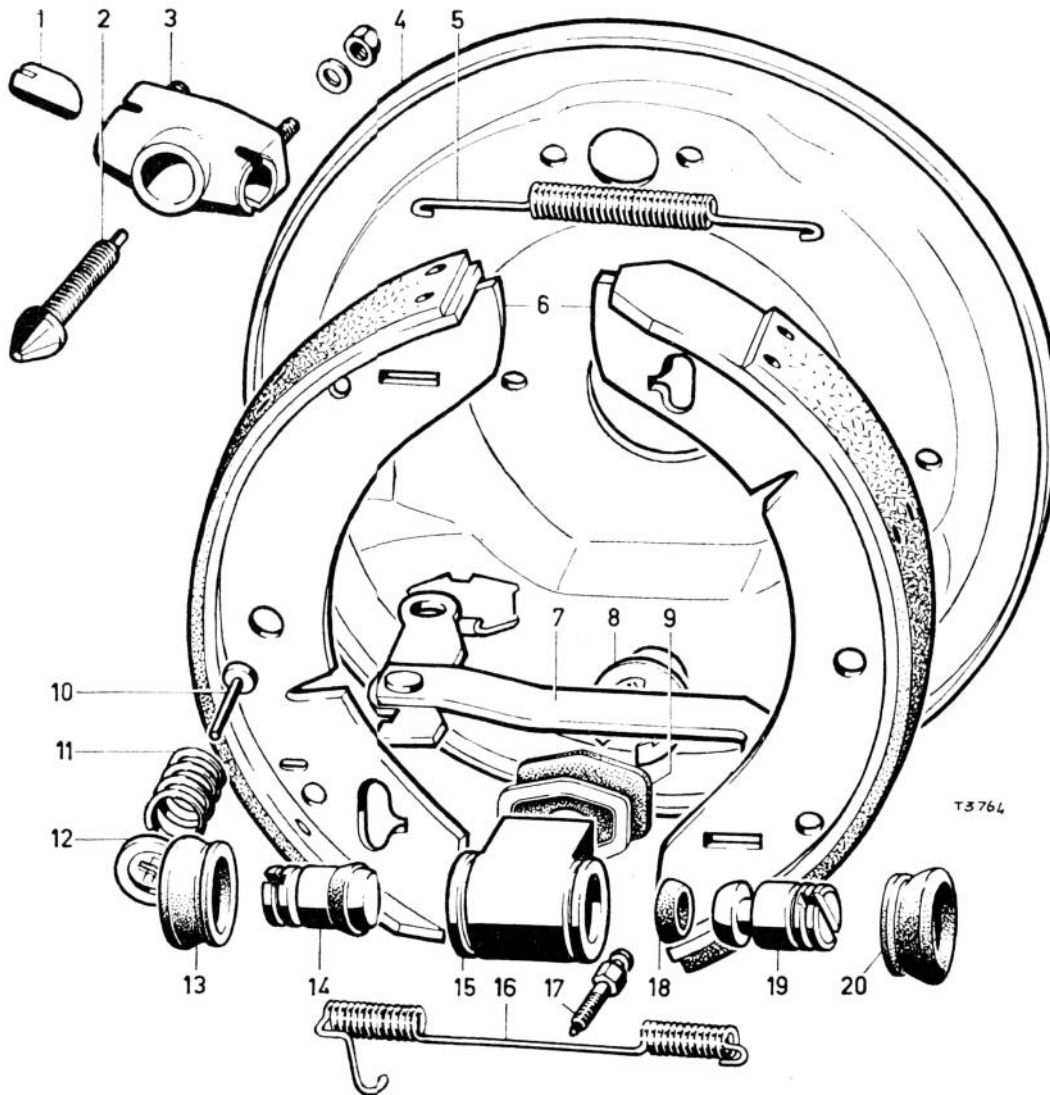


Fig. 45. Disc brake



- |                       |               |                  |
|-----------------------|---------------|------------------|
| 1 Adjuster peg        | 8 Circlip     | 15 Cylinder      |
| 2 Adjuster wedge      | 9 Boot        | 16 Spring        |
| 3 Adjuster housing    | 10 Steady-pin | 17 Bleeder screw |
| 4 Brake backing plate | 11 Spring     | 18 Seal          |
| 5 Return spring       | 12 Washer     | 19 Piston        |
| 6 Brake shoes         | 13 Boot       | 20 Boot          |
| 7 Parking brake lever | 14 Piston     |                  |

**Fig. 46. Rear brake, exploded view**

The rack damper should be adjusted when the yoke and springs are installed, but without the packing shims. Tighten the attachment bolts with the rack in the straight-ahead position until a force of 15lb in is required to rotate the steering pinion shaft.

Measure the gap between the damper cover plate and its joint face on the rack housing with feeler gauges ('B' in Fig. 44); remove the cover, coat both joint faces with gasket sealing compound and install the cover with packing shims, in thickness equal to the feeler measurement minus 0.001–0.003 in to obtain the requisite pre-load.

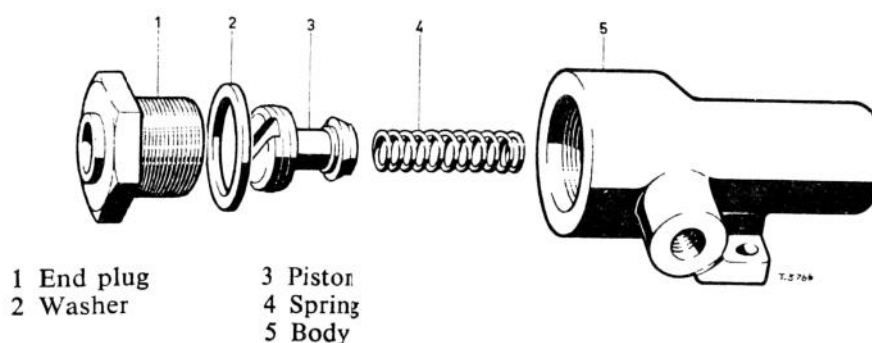


Fig. 47. Brake pressure limiting device

After assembly, the torque load required to start the pinion moving should not exceed 25lb in. Install a new pinion shaft oil-seal.

Further assembly is a reversal of the above procedure. Do not forget to fill the rack housing with one third pint SAE 140 EP oil, holding the housing upright.

After installation in the vehicle the front wheel alignment should be checked and if necessary corrected.

**Track rods:** The track rods are directly fitted to the steering-gear rack and are adjustable in order to correct toe-out. Make sure that they are adjusted to equal lengths.

**Steering swivels:** The steering swivels form an integral unit with the front wheel hub assemblies; no separate king pins are fitted.

**Brakes:** Hydraulically-operated foot-brake on all four wheels. The parking brake operates mechanically on the rear wheels only. The brake fluid reservoir is mounted on the scuttle under the bonnet and incorporates the brake master cylinder.

An equalizer valve is incorporated in the brake system, limiting the pressure going to the rear-wheel brakes to a pre-set amount; this device is non-adjustable.

The front wheels are fitted with disc brakes.

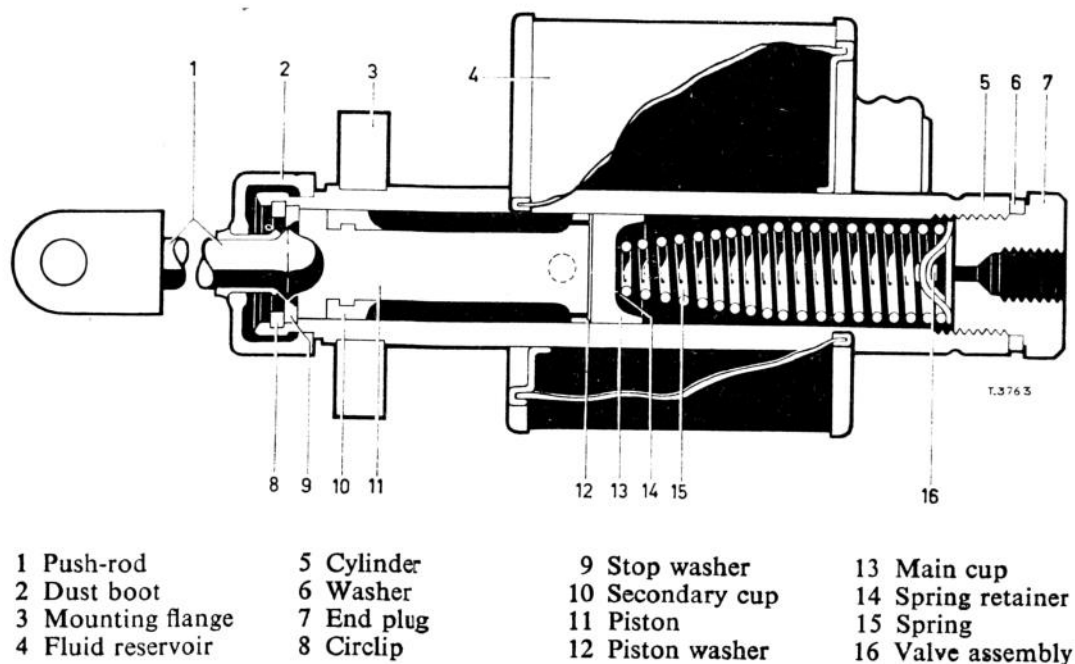


Fig. 48. Brake master cylinder, sectioned view



**Disc brakes:** Disc brakes of the caliper type are fitted to the front wheels. The brake unit is a caliper which straddles the disc and houses two horizontally opposed blind cylinders and the friction pads. The friction material is bonded to a steel backing plate and is inserted between each piston and the brake disc. The pads and backing plates are retained by pins and spring clips. The disc brakes are self-adjusting in operation. The brake pads should be renewed when wear has reduced their lining thickness to  $\frac{1}{16}$  in.

**Rear brake adjustment:** Each rear brake is provided with one square-headed adjuster.

To adjust the brake, turn the adjuster in a clockwise direction until the brake drum is locked; then back-off the adjuster until the drum rotates freely.

**Parking brake:** The parking brake cables are adjustable at the parking brake lever by means of nuts.

**Brake equalizer:** This pressure-limiting device for the rear-wheel brakes is secured to the foremost cross-member of the rear sub-frame. The maximum pressure in the rear-wheel brake cylinders is 520lb/sq in.

## ELECTRICAL EQUIPMENT

Wiring diagrams: see pages 69 to 77.

### Generator:

#### *Dismantling:*

Remove the drive pulley securing nut and withdraw the pulley and the Woodruff key from the armature shaft. Remove the two through-bolts and remove the commutator end-cover.

Withdraw the pulley end-cover, together with the armature and its ball-bearing, from the yoke.

Unless the ball-bearing is worn or damaged, its removal from the cover is unnecessary; if required, the bearing must be pressed out by means of a suitable hand press after the plate rivets have been drilled out. Thoroughly clean all parts and carry out the following inspections: Check the condition of the carbon brushes and ensure that these can move freely in their holders; if this is not the case, they should be polished with a smooth file. If the brushes are worn or broken, new brushes must be fitted and properly bedded on the commutator. This can be performed by wrapping a strip of very fine sandpaper around the commutator and pressing the brushes in their holders against the commutator, which should then be turned by hand until the brushes are seated properly.

The commutator should be smooth and free from pits, burrs or burned-in spots. Clean the commutator with a soft cloth soaked in petrol, and if necessary polish it with a strip of very fine sandpaper. A badly worn commutator should be turned in a lathe running at high speed and employing a sharp tool; undercut the insulation, after which the final polishing should be done with very fine sandpaper (see *Technical Data*). The field coils may be tested *in situ* by means of an Ohm meter of 6.0–6.3 Ohms, or by connecting a 12-volt battery with an ammeter in series between the field coil terminal and the yoke. The ammeter reading should be approximately 2 amps; no reading indicates an open circuit, necessitating renewal of the coils. An ammeter reading considerably more than 2 amps or an Ohm-meter reading of much less than 6 Ohms is evidence of a short-circuit in one of the field coils. Install new field coils as necessary. The armature should be checked with a 'growler' and voltage drop-test equipment; if these are not available, check the armature by substitution. The bearing bush can be removed by means of a suitable extractor or by screwing a  $\frac{5}{8}$  in tap into it, after which it can be withdrawn.

**NOTE:** *Before pressing in a new porous bronze bearing bush, it should be immersed in light engine oil for 24 hours (or for two hours in oil heated to 100°C). Do not ream the bush.*

When pressing the pulley end-cover onto the armature shaft, be sure to support the inner bearing race *and not the end-cover*; this is best accomplished with a piece of tube.

*Reassembly:*

After thorough examination of all parts, renewing those that are worn or damaged. Reassembly is effected in reverse sequence of the dismantling procedure, paying particular attention to the following:

If the ball-bearing is to be renewed, the new bearing should be packed with high-melting-point grease before pressing it into the end-cover, preceded by the oil-retaining washer, the felt washer and the corrugated washer. After the bearing has been pressed home, the bearing retaining plate must be secured with new rivets. When installing the commutator end-cover complete with the brush gear, the brushes must be held clear of the commutator by partially withdrawing them from their holders until the brush springs push them sideways against the holders, thus keeping them in this lifted position. Once the end-cover is on the shaft and the distance between the cover and the yoke amounts to approximately  $\frac{1}{2}$  in, the brushes should be released onto the commutator with a small hook or screwdriver. Before finally pressing-on the end-cover, ensure that the brush springs are properly seated on the brushes.

**Starter motor:**

**NOTE:** Before dismantling note that the commutator and the brush gear can be examined without dismantling the starter motor; in order to check the brush gear, it is sufficient to remove the starter cover band. If the brushes are sticky and cannot move freely in their holders, they should be pulled out and lightly dressed with a smooth file. If the commutator is blackened or dirty, it can be cleaned by holding a soft cloth, soaked in petrol, against it while rotating the armature by hand.

*Dismantling:*

Lift the brush springs and pull the brushes clear of their holders. Remove the terminal nuts and washer from the terminal post on the commutator end-cover. Remove the two through bolts and remove the commutator end-cover.

Remove the drive end-cover, together with the armature and drive assembly.

*Examining and reconditioning:*

The correct brush spring tension of 25 to 15 oz should be checked with a spring balance; if necessary, replace the springs.

Chipped, cracked, worn or otherwise impaired brushes should be renewed by unsoldering the flexible connections and soldering the new brush connections to the terminals. Replacement brushes are pre-formed, which makes bedding on the commutator unnecessary. The commutator must be smooth and free from pits and burned spots. Clean the commutator with a petrol-moistened cloth; if this gives unsatisfactory results, carefully polish the commutator with very fine sandpaper. A badly damaged commutator must be turned off with a high-speed lathe, using a sharp tool. Do not remove more material than is necessary.

**NOTE:** *Do not undercut the insulation between the segments.*

The field coils can be tested by connecting a 12-volt lamp with a 12-volt battery to the tapping point of the coils, to which the brushes are soldered, and the field terminal post. If the lamp does not light up, it becomes evident that there is an open circuit in the field coils, in which case they should be renewed. If the lamp

does light up, this does not necessarily mean that the field coils are in good order, as a short-circuited coil will also cause the lamp to light. This condition may be checked by removing the test lead from the brush connector and connecting it to the yoke instead; if the bulb lights up now, it is certain that the coils are short-circuited.

The armature core should, under no circumstances, be machined, nor should attempts be made to true-up a distorted armature shaft.

If the porous armature bearing-bushes are worn to such an extent that renewal is imperative, follow the procedure outlined under *Generator*.

The drive assembly can be withdrawn from the shaft after the spring has been compressed and the circlip has been removed.

Carefully clean and examine all parts and renew them if necessary.

#### *Reassembly:*

Reassembly is a reversal of the above operations.

#### **Replacing electric light bulbs:**

##### *Headlamps (bulb type):*

Remove the rim by releasing the screw at the bottom. Withdraw the three-pin bulb socket after having released the wire retaining clip, and remove the bulb. When fitting the new bulb, ensure that the rectangular tab on the bulb flange engages the slot in the reflector flange. Replace the spring clip and install the reflector with the rim.

##### *Headlamps (sealed-beam type):*

Release the retaining screw at the bottom of the rim and remove the rim. Remove the inner rim securing screws, disconnect the three-pin sealed-beam socket and remove the sealed-beam unit.

Installation is a direct reversal of the above operations.

##### *Headlamp adjustment (UK models only):*

The headlamps should be set so that the main beams are parallel with the road surface or in accordance with local regulations.

Adjustment is possible after removing the headlamp rim; vertical adjustment is effected by turning the screw at the top of the lamp in the required direction; horizontal adjustment by turning the adjustment screw on the right-hand side of the lamp.

##### *Tail, stop and direction-indicator lamp bulbs:*

These bulbs can be reached through the access hole in the rear wing valance; pull out the bulb fittings, after which the bulbs can be removed.

##### *Rear number-plate lamp bulb:*

The bulb can be removed after the securing screws, the cover and the glass have been removed. The bulbs are of the bayonet-type and may be installed either way round.

##### *Courtesy light bulb:*

Removal of the bulb is effected by gently squeezing off the plastic cover and removing the festoon-type bulb from its retaining clips.

## **BODY**

#### **Window regulators:**

##### *Removal:*

Remove the inner door handle and the window regulator handle by unscrewing the central Phillips-headed screw; remove the door pull and carefully remove the

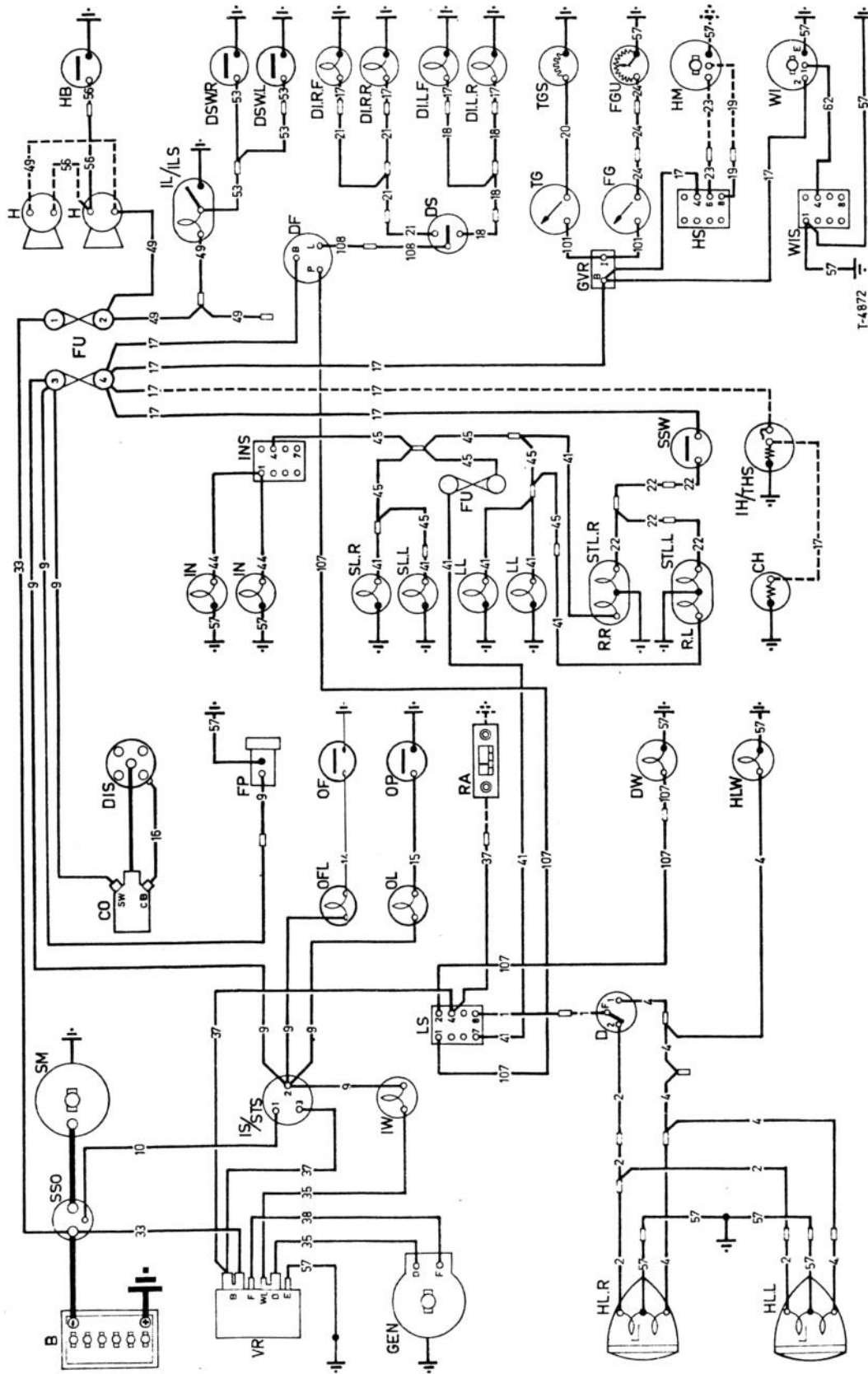


Fig. 49. Wiring diagram, Austin 1100

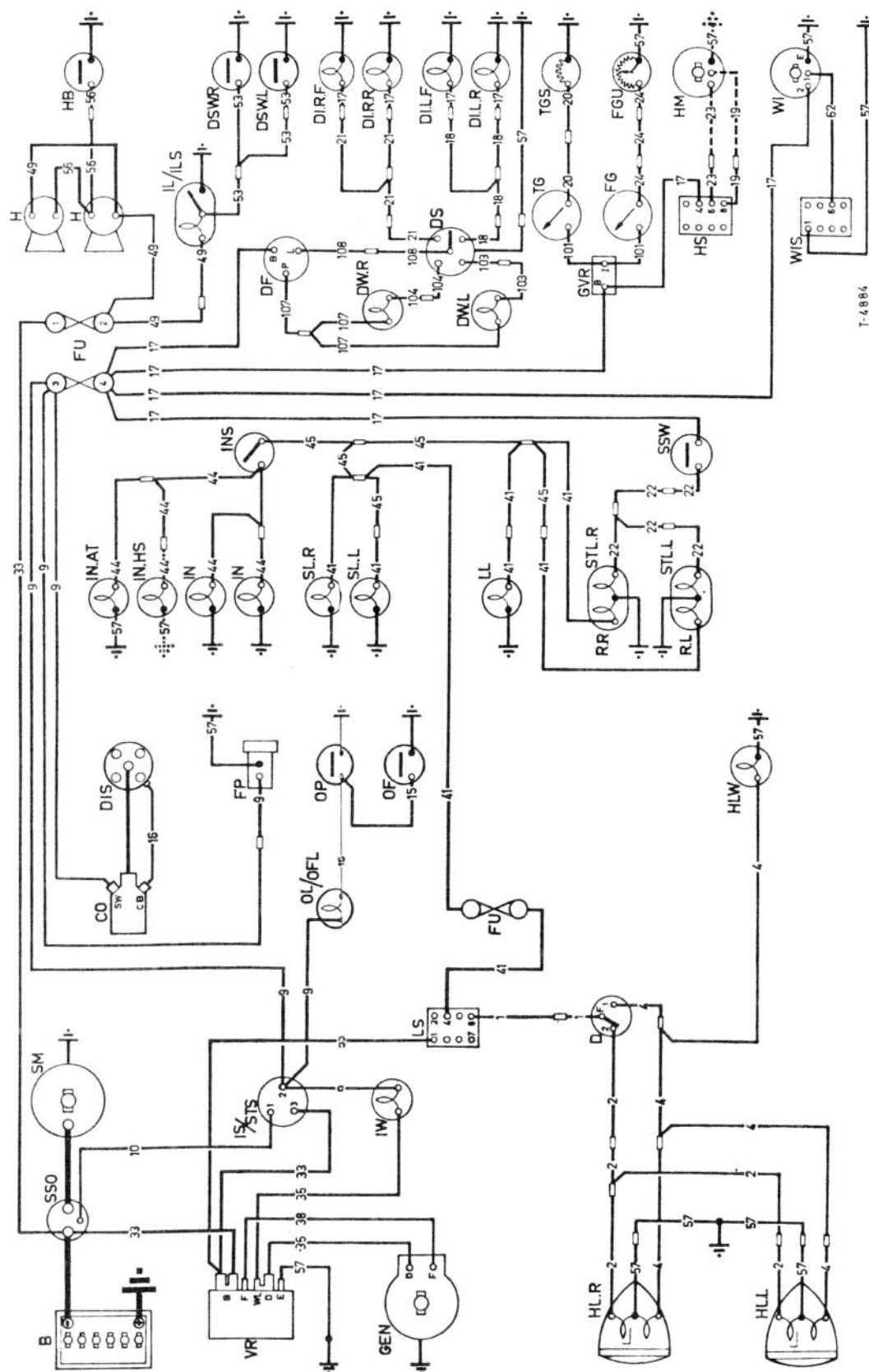
*Key to wiring diagrams (Fig. 49 to 56)*

<b>A</b>	Ammeter (Vanden Plas Princess only)	IL/ILS.F	Interior light and switch, front
<b>B</b>	Battery	IL/ILS.L.R.	Interior light and switch left rear
<b>CH</b>	Suction chamber heater (MG 1100 later models and Austin and Morris only)	IL/ILS.R.R.	Interior light and switch, right rear
<b>CL</b>	Clock	<b>IN</b>	Instrument light
<b>CLI</b>	Cigar lighter	<b>IN.AT</b>	Ashtray illumination
<b>CO</b>	Coil	<b>IN.CL</b>	Clock illumination
<b>D</b>	Dimmer switch	<b>IN.CR</b>	Tachometer illumination (Kestrel only)
<b>DE</b>	Defroster (Vanden Plas Princess only)	<b>IN.HS</b>	Heater switch illumination
<b>DES</b>	Defroster switch (Vanden Plas Princess only)	<b>IN.SPM</b>	Speedometer illumination
<b>DF</b>	Direction-indicator flasher	<b>INS</b>	Instrument light switch
<b>DI.L.F</b>	Direction-indicator, left front	<b>IS/STS</b>	Ignition/starter switch
<b>DI.L.R.</b>	Direction-indicator, left rear	<b>IW</b>	Ignition/generator warning light
<b>DI.R.F</b>	Direction-indicator, right front	<b>LL</b>	Licence plate lamp
<b>DI.R.R</b>	Direction-indicator, right rear	<b>LS</b>	Light switch
<b>DIS</b>	Distributor	<b>OF</b>	Oil filter light switch
<b>DS</b>	Direction-indicator switch	<b>OFL</b>	Oil filter warning lamp
<b>DSW.L</b>	Door switch, left	<b>OL/OFL</b>	Oil pressure/oil filter warning light (earlier models MG and Morris only)
<b>DSW.R</b>	Door switch, right	<b>OL</b>	Oil pressure warning light (except Vanden Plas Princess)
<b>DW</b>	Direction-indicator warning light	<b>OP</b>	Oil pressure switch (except Vanden Plas Princess)
<b>FG</b>	Fuel gauge	<b>R.L</b>	Rear lamp, left
<b>FGU</b>	Fuel gauge tank unit	<b>R.R</b>	Rear lamp, right
<b>FM</b>	Fan motor	<b>RC</b>	Tachometer
<b>FO.L</b>	Fog lamp, left	<b>REL</b>	Reversing lamp
<b>FO.R</b>	Fog lamp, right	<b>RELS</b>	Reversing lamp switch
<b>FOS.L</b>	Fog lamp switch, left	<b>RA</b>	Radio
<b>FOS.R</b>	Fog lamp switch, right	<b>RBL</b>	Radiator badge lamp
<b>FP</b>	Fuel pump	<b>SL.L</b>	Side lamp, left
<b>FU</b>	Fuses	<b>SL.R</b>	Side lamp, right
<b>GEN</b>	Generator	<b>SM</b>	Starter motor
<b>GVR</b>	Gauge voltage regulator	<b>SSO</b>	Starter solenoid
<b>H</b>	Horn	<b>SSW</b>	Stoplamp switch
<b>HB</b>	Horn ring (button)	<b>STL.L</b>	Stoplamp, left
<b>HL.L</b>	Headlamp, left	<b>STL.R</b>	Stoplamp, right
<b>HL.R</b>	Headlamp, right	<b>TG</b>	Water temperature gauge
<b>HLF</b>	Headlamp flash contact (Wolseley, Vanden Plas Princess, MG 1100 later models and Kestrel)	<b>TGS</b>	Water temperature gauge sender unit
<b>HLW</b>	Mainbeam warning light	<b>VR</b>	Voltage regulator
<b>HM</b>	Heater motor	<b>WA</b>	Windshield washer
<b>HS</b>	Heater motor switch	<b>WI</b>	Windshield wiper
<b>IH/THS</b>	Induction heater and thermostat (MG 1100 later models and Austin and Morris only)	<b>WAS/WIS</b>	Windshield washer-wiper switch

*Colour key to wiring diagrams (Figs. 49 to 56):*

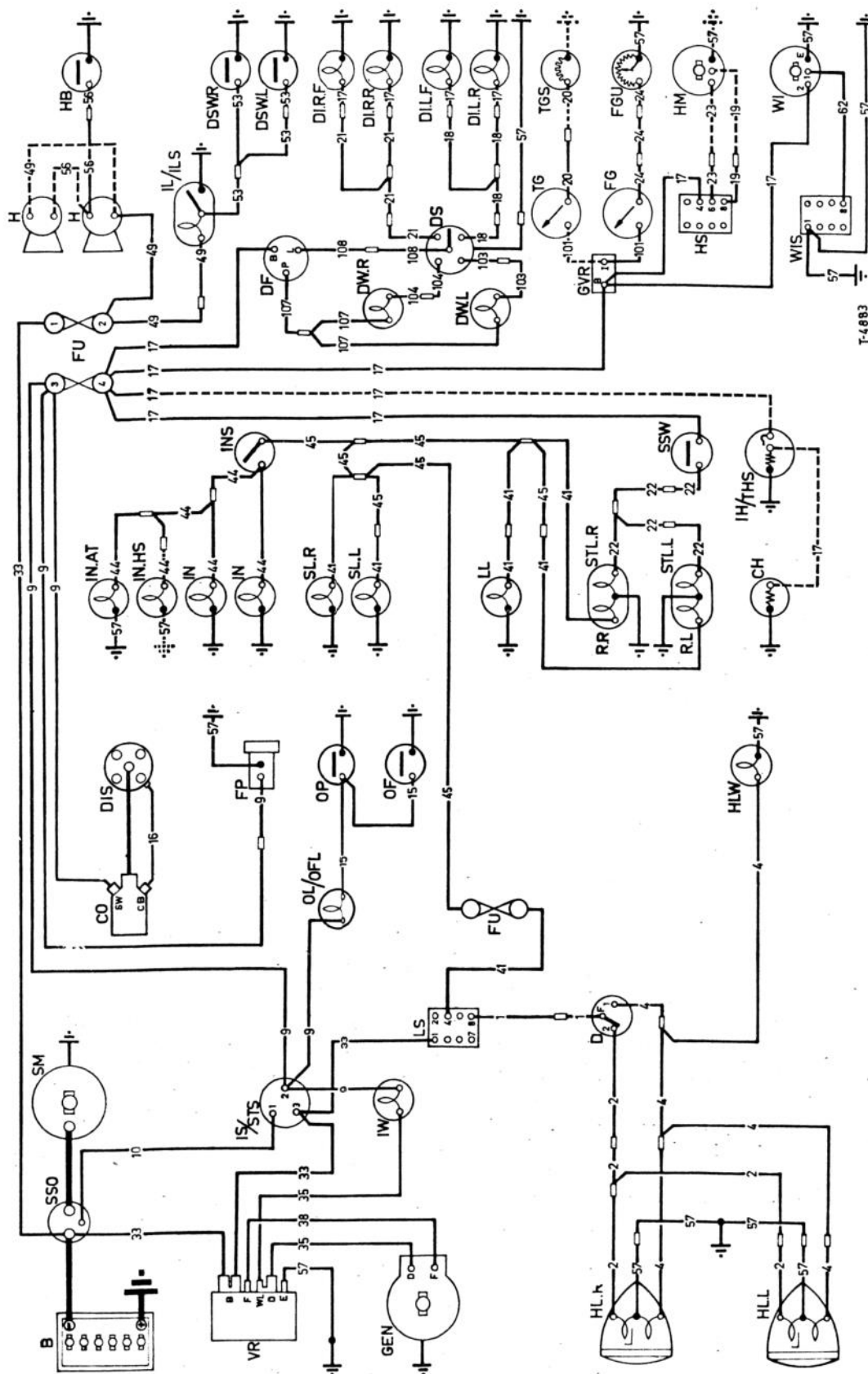
1 Blue	18 Green/red	37 Brown/white	56 Purple/black
2 Blue/red	19 Green/yellow	38 Brown/green	57 Black
4 Blue/white	20 Green/blue	41 Red	62 Black/green
9 White	21 Green/white	42 Red/yellow	101 Light green
10 White/red	22 Green/purple	43 Red/blue	103 Light green/yellow
14 White/purple	23 Green/brown	44 Red/white	104 Light green/blue
15 White/brown	24 Green/black	45 Red/green	107 Light green/purple
16 White/black	33 Brown	49 Purple	108 Light green/brown
17 Green	35 Brown/yellow	53 Purple/white	109 Light green/black





**Fig. 50. Wiring diagram, MG 1100 early models**





**Fig. 52. Wiring diagram, Morris 1100 early models**

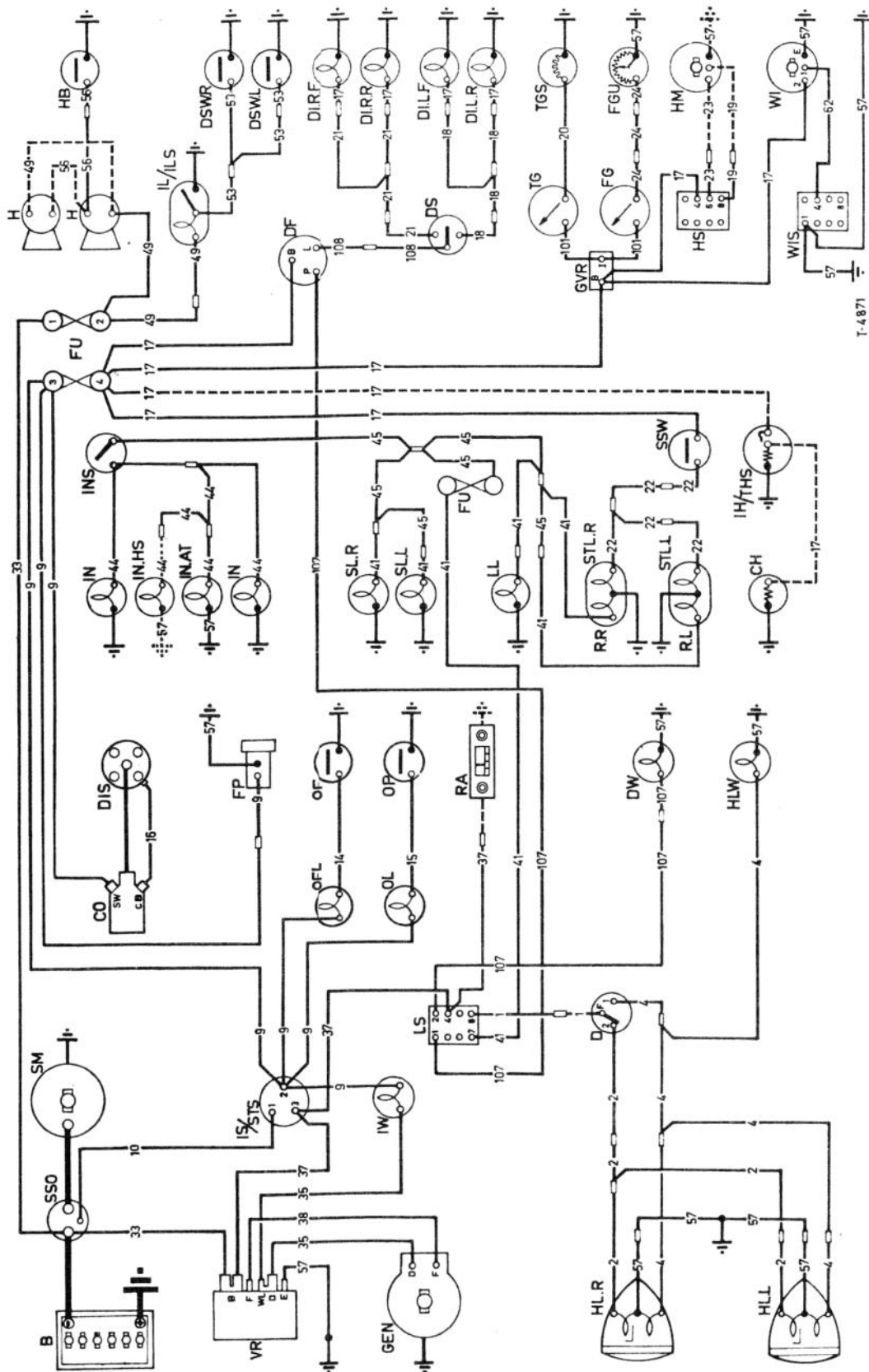
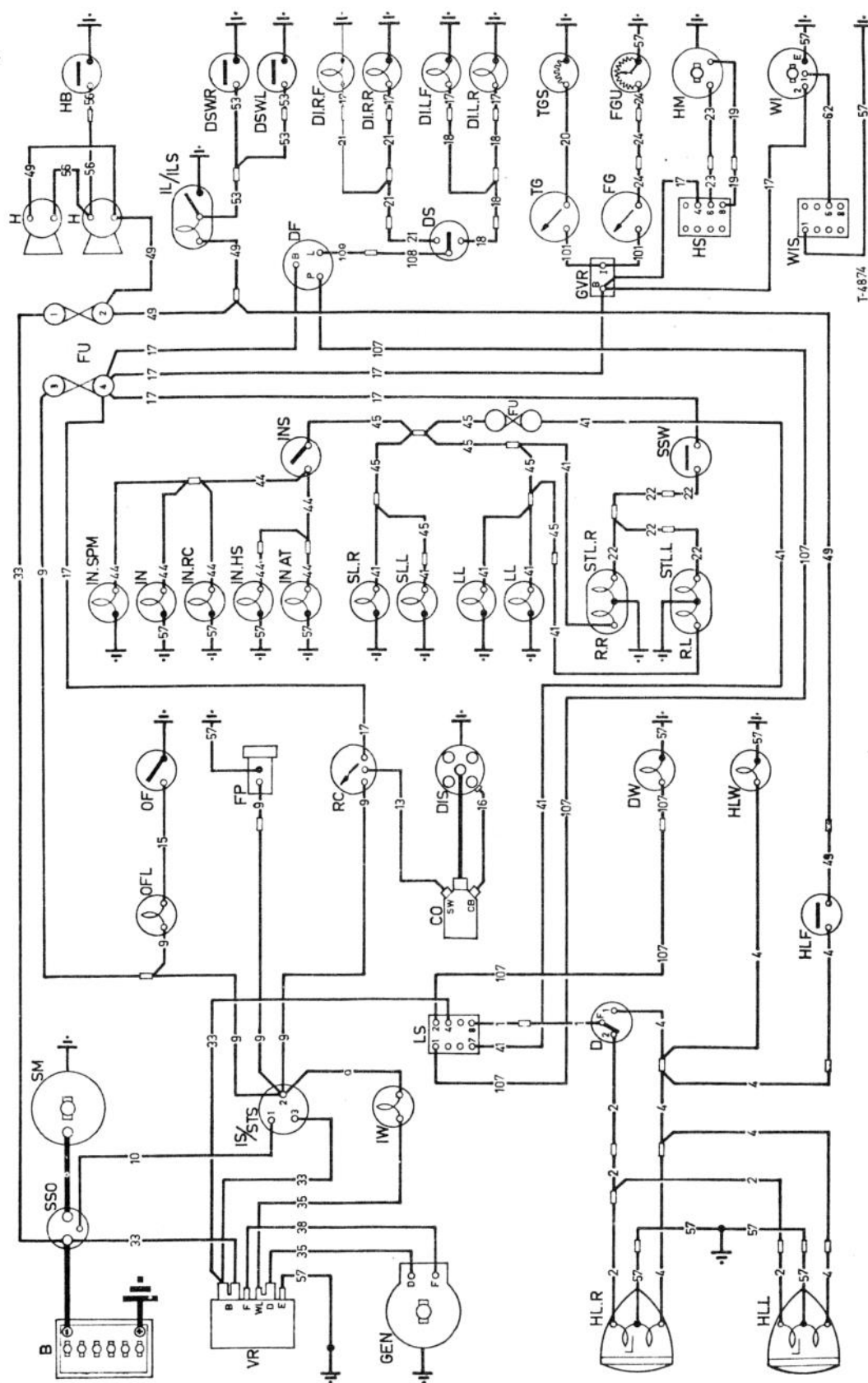


Fig. 53. Wiring diagram, Morris 1100 later models



**Fig. 54. Wiring diagram, Riley Kestrel**



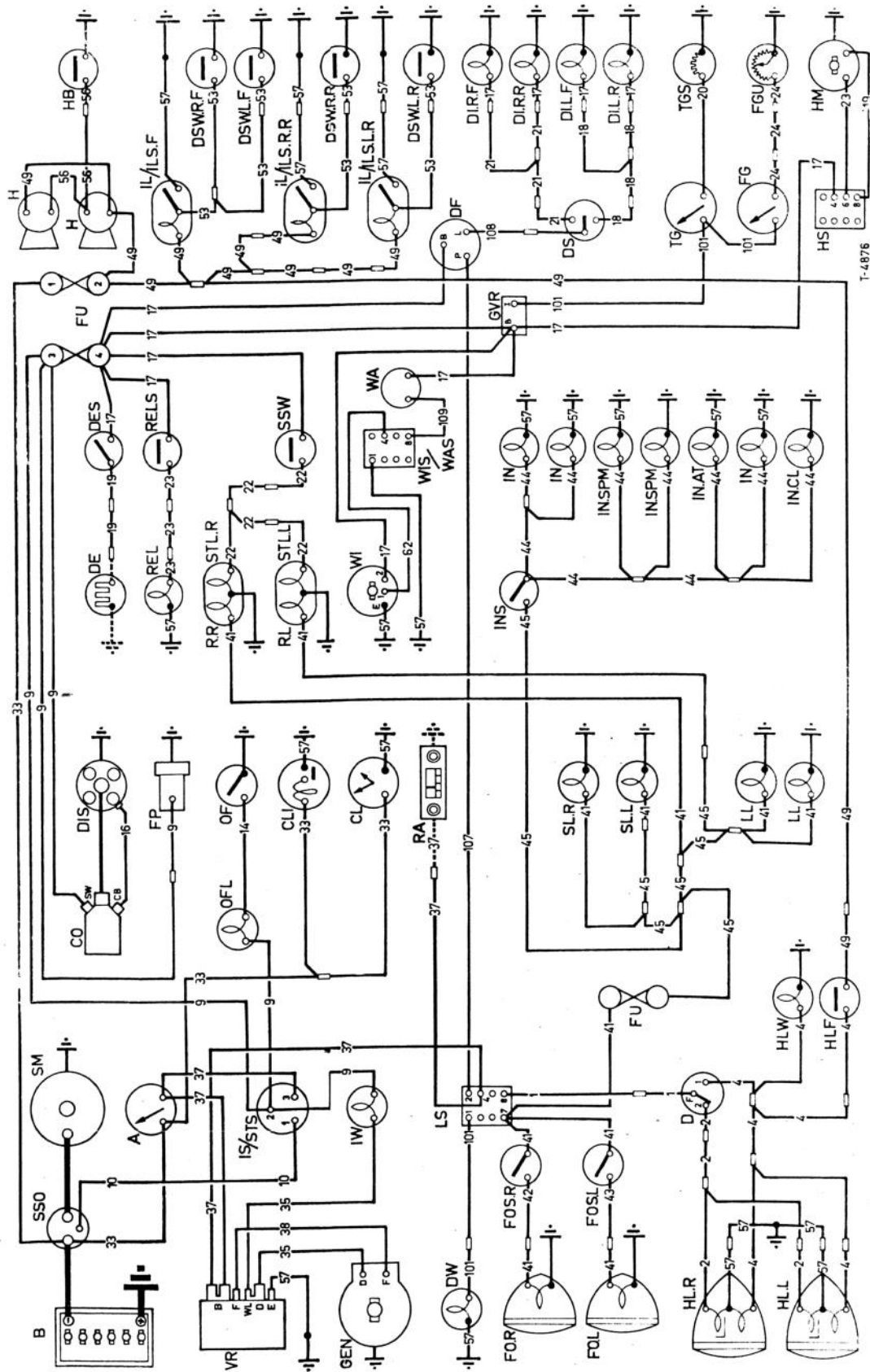
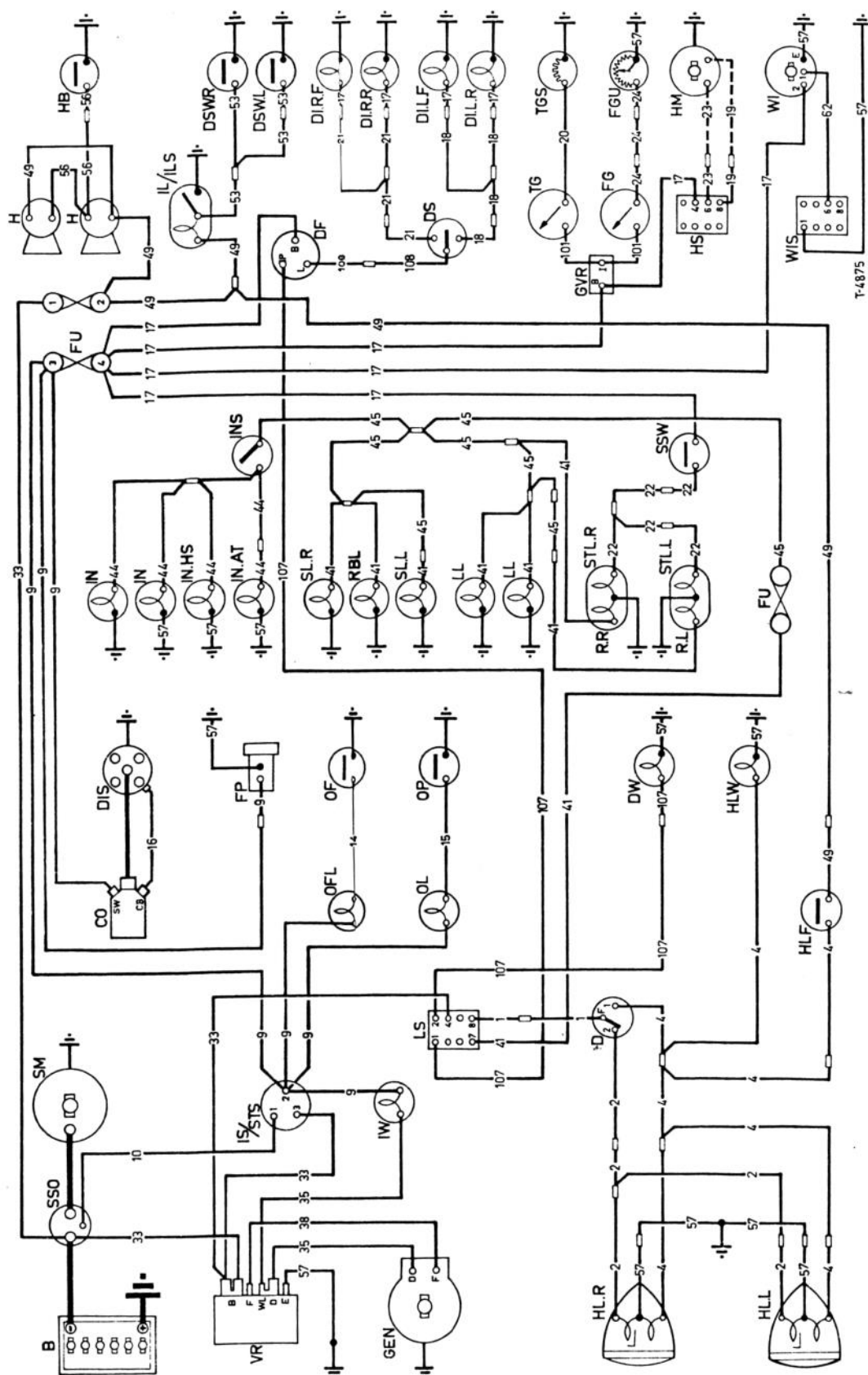


Fig. 55. Wiring diagram, Vanden Plas Princess



**Fig. 56. Wiring diagram, Wolseley 1100**

door trim panel. Remove the window regulator securing screws, as well as the window regulator bracket securing screws.

Release the window regulator arc from the rail at the lower edge of the window glass. Lift the glass up to clear it from the regulator and withdraw the regulator and bracket assembly from the door.

*Installation:*

Installation is a reversal of the removal procedure.

**Panel and warning lamps:**

*Austin:* The panel and warning lamps can be reached from under the facia by withdrawing the push-in type fittings from the rear of the instrument panel.

*MG:* The panel and warning lights can be reached after removing the access cover from inside the glovebox. Remove the retaining nut and bracket from the rear of the ashtray. Disconnect the ashtray lamp-holder and withdraw the assembly. Remove the ignition key and the windscreen-washer control escutcheons. Disconnect the choke control and remove the indicator switch and covers. Disconnect the steering column to facia support bracket and pull the instrument panel towards the rear. Now the bulbs with their holders can be pulled out from the rear of the combined instrument panel.

*Morris:* The panel and warning lights can be reached as follows:

Remove the four Phillips-headed screws on the instrument cowl and remove same. Remove the three Phillips-headed screws attaching the instrument to the facia and pull the combined instrument towards the steering wheel; now the bulb-holders can be pulled out from the rear of the instrument.

*Princess:* Access to the panel and warning lights can be gained by removing the bezels and pushing out the ignition/starter and wiper/washer switches. Remove the wing nut directly behind the ball-mounted air-duct on the driver's side. Remove the glove box lid and the screws securing the glove box to the facia board. Remove the wing nuts, one of which is directly below and behind the air-duct on the passenger's side, the other in the centre of the facia. Disconnect the steering column to body cross-member support bracket and lower the steering column. Pull the facia board clear from its surround. The panel and warning light bulbs may now be withdrawn from the rear of the instrument panel.

For refitting, reverse the above operations.

**Windshield wipers:**

*Removal of motor, gearbox and wheelboxes:*

The windshield-wiper motor and gearbox is situated on a bracket on the radiator valance and is secured to the valance by set-screws. The cable rack, connected to the cross-head in the gearbox, passes through outer casings which connect the gearbox to the first wheelbox and the first wheelbox to the second wheelbox. Remove the facia panel. Disconnect the wiper arms, the electrical connections from the motor and the outer cable from the gearbox housing. Remove the set-screws securing the motor to the radiator valance and remove the motor and the cable rack. Back-off the cover screws in each wheelbox and remove the cable rack outer casings. Remove the nut, front bush and washer from the front of each wheelbox and remove the wheelbox, together with the rear bushing and the spindle tube, from underneath the top panel.

*Installation:*

Installation is a reversal of the removal procedure; however, care should be taken to ensure that the wheelboxes are correctly lined-up and that the cable rack engages the gear and spindle assemblies.



**Valve guides:**

Length, inlet and exhaust:	1.531 in
Diameter, outside: inlet and exhaust	0.469 in
inside: inlet and exhaust	0.2813–0.2818 in

**Valve springs (twin carburettor):**

	<i>outer spring</i>	<i>inner spring</i>
Uncompressed length, inlet and exhaust:	1.750 in	1.672 in
Number of effective coils:	4½	6½
Spring tension: inlet and exhaust, valve open	88 lb	30 lb
valve closed	52 lb	18 lb

**Valve springs (single carburettor):**

Uncompressed length, inlet and exhaust:	1.750 in
Number of effective coils:	4½
Tension: inlet and exhaust, valve open/closed:	85 lb/52.5 lb

**Valve tappets (barrel type):**

Length/diameter:	1.5 in/0.812 in
Diameter:	0.812 in

**Valve timing chain:**

Chain pitch and number of links:	¾ in; 52
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**Valve rockers and valve-rocker shaft:**

Valve-rocker bush bore (reamed to size):	0.5630–0.5635 in
Valve-rocker shaft support nuts, tightening torque:	25 lb/ft (see also <i>Cylinder head</i> )

**Cylinder machining dimensions:**

Ground bore in cylinder block for fitting new liners:	2.64075–2.64125 in
Outside diameter of liner:	2.64325–2.64400 in
Interference fit of liner in bore:	0.002–0.00325 in
Finishing dimension of installed liner:	2.542–2.5435 in

**Pistons:**

Type:	solid skirt
Piston clearance, bottom of skirt:	0.0005–0.0011 in
top of skirt:	0.0021–0.0037 in
Available oversizes:	+0.010 in; +0.020 in
Piston:	suitable bore size
Standard:	2.5424–2.5447 in
Oversize, +0.010 in:	2.5524–2.5547 in
+0.020 in:	2.5624–2.5647 in

**Piston rings:**

Compression ring (top):	plain internal chamfer (chrome-faced)
Second and third ring:	tapered
Width, top ring:	0.062–0.0625 in
second and third ring:	0.0615–0.0625 in
Thickness:	0.106–0.112 in
Ring gap, when fitted:	0.007–0.012 in
Clearance in groove:	0.002–0.004 in
Oil control ring:	slotted scraper type
Width:	0.124–0.125 in
Thickness:	0.106–0.112 in
Ring gap when fitted:	0.007–0.012 in
Clearance in groove:	0.0015–0.0035 in

**Piston pins:**

fully-floating, thumb-fit in piston



**Connecting rods:**

Length between centres: 5.75 in

**Big-end bearings:**

Material: steel-backed, lead-bronze-lead-indium plated

Radial clearance: 0.008–0.012 in

Bearing diametrical clearance: 0.001–0.0025 in

Tightening torque, bearing cap bolts: 35 lb ft

**Main bearings (three, half-shell type):**

Material: steel-backed, lead-bronze, lead-indium plated

Length:  $1\frac{1}{8}$  in

End-clearance: 0.002–0.003 in

End-float: at centre main bearing

Bearing clearance: 0.001–0.0027 in

Available undersizes: 0.010 in, 0.020 in, 0.030 in, 0.040 in

Tightening torque, main bearing cap bolts: 60 lb ft

**Crankshaft:**

Main journal diameter: 1.7505–1.751 in

Minimum machining diameter: 1.7105 in

Crankpin journal diameter: 1.6254–1.6259 in

Crankpin, minimum machining diameter: 1.5854 in

**Camshaft:**

Journal diameters, front: 1.6655–1.666 in

centre: 1.62275–1.62325 in

rear: 1.3725–1.3735 in

Camshaft end-float: 0.003–0.007 in

**Camshaft bearings:**

Inside diameter, front: 1.667–1.6675 in

centre: 1.62425–1.62475 in

rear: 1.3745–1.3750 in

Radial clearance: 0.001–0.002 in

**Oil pump (internal gear or vane type):**

Relief valve spring, free length: 2.55/64 in

fitted length: 2.5/32 in

Relief valve opens at: 60 lb/sq in

Oil pressure (running): 60 lb/sq in

(at idling speed): 15 lb/sq in

**Carburettor(s):**

Make and type: SU type HS2, (automatic HS4) single or twin

Throat bore: HS2:  $1\frac{1}{4}$  in, HS4:  $1\frac{1}{2}$  in

Jet size: 0.090 in

	<i>Single</i>	<i>Automatic</i>	<i>Twin</i>
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Needles, standard:	AN	DL	D3
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weak mixture:	EB	ED	GV
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rich mixture:	H6	BQ	D6
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Colour piston spring (twin carburettor): blue

(single carburettor): red

**Fuel pump:**

Make and type: SU electric; SP or AUF 200

Capacity: 56 pints/h

Pump pressure: 2.5–3 lb/sq in

**Ignition system:**

Spark plugs:	Champion N5 14mm
Electrode gap:	0.025 in
Spark coil:	LA12
Distributor type and contact points gap:	25 D4; 0.014–0.016 in
Firing order:	1,3,4,2
Static ignition timing (single carburettor):	3° B.T.D.C.
(twin carburettor):	5° B.T.D.C.

**Distributor test data:***Single-carburettor version, high compression:*

Automatic advance:	starts at 300rpm, ends at 30–34° at 5500rpm
Vacuum advance (crankshaft degrees):	maximum 14° at 13 in Hg
Dwell angle:	60° ± 3°

*Single-carburettor version, low compression:*

Automatic advance:	starts at 700rpm, ends at 32–36° at 5600rpm
Vacuum advance (crankshaft degrees):	maximum 20° at 17 in Hg
Dwell angle:	60° ± 3°

*Twin-carburettor version, high and low compression:*

Automatic advance:	starts at 700rpm, ends at 28–32° at 5000rpm
Vacuum advance (crankshaft degrees):	maximum 14° at 7 in Hg
Dwell angle:	60° ± 3°

**Cooling system:**

Type: pressurised radiator with 'no loss' expansion tank, water pump and fan

Thermostat opens at: 82°C (180°F); cold climates 88°C (190°F)

Radiator cap relief valve opens at: 13 lb/sq in

**Clutch** (single dry plate):

Clutch driven plate diameter:	7½ in
Friction material:	wound yarn
Number of clutch springs:	6 (later models, diaphragm spring)
Colour:	Black/white spot
Type clutch fluid:	Lockheed disc brake fluid (Series II)

**Gearbox** (four-speed manual):

Gear ratios:	1.0:1, 1.412:1, 2.172:1, 3.627:1, R 3.627:1
Overall gear ratios:	4.133:1, 5.83:1, 8.98:1, 14.99:1, R 14.99:1

**Steering** (rack and pinion type):

Steering wheel turns (lock to lock):	3½	} unladen
Steering wheel diameter:	16¼ in	
Camber angle:	½° positive	
Castor angle:	6°	
Wheel swivel inclination:	10°	
Toe-out:	⅛ in	
Steering lock angle of outer wheel with inner wheel at 20°:	19°	

**Suspension:**

Fluid pressure: All models except Princess:	205 lb/sq in
Princess:	230 lb/sq in

*Rear:*

Toe-out:  $\frac{1}{8}$  in  
 Camber: 1° positive

**Brakes:***Front:*

Disc diameter: 8 in  
 Friction pad area (total): 16.5 sq in  
 Swept area (total): 133.2 sq in  
 Friction material: Ferodo DA3  
 Minimum brake pad thickness:  $\frac{1}{16}$  in (1.59 mm)

*Rear:*

Drum inner diameter: 8 in  
 Lining dimensions: 7.68 x 1.25 x 0.094 in  
 Total swept area: 63 sq in  
 Friction material: Ferodo AM8

**Tyres:**

Size: 5.50-12 or SP 145-12  
 Pressure, front/rear: See page 21

**Electrical equipment:**

Battery: Lucas N9 or NZ9  
 Battery capacity: 43 Ah at 20-hour rate  
 Electrical system: 12-volt, positive earth  
 Starter motor: Lucas M35G  
 Generator: Lucas C40  
 Maximum output: 22 Amp  
 Control box: Lucas RB340  
 Cut-out relay, cut-in voltage: 12.6-13.4  
   drop-off voltage: 9.3-11.2  
   reverse current: 8.0 Amp (maximum)

Voltage regulator (at 1500 generator rpm):

Open-circuit setting at 20°C (68°F): 14.2-14.8 volts

Settings for ambient temperatures other than 20°C (68°F) should be corrected as follows:

For every 10°C (18°F) above 20°C (68°F): subtract 0.2 volts

For every 10°C (18°F) below 20°C (68°F): add 0.2 volts

**BULB CHART**

	volts	watts
Headlamps (left-hand drive Europe, except France):	12	45/40
Headlamps (left-hand drive, except USA and Europe):	12	42/36
Side lamps, Austin, Morris, MG, Princess:	12	6
Direction-indicator lamps (front and rear):	12	21
Tail and stop-lamps:	12	6/21
Number-plate lamp, all models	12	6
Panel and warning lights:	12	2.2
Courtesy light:	12	1.5

**TIGHTENING TORQUES**

Rocker-shaft support nuts: 25 lb ft  
 Cylinder-head stud nuts: 40 lb ft  
 Main bearing bolts: 60 lb ft  
 Connecting-rod bearing bolts: 35 lb ft

Flywheel centre bolt:	110/115lb ft
Transmission to crankcase:	6lb ft
Flywheel-housing stud nuts and bolts:	18lb ft
Manifold to cylinder head:	15lb ft
Water pump:	17lb ft
Oil filter:	16lb ft
Oil pump:	9lb ft
Valve-rocker cover:	4lb ft
Timing cover, $\frac{1}{4}$ in UNF bolts:	6lb ft
5/16in UNF bolts:	14lb ft
Crankshaft pulley nut:	70lb ft
Transmission housing studs, $\frac{3}{8}$ in UNC:	8lb ft
$\frac{5}{16}$ in UNC:	6lb ft
Transmission housing stud nuts, $\frac{3}{8}$ in UNF:	25lb ft
$\frac{5}{16}$ in UNF:	18lb ft
Driven gear to differential housing:	55-60lb ft
Drive-shaft flange nuts:	80-85lb ft
Steering lever to hub bolts:	30-35lb ft
Steering lever ball-joint nut:	25lb ft
Steering knuckle ball-pin bottom nut:	35-40lb ft
Steering knuckle ball-pin top nut:	35-40lb ft
Front hub nut (drive shaft):	150lb ft
Steering knuckle ball-pin housing:	70lb ft
Rear stub axle nut:	60lb ft
Front suspension upper arm pivot nut:	35-40lb ft
Front suspension lower arm pivot nut:	35-40lb ft
Steering-wheel nut:	50lb ft
Wheels to hubs:	42lb ft
Brake disc to hub:	40-45lb ft
Front swivel hub to caliper:	45-50lb ft

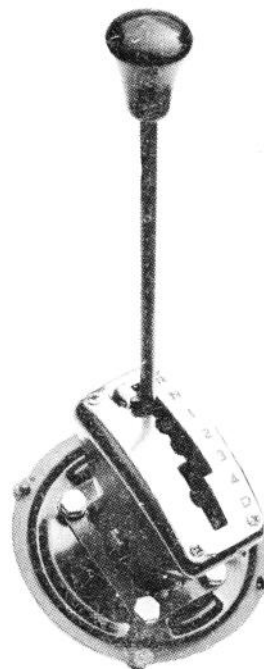


Fig. 57 Selector lever

## AUTOMATIC TRANSMISSION

### General description:

The automatic transmission which was introduced for the BMC Mini and 1100 models, was designed within the Automotive Products Group of Companies, and developed in collaboration with the British Motor Corporation.

This transmission is unusual in that it is provided with four forward gear ratios and an overriding manual control that enables each of the four forward speeds to be held whenever desired.

This override control can be used as a normal gear change, so that if, for example, the driver wants to use full revs in each gear, it will be possible to hold first, second or third gear to peak rpm before changing into the next higher ratio. Alternatively, if the selector lever is moved to position 'D', the driver need only operate the throttle, and whichever gear is appropriate for the prevailing conditions will be selected automatically.

The lever and gate illustrated in Fig. 57 replace the conventional manual arrangement. The normal extremes of travel select neutral and forward automatic drive. An upward movement of the lever allows extra travel to engage reverse. The lever is spring-biased to the left to provide an intermediate stop for third gear hold. Other hold positions are provided for second and first. First gear is provided with

a freewheel which prevents shock if engaged at too high a speed. The lever is connected mechanically to a spool valve located in the main valve block. In many ways the layout of this transmission follows closely the standard arrangement. The engine power is transmitted through an idler wheel to the input gear which drives the bevel reduction gears and thence by means of a pair of final drive gears to a conventional type differential. The major differences are that a hydrokinetic torque converter replaces the clutch and flywheel assembly and bevel reduction gears are used instead of layshaft gears. Both the reduction gear and differential units run parallel to, and below, the crankshaft and are housed in the gear casing, which serves also as the engine sump. To provide automatic gear selection, brake bands control the power flow through the bevel reduction gears and the output is coupled to the final-drive pinion by means of two multi-disc clutch assemblies. All of these friction units are operated hydraulically and the source of power is provided by a large-capacity pump. This pump, which is driven off the end of the camshaft by means of a spider coupling, replaces the standard unit and serves both the engine and transmission systems.

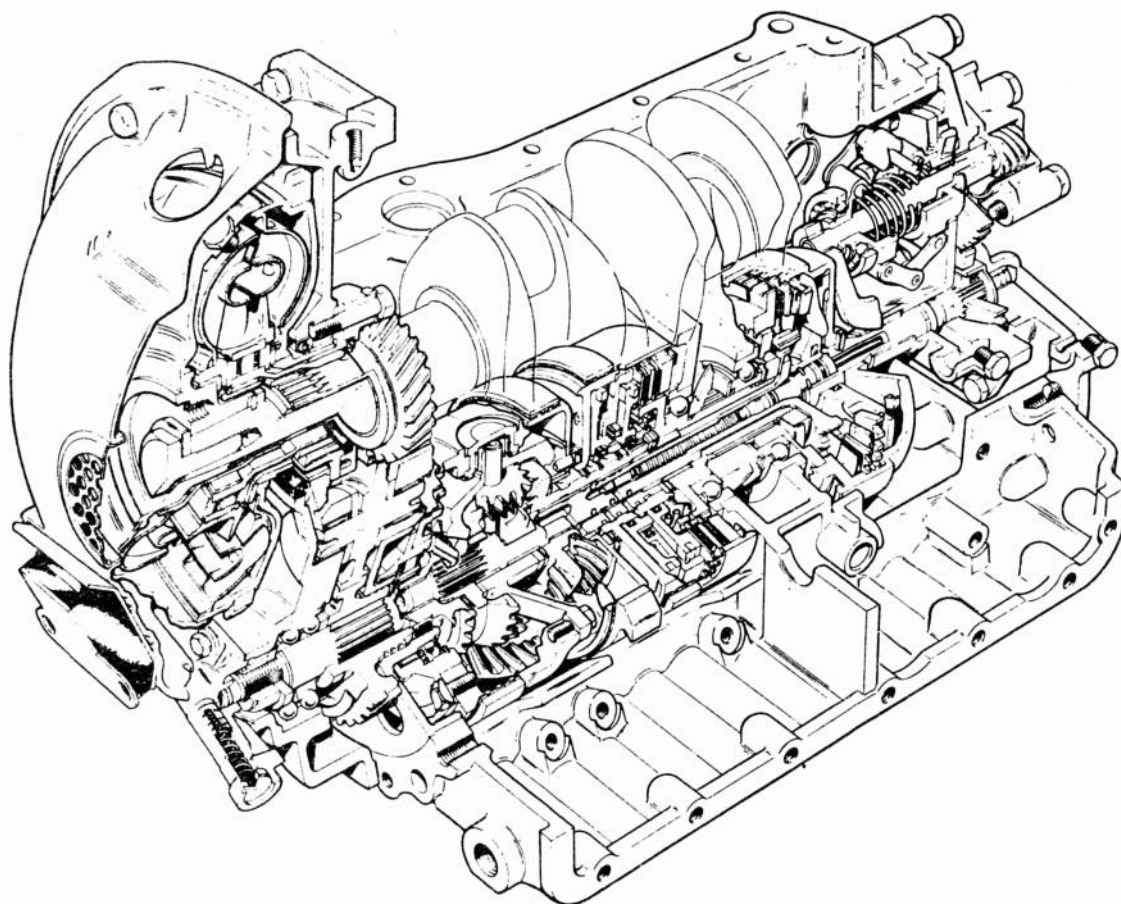


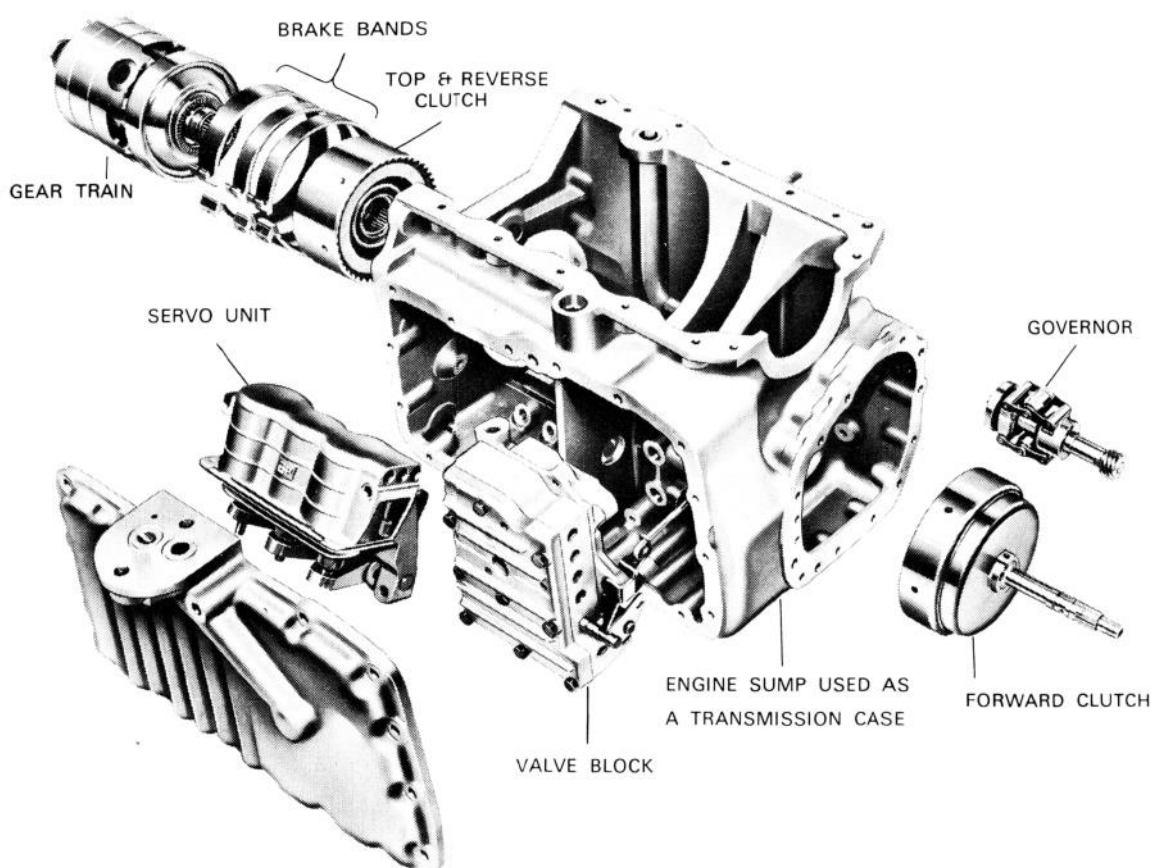
Fig. 58. Ghost view of automatic transmission unit

**Overall gear ratios, 1100 models**

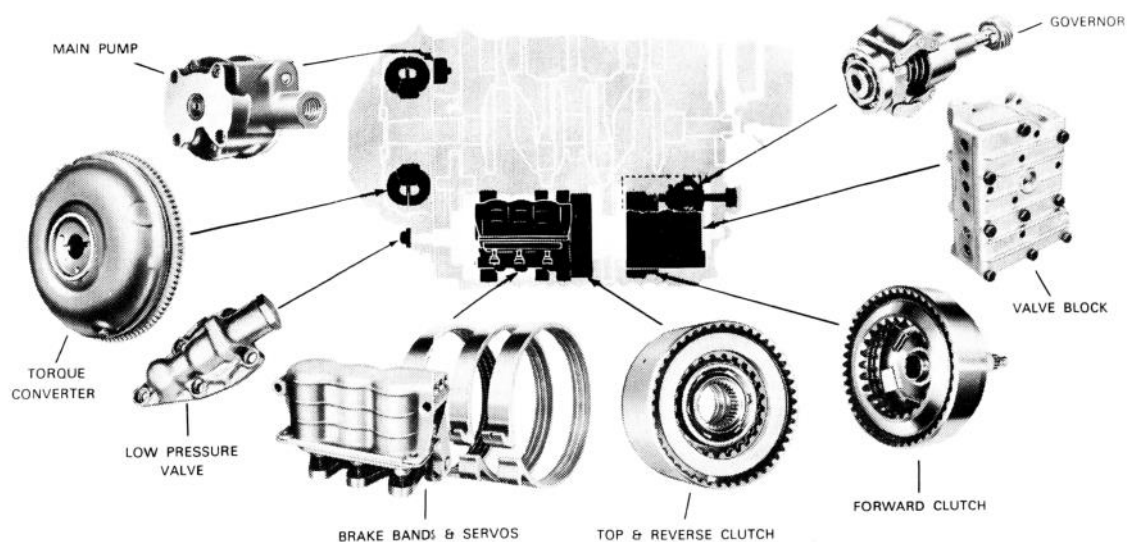
Early models, first: 9.35 : 1  
 second: 6.41 : 1  
 third: 5.08 : 1  
 top: 3.476 : 1  
 reverse: 9.35 : 1

Later models, first: 8.796 : 1  
 second: 6.033 : 1  
 third: 4.774 : 1  
 top: 3.27 : 1  
 reverse: 8.796 : 1





**Fig. 59. Exploded view of automatic transmission**



**Fig. 60. Major components of automatic transmission**

## GENERAL FAULT FINDING CHART FOR PETROL ENGINES

Some items in this chart are not applicable to every make of petrol engine

### Engine will not start

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

Spark plugs oiled-up	<i>Clean; if necessary replace</i>
Spark plug insulator cracked	<i>Replace</i>
Spark plug gap too wide or too close	<i>Reset gap</i>
<i>No spark at distributor:</i>	
Loose, broken or shorted low-tension lead between coil and/or inside distributor	<i>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 at one end; a broken lead will stretch</i>
Cracked rotor or distributor cap	<i>Replace</i>
Contact breaker points dirty, worn or maladjusted	<i>Clean and adjust; if necessary replace</i>
Carbon brush in distributor cap not making contact	<i>Free; if necessary replace</i>
Faulty condenser	<i>Replace</i>
<i>No spark at coil:</i>	
High-tension lead loose or broken	<i>Replace</i>
Broken or loose low-tension leads or faulty ignition switch	<i>Check wiring, repair or replace; check switch, replace if defective</i>
<hr/>	
<b>D. Starter cranks engine, but engine will not start</b>	
<i>Trouble in fuel system:</i>	
<i>No petrol in carburettor:</i>	
Empty fuel tank	<i>Fill up. If necessary, check and repair or replace fuel gauge</i>
Obstructed or damaged fuel pipe	<i>Clean; if necessary repair or replace</i>
Air leak in petrol line	<i>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</i>
Fuel filter clogged	<i>Clean and refit with new gasket. Always carry a spare gasket and a glass filter bowl, if so equipped</i>

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

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**

<i>Ignition trouble</i>	
Spark plug or coil leads loose or damaged	<i>Tighten; replace if necessary</i>
Incorrect spark plug gap	<i>Regap</i>
Cracked spark plug insulator	<i>Replace faulty spark plug</i>
Spark plug oiled-up	<i>Clean, if necessary replace with spark plug of correct type. If trouble persists, check for mechanical trouble</i>
Cracked distributor cap	<i>Replace</i>
Loose connection in primary circuit	<i>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</i>
Distributor otherwise faulty	<i>See C</i>
<i>Trouble in fuel system</i>	<i>See D</i>

D

<p><i>Mechanical trouble</i></p> <p>Incorrect valve clearance</p> <p>Valve sticking</p> <p>Valve spring broken</p> <p>Worn piston, piston rings and cylinder or burnt valve; cylinder-head gasket blown</p>	<p><i>Adjust</i></p> <p><i>Try to free by pouring a gum solvent of good quality into carburettor air intake; if not successful, dismantle and repair</i></p> <p><i>Replace. Usually the valve concerned will have to be ground</i></p> <p><i>Test compression; if too low, dismantle for repairs</i></p>
<p><b>F. Engine starts and stops</b></p> <p><i>Trouble in ignition or fuel system:</i></p> <p>Obstructed exhaust system</p>	<p><i>See C and D</i></p> <p><i>Check and repair or replace</i></p>
<p><b>G. Engine runs on wide throttle only</b></p> <p>Idle jet clogged or mixture improperly adjusted</p> <p>Valve sticking or burnt; valve spring broken; other mechanical trouble</p>	<p><i>Clean idle jet and/or idle air bleed; adjust</i></p> <p><i>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</i></p>
<p><b>H. Lack of power</b></p> <p>Ignition too far retarded or other ignition trouble</p> <p>Obstructed exhaust system</p> <p>Trouble in fuel system</p> <p>Loss of compression</p> <p>Dragging brakes</p>	<p><i>Check and correct (See C)</i></p> <p><i>Dented exhaust pipe and/or muffler</i>  <i>Dislocated baffle plate or muffler</i>  <i>Replace</i></p> <p><i>Check and correct (See D)</i></p> <p><i>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</i></p> <p><i>Check and correct. Essentially this is not an engine trouble</i></p>



**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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# **BMC 1100**

**ADO 16**

**from 1962**

**AUSTIN 1100 MG 1100 MORRIS 1100**

**RILEY KESTREL WOLSELEY 1100**

**VANDEN PLAS PRINCESS 1100**