

# Motor Trader service data

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SHEET NUMBER **504**

## VOLKSWAGEN 1600 (1302S) model

Manufacturer: Volkswagenwerke AG, Wolfsburg, Germany

**M**ECHANICAL layout is relatively simple; the flat four cylindered horizontally opposed air-cooled engine is rear mounted and is an integral part of the transmission and final drive unit. All four forward gears are synchromesh and transmit the drive to the rear wheel final drive unit. Suspension is independent at front and rear and steering is of the direct acting worm and sector type.

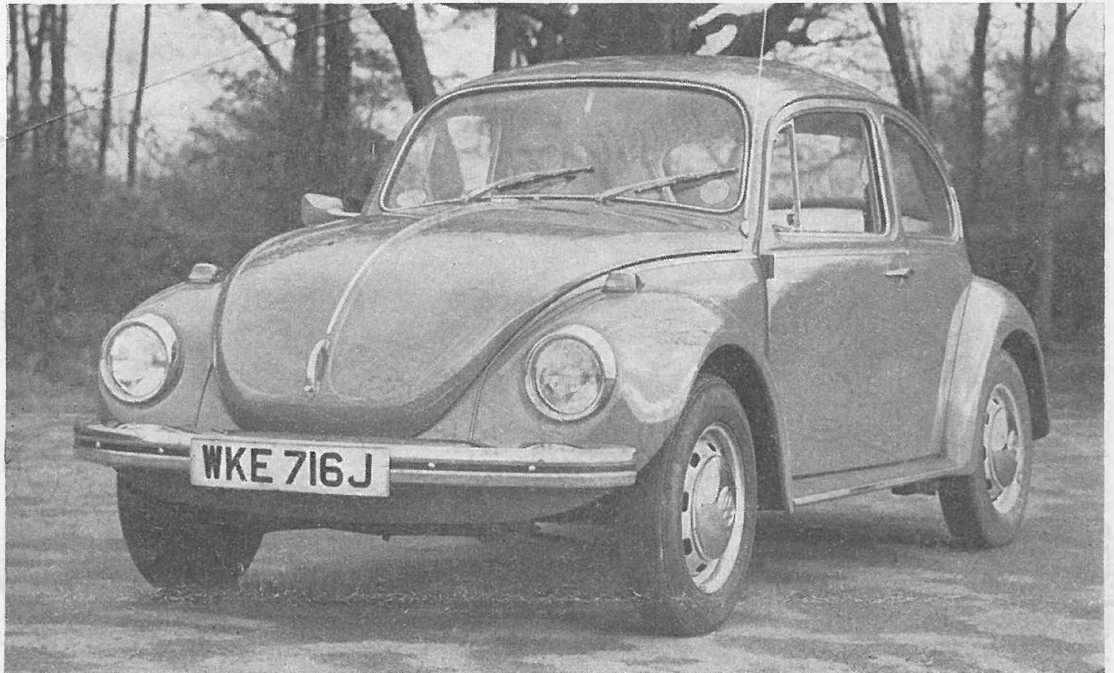
Cars are identified by chassis and engine serials, also by an identification plate. The chassis number is stamped on the backbone of the chassis, and is revealed on removal of the rear seat. Engine serials are embossed on the crankcase side of the generator support flange; above and to the left of the dipstick. The identification plate is found on the valance behind the spare wheel which is mounted in the front luggage compartment.

Special tools have been designed to facilitate service work. A list of those which are considered essential is set out on p. ix and it should be borne in mind that many service operations may be found difficult or impracticable without them. Before attempting service work, it is advisable to possess the requisite complement of these service tools.

Service policy of the manufacturers and their UK distributors remains much as before in that where possible or practicable they state that service work should be carried out through VW dealers who are staffed, trained and equipped to carry out all repair and overhaul operations on all VW cars. This is a policy much in line with that stated by most British and British-based manufacturers.

Threads and hexagons are all of the Metric thread series classification. To avoid confusion, readers will note that both British and Metric units are used in the tabular data and where dimensional tolerances are quoted in the text, similar notation is also used.

As is the case with most vehicle manufacturers, but particularly in



**DISTINGUISHING FEATURES** Similar to other vehicles in the range, the 1600cc., model (Series 1302S) has longer and deeper front, larger "hump" on engine compartment and louvres behind rear windows

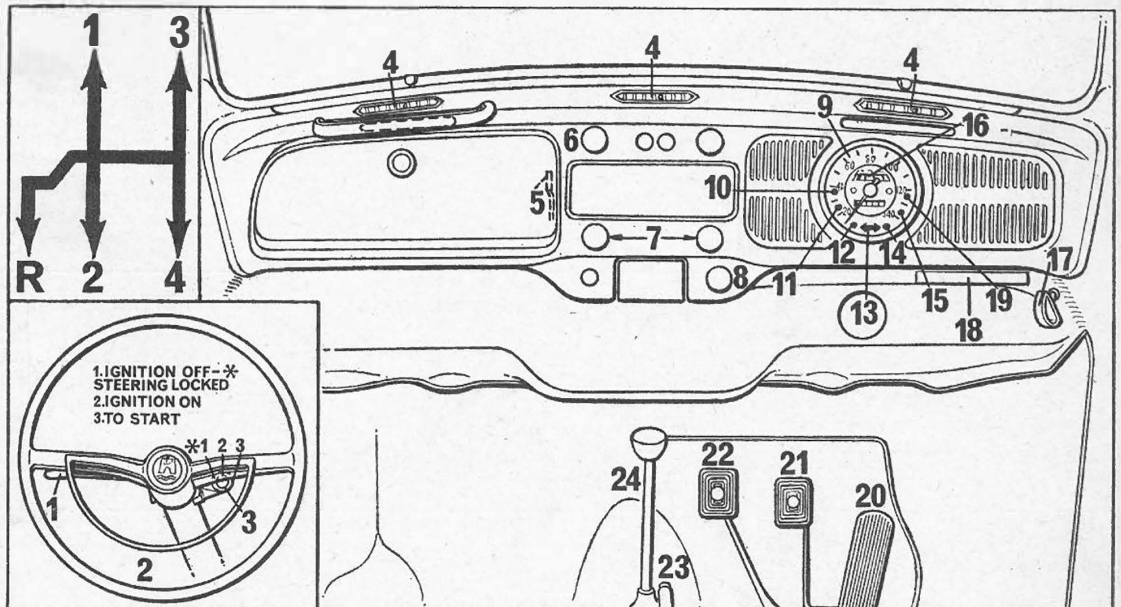
### KEY TO INSTRUMENT PANEL

- 1 Turn signal and dimmer lever
- 2 Horn ring
- 3 Steering ignition lock
- 4 Defroster and fresh air vents
- 5 Front bonnet release
- 6 Lighting switch
- 7 Fresh air control knobs
- 8 Hazard warning light switch
- 9 Speedometer
- 10 Parking warning light

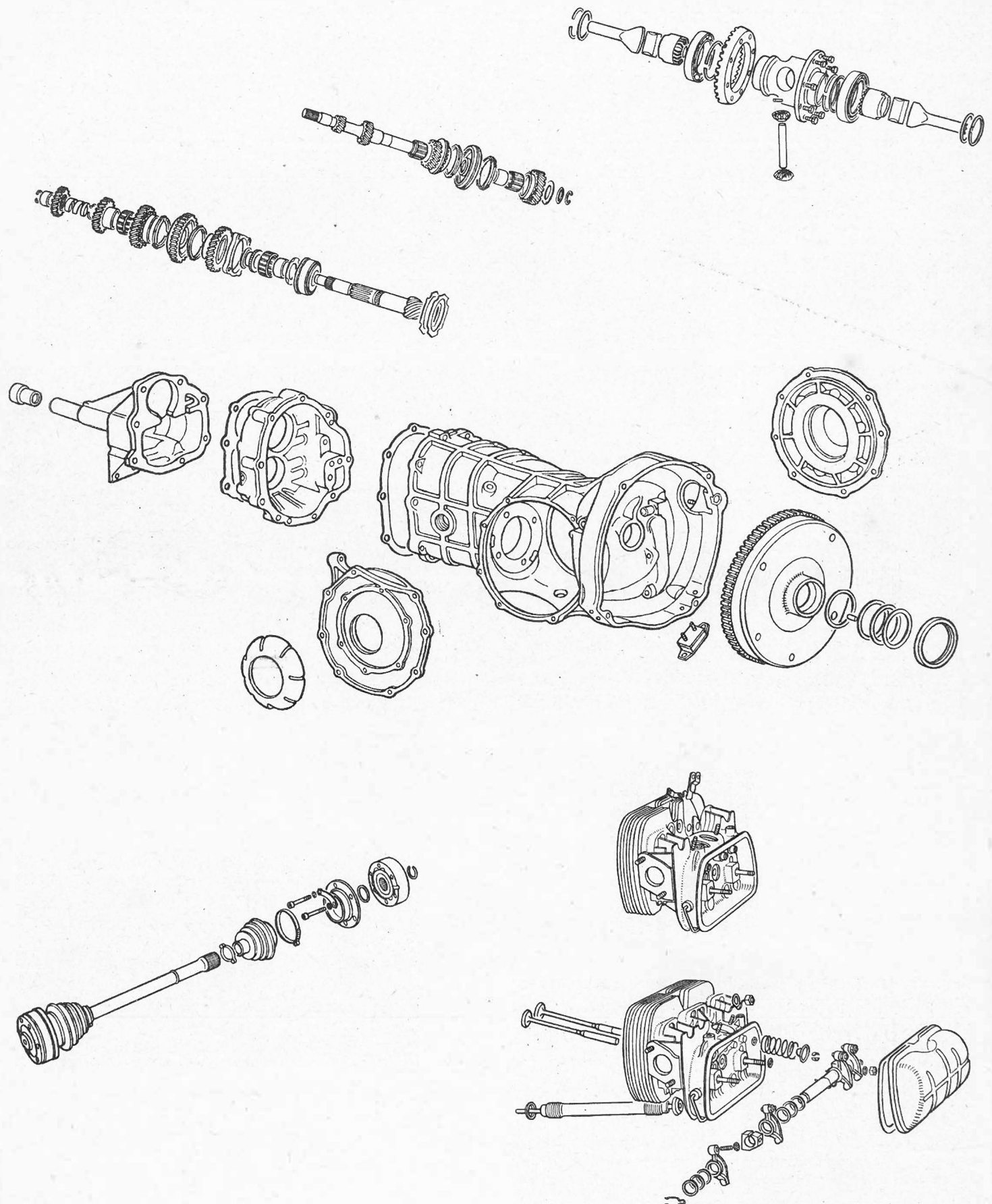
- 11 Heated rear window warning light (optional extra)
- 12 Generator and cooling warning light
- 13 Turn signal warning light
- 14 Oil pressure warning light
- 15 Fluid temperature warning light (only on vehicles with automatic transmission)
- 16 Fuel gauge
- 17 Petrol filler release
- 18 Fuse box

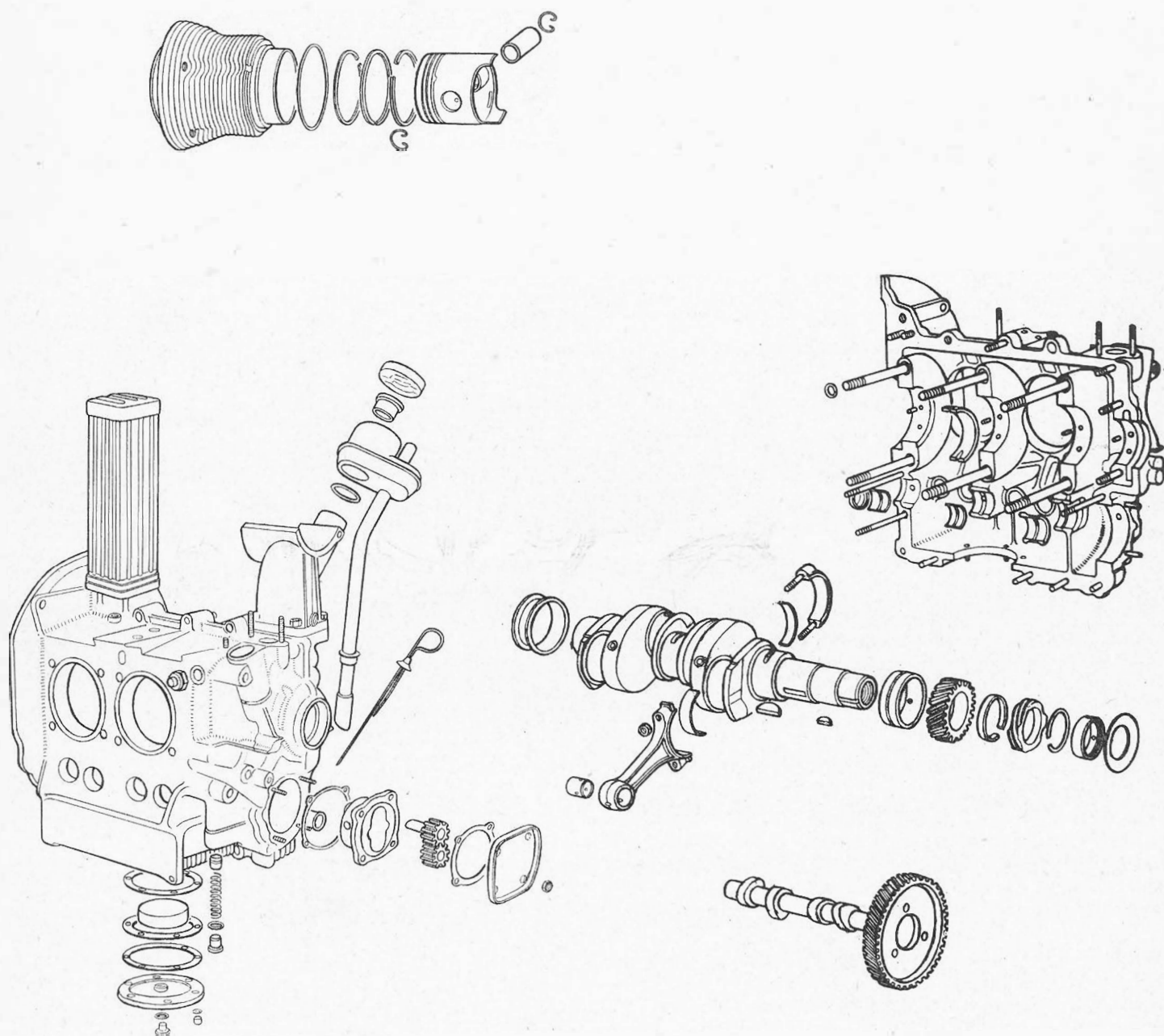
- 19 High beam warning light
- 20 Accelerator pedal
- 21 Brake pedal
- 22 Clutch pedal
- 23 Handbrake
- 24 Gear lever

Inset upper left shows operative positions of gear lever and lower left: location of steering column mounted controls and ignition key positions



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Parts of the engine and transmission showing the relative order of assembly of the fixed and moving components



the case of VW, they insist that none but genuine VW spare parts are used to effect repairs. In this context it should be noted that a "goodwill" aspect applies to the vehicle guarantee in the sense that warranty claims may be considered favourably even outside the official guarantee period, but **ONLY** if genuine VW parts have been used in the repairs so effected.

## ENGINE

### Mounting

The engine has no separate mountings and is bolted direct to the transmission case at the clutch housing joint face by two nuts and bolts and two studs and nuts.

The transmission is mounted to the frame by a rubber cushion at the front end and a rubber cushioned carrier at the rear. Carrier is bolted up to body extension and secured by one 27mm hex. head bolt at each end side. Additional mounting rubber is nipped up by two nuts and studs to

body frame at front end of transmission case.

### Removal

Engine may be removed without transmission and final drive. To remove transmission it will be necessary to remove engine first.

Jack up vehicle and place on stands so that car is clear of ground by three feet (approx.). Disconnect earth strap from battery, block fuel line and open engine cover. Take off air cleaner and engine rear cover plate. Disconnect cables, pipes and wires connected to engine unit and generator. Loosen mounting screw on distributor support and turn unit so that vacuum chamber will clear rear cover plate when engine unit is removed. Disconnect both heating control cables and loosen flexible heater pipes from engine. Remove fuel pipe at engine end.

Unscrew nuts of lower engine mounting bolts, withdraw accelerator cable from conduit tube. Place jack beneath engine and remove nuts from upper mounting bolts. Raise

jack until platform contacts engine and manoeuvre engine until clutch release plate clears main drive shaft. Lower jack and tilt unit down rear end and withdraw from vehicle. Care should be taken to see that clutch components are not damaged during this stage of the procedure.

Installation is reverse of dismantling process, following points being observed: Install engine only, with rear cover plate removed. Retime distributor when replacing engine. Centralize clutch plate with special mandrel VW 219. Check over clutch mechanism and replace defective parts, if any. Examine needle bearing in flywheel gland nut for wear and repack with 10 grams (:35oz) Universal Grease. Lubricate:—starter shaft bush, drive pinion, and main drive shaft splines and spigot with graphite-based oil. Clean transmission case and engine flange. To ease entry of main drive shaft into clutch plate and gland unit needle bearing rotate engine at V-belt and engage a gear to steady drive shaft.

When mounting engine, insert lower mounting bolts in their

respective holes in transmission case flange. Press engine against flange and ensure good seatings. Tighten upper and lower bolts slightly and then fully.

### Cylinders and Crankcase

Horizontally opposed, each pair of cylinders is spigot mounted in either half of crankcase, which is split vertically and of light metal casting. Crankcase halves are machined in pairs and replacement must be made in pairs. Any of the four cylinders, finned for air-cooling is interchangeable. They can be replaced separately, or together with corresponding pistons. *NB:* Colour coding and piston sizing applies. A clearance of .04mm should be established between pistons and cylinders. Each pair of cylinders has a detachable cylinder head, also of light metal die-casting. Combustion chambers are fitted with shrunk-in valve seat inserts.

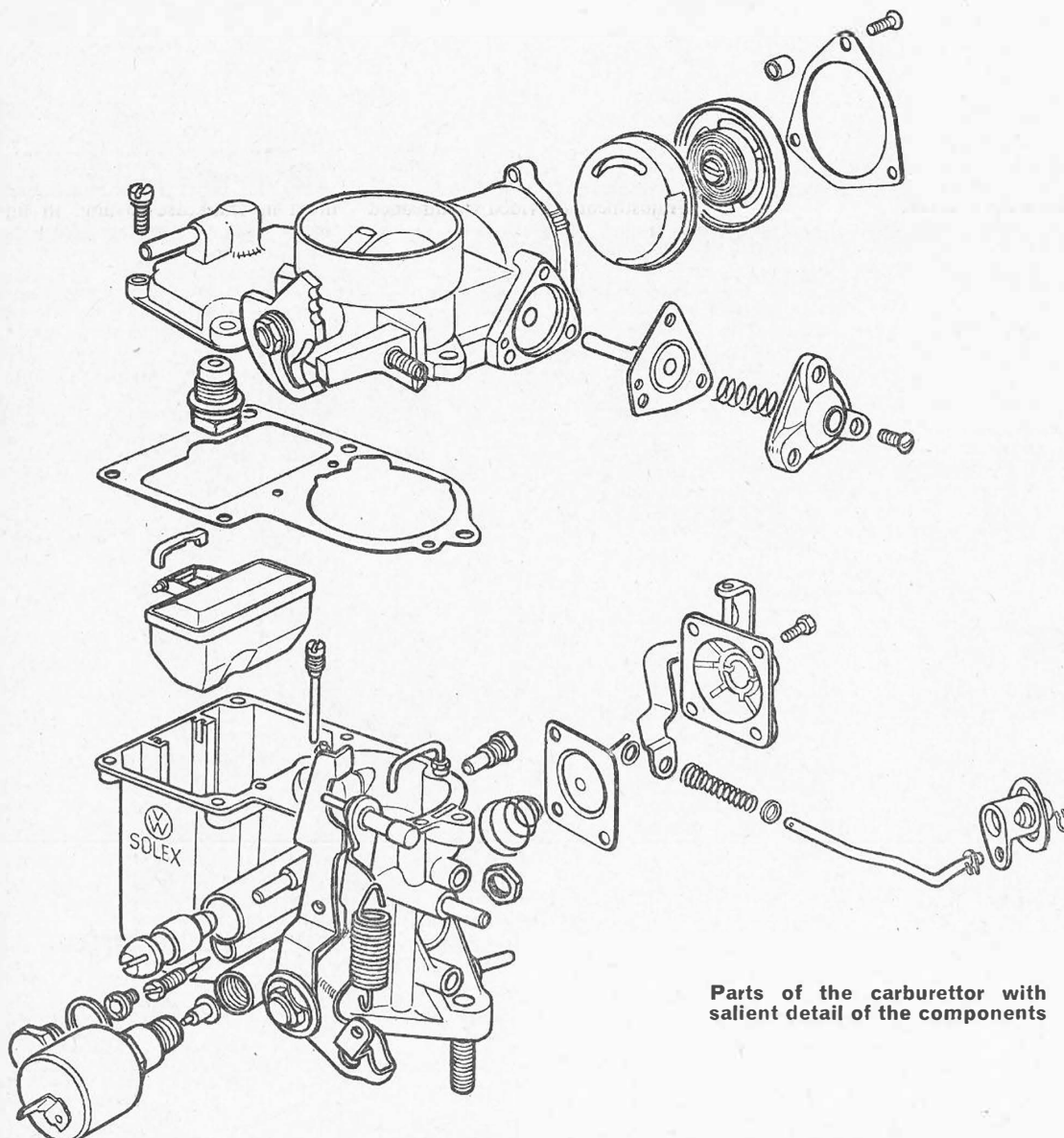
To remove cylinders, after cylinder head removal, take out valve push-rods and tubes, deflector plate below, and lift off. When replacing, care should be taken to ensure that checks for wear are made and that, if necessary, the replacement should be of same bore size to other three.

### Crankshaft

Four main bearings carried in either half of crankcase. No. 2 bearing (from clutch end) is split. No. 1 is lead-coated and takes crank end-float. Flywheel, with starter ring gear is retained by gland nut and dowelled to crankshaft by four dowel pins. Timing and distributor drive gears are keyed on to shaft by Woodruff keys and retaining ring, together with fan pulley, which is bolted to crank end. Oil thrower and return thread provide oil seal at front (pulley side) and oil seal is fitted at rear of flywheel. *NB:* Special Tool only. Bearings are thick-walled alloy pre-finished to size, no hand fitting permissible. When replacing bearings place Nos. 1, 3, and 4 in left-hand half of crankcase so that dowel holes and oil holes register with oil passages in crankcase. Dowel hole in No. 1 bearing must be towards flywheel. Note: Crankshaft dowel holes should be checked for wear. If worn, remove crank, insert drill and jig (VW 231 c/d), drill new holes, 7.8mm dia. 45 deg offset and ream out to 8mm. When refitting crankshaft slide No. 3 main bearing into position followed by Woodruff key for crankshaft timing gear and distributor drive gear. Note: Spacer in between. Check gears for tooth contact. Heat gear to 80 deg C in oil bath and press on to shaft followed by spacer. Check distributor drive gear for wear, heat to 80 deg C and press on to shaft, and fit circlip slide on to No. 4 main bearing. Fit oil thrower to shaft, concave face outwards (to crankshaft pulley), insert Woodruff key.

### Connecting Rods

H-section stampings, big ends split horizontally, small ends bushed for fully floating gudgeon pins. Thin-wall steel-backed lead-indium lined bearings location by tabs in rods and caps. Rod shoulders are machined for heads of high tensile steel nuts,



Parts of the carburettor with salient detail of the components

ENGINE DATA	
Type	horiz-opposed
No. of cylinders	4
Bore x stroke: mm	85.5 x 69
in	3.36 x 2.72
Capacity: cc	1584
cu in	96.6
Max. bhp at rpm (SAE)	60-4000
Max. torque at rpm (SAE)	81.6 lb.ft-3000
Compression ratio	7.5:1

CRANKSHAFT AND CON. RODS		
	Main Bearings	Crankpins
Diameter Nos. 1 & 3	55mm	55mm
No. 4	40mm	55mm
Running clearance: main bearings		.004-.010in
big ends		.0008-.003in
End float: crankshaft		.0027-.005in
big ends		.004-.016in
Undersizes		.010, .020, .030in
Con. rod centres		Not quoted

PISTONS AND RINGS		
Clearance (skirt)	.0016-.0024in	
Oversizes	.002 & .004in	
Max. wt. variation per set	5g*	
Gudgeon pin: diameter	21.997-	
	22.002mm	
fit in piston	floating	
fit in con. rod	.0004-.0008in	
No. of rings	2	1
Gap	.012-.018in	.010-.016in
Side clearance in grooves (in)		
upper	.0027-.0035	.001-.002in
lower	.0020-.0027	not quoted
Width of rings	not quoted	not quoted
* New condition—10g wear limit		

which should be renewed on re-assembly. As with main bearings, crankcase must be split and crankshaft removed for removal of rods. Rods are balanced and difference in weight between any two in one set must not be in excess of 5 grams (2.8dr.). If necessary, shoulders and sides of heavier rods should be ground to achieve this tolerance.

Gudgeon pins should be light push fit dry in new bushes at room temperature.

Rods and caps are numbered and should be assembled with numbered sides together. Retaining bolts should be tightened to torque figure of 3-3.5 mkg (22-25 lb.ft), dry. NB: Casting mark on shafts must be uppermost.

## Pistons

Flat-topped aluminium alloy, solid skirts ground for clearance. Two compression rings and one scraper ring, all fitted above gudgeon pin. Fully floating gudgeon pins retained in piston bosses by circlips.

Pistons are graded and marked for size as follows: Size grade, grade of size marked by paint dot, arrow and word "vorn" stamped or indented, which must point to fly-wheel when fitting piston, weight grade marked by paint line and grade of weight indicated by symbols—brown colour—"under"—and grey—"over" weight. All these marks, colours, symbols and letters appear on piston crowns or lug marks for correct assembly.

When refitting pistons to cylinders ensure that compression rings are fitted with markings "top" or "oben" uppermost and that ring gaps are properly established (see data tables) and spaced at approx. 120 deg around piston.

Oversize gudgeon pins, bushes reamed to size, are also available in

.003mm steps, coloured for identification; black small, white med., and green oversize.

Cylinder must be removed for piston removal and refitting—see previous section under "Cylinders and Crankcase".

## Camshaft

Helical drive gear at front end, shaft runs in three bearing shells machined in each half of crankcase. Removal achieved by parting crankcase when shaft may be lifted out.

When installing, care should be taken to see that cams and journals are free from burrs and abrasions. One timing gear tooth is centre punched for timing and when refitting, this should be mated between two similarly marked crankshaft-gear teeth.

Check backlash of timing gear to be nil—.05mm (.002in). Various sizes of camshaft gear on shafts are available to secure this tolerance and are marked -1, 0, +1, +2, etc., on their inner face.

This indicates in .001mm the variation in pitch radius from standard pitch radius on gears marked "0". These size markings should not be confused with the timing mark on other side of gear.

## Tappets and Rockers

Plain cylindrical tappets sliding in crankcase. Remove after parting crankcase for dismantling. Short pushrods operate inlet and exhaust valve rockers for each pair of cylinders. Rockers, offset are carried on hollow tubular shaft supported in two retaining blocks in each cylinder head. Pair of rockers for each cylinder fitted either side of shaft retaining block. Lateral movement of rockers controlled by packing washers and shims and each is

CAMSHAFT	
Drive type	gears
No. of bearings	3
Bearing clearance	.0008-.002in
End-float (thrust bearing)	.0016-.005lin

VALVES		
	Inlet	Exhaust
Head diameter	1.396in	1.259in
Stem diameter	.3130-.3126in	.3118-.3114in
Face-angle	45°	45°
Spring length at load	31mm	126 ± 8.8 lb

CHASSIS DATA	
Clutch Make	VW
Type	sdp
Permissible out of balance (max.)	15cmg
Pressure plate run out	.004in
Release ring run-out	.012in
Flywheel/release ring distance	1.0511-1.0747in
Springs: length loaded	1.1495in
load (lb)	95-109 75-81
colour	85-97 65-72
Clutch plate run-out	white red
Clutch pedal free play	.020in .40-.80in

GEARBOX	
Type	synchromesh
No. of forward speeds	4
Gear ratios: 1st	3.80:1
2nd	2.06:1
3rd	1.26:1
4th	.082:1
Rev.	3.61:1

FINAL DRIVE	
Type	sb drive—cv. joints
Crownwheel/bevel pinion teeth ratio	43/8

BRAKES		
	Front	Rear
Type	disc	drum
Disc or drum diameter	277mm	230mm
Disc thickness—new	.374in	—
min. thickness after reworking	.008in	—
lateral run-out—max. friction pad thickness (new)	.394in	—
lining thickness (new)	—	.16-.15in
lining width	—	1.57in
Total lining surface	—	55.5in <sup>2</sup>

SPRINGS		
	Front	Rear
ind. strut type suspension	—	ind. tb

SHOCK ABSORBERS	
Make	VW
Type	telescopic hydraulic
Service	replacement

STEERING BOX	
Make	VW
Type	worm & sector
Adjustments: column end float	none
cross shaft end float	grubscrew & locknut
mesh	—

retained in lateral location by spring clip on shaft.

Adjustment provided by threaded ball ended screw in each rocker, which contacts valve stem and ball ends should rest eccentrically in rocker arm sockets. To ensure valve rotation during operation, rocker arm adjusting screws should contact valve stem slightly offset to right. Individual rockers and shafts may be removed after taking out retaining blocks and removal of spring clips and washers.

Valve adjustment should be made in following order: 1st—2nd—3rd—4th cylinder, and adjustment made to valves of cylinder, the piston of which is on TDC of compression stroke. Adjustment of valve clearance should only be made with engine cold. Clearances should be as set out in data tables, p. ix.

## Valves

Overhead, in-line for each pair of cylinders. Inlet valves larger than exhaust, but of similar face angle. Valves not interchangeable. Valve seat inserts pressed into cylinder heads and may be recut to 45 deg providing that outer edge of 15 deg chamfer does not exceed outer diameter of valve seat insert.

Valve guides are chill fit in cylinder heads, chamfered at inner ends, remove guides by punching out with stepped drift. New guides pressed in from top of cylinder head.

Valves have single coil springs locating on seats around upper ends of guides and are retained by caps and split cone cotter fixings. Fit with close coils to head.

## Lubrication

Gear-driven pump recessed on engine crankcase casting. Oil cooler fitted, and when replacing after

engine overhaul should be pressure tested to 6kg/cm<sup>2</sup>. Relief valves fitted in crankcase casting. In unloaded condition spring should be 62-64mm long.

Pump may be extracted for overhaul after removal of securing nuts and gears. Backlash of gears should be nil-.008in and endfloat .0027-.0075in.

Pump is driven from camshaft and circulation is via oil cooler and delivered under pressure to main and big-end bearings through drilled passages in crankcase. Oil is fed to big ends and camshaft bearings through drillings in crankshaft and through hollow pushrods to rocker arms and valve gear. Cylinder walls, pistons and con. rods are lubricated by splash and mist.

Pressure switch in circuit, and warning light gives indication of low pressure, below .3-6kg/cm<sup>2</sup> (4.3-8.5 lb/sq.in).

## Ignition

Coil and distributor, incorporating vacuum advance-retard mechanism.

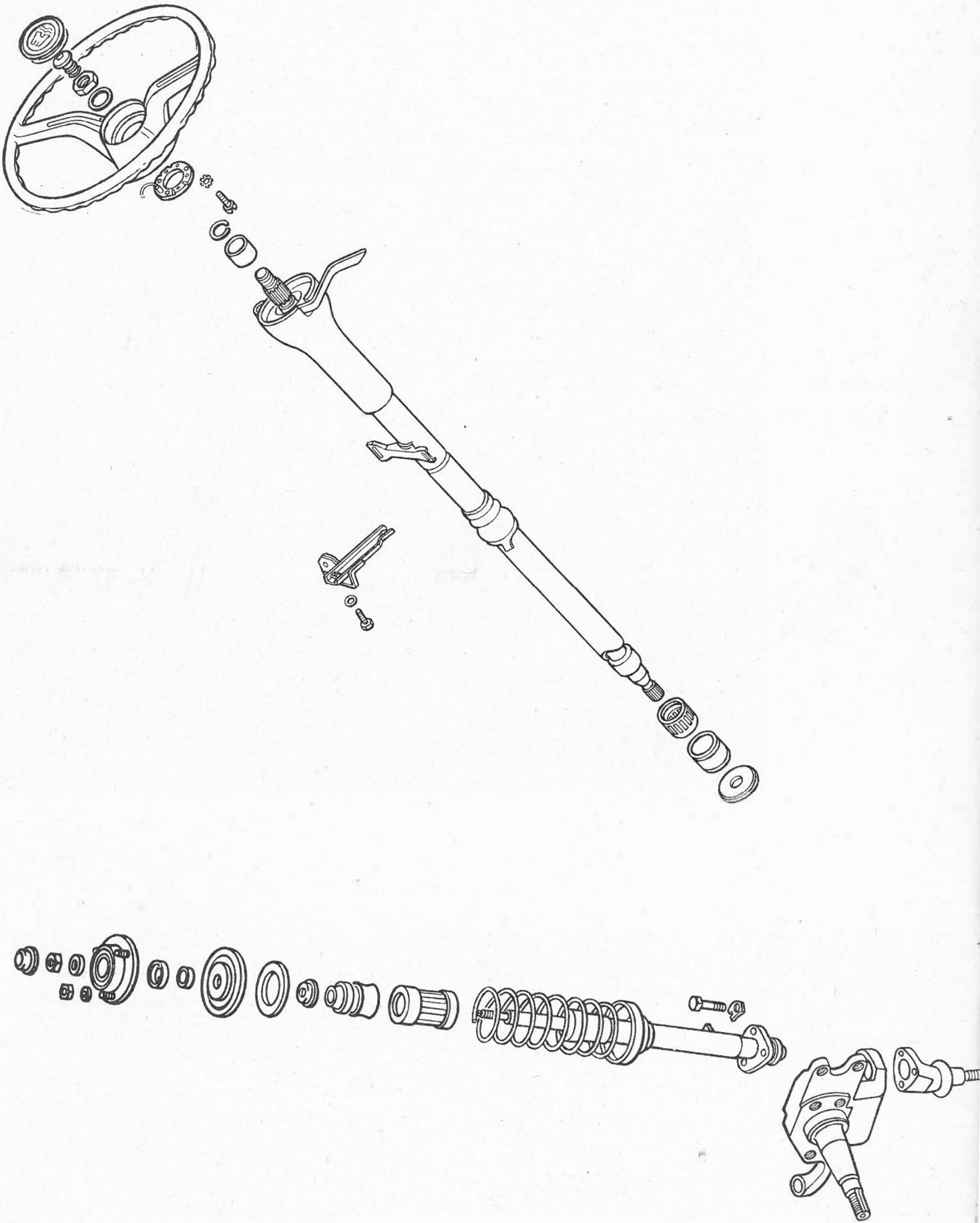
When stripping engine, remove distributor unit complete with its bracket. This will facilitate ignition timing, which will be undisturbed on reassembly of distributor to engine, provided that distributor drive shaft is refitted.

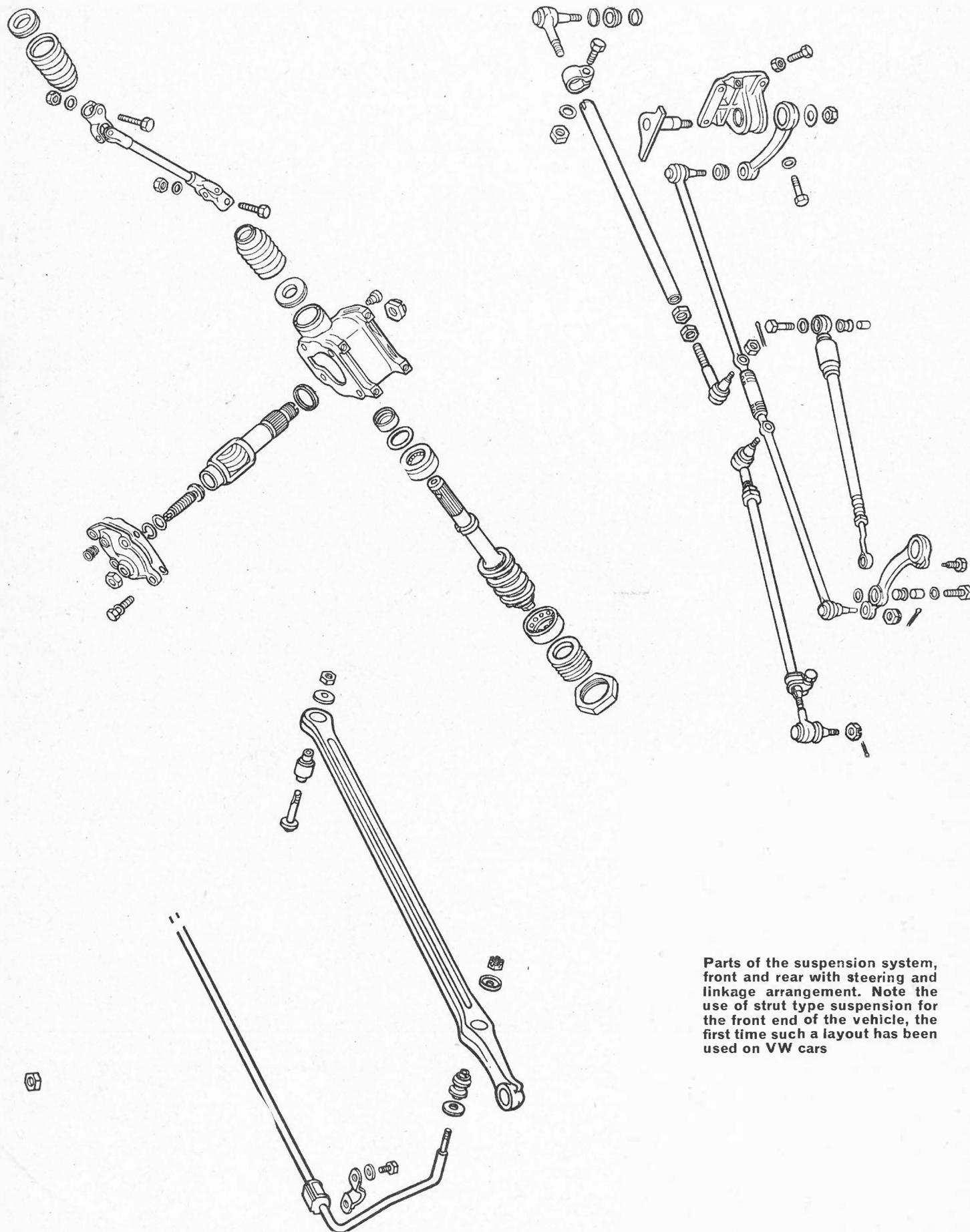
## TRANSMISSION

### Clutch

Single dry plate clutch, with centred ball thrust release bearing. Operation is by cable and access to clutch unit in service is obtained after removal of engine unit as detailed in engine section.

Adjust so that there is pedal free play clearance of 10-20mm (4-8in)





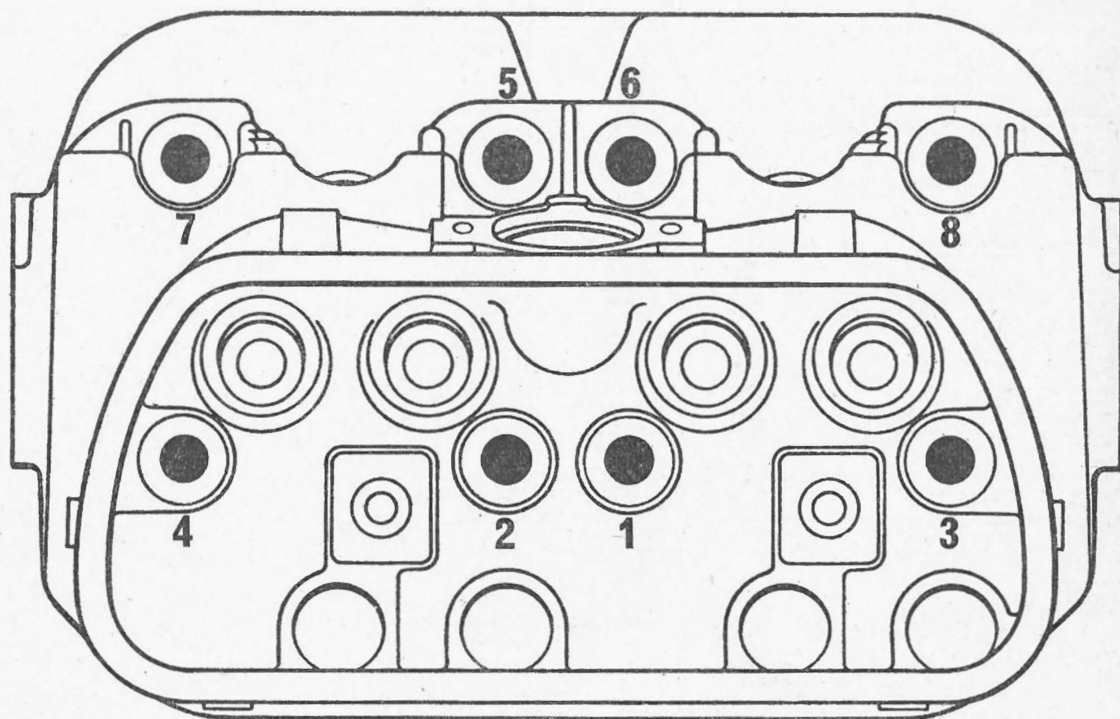
Parts of the suspension system, front and rear with steering and linkage arrangement. Note the use of strut type suspension for the front end of the vehicle, the first time such a layout has been used on VW cars



Adjustment is provided at cable end by wing nut.

## Gearbox and Rear Axle

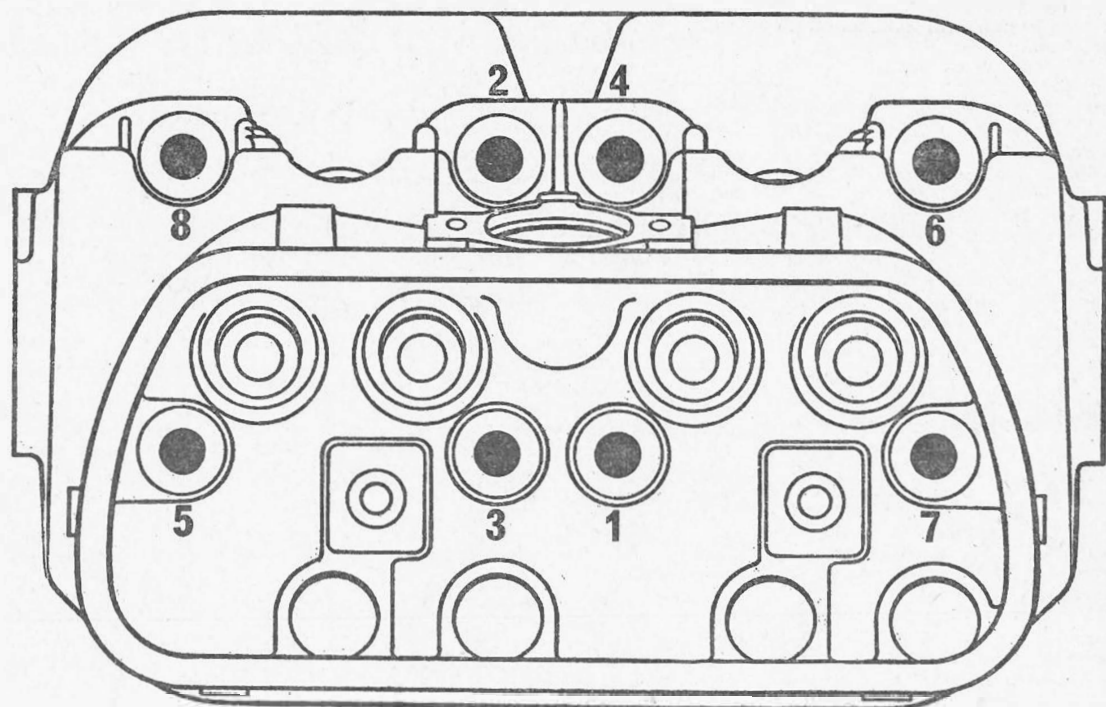
Four-speed gearbox, synchromesh on all forward gears, remote control centre lever operation. Synchromesh devices consist of clutch gear, shifting plates, stop ring and operating sleeve. When operating sleeve is moved towards gear to be engaged, shifting plates bring coned surface of stop ring into contact with coned face of gear. The faster-moving gear carries synchronizing stop ring around until ring is stopped by shifting plates, bringing stop ring gear teeth out of line with internally cut spline of operating sleeve. Braking takes place between two coned surfaces and when exact synchronization speed is reached, splines of operating sleeve engage with teeth of synchronizer stop ring and with clutch teeth of gear, these are chamfered for easier engagement. Clutch adjustment and proper free-play of pedal is very important since cases of synchromesh failure have been traced to faulty clutch operation.



## Final Drive

Helical cut drive pinion and crown-wheel with differential bevel gears which transmit the drive, via two drive shafts to the rear wheels. Drive is taken forwards from engine and clutch unit to gearbox and from mainshaft of gearbox rearwards to final drive pinion and crown-wheel. Since gearbox and final drive unit are in one transmission unit, we depart from our usual practice, and describe these items, and servicing together.

**Order of tightening cylinder head stud nuts. Note: correct procedure is to tighten stud nuts of EACH head down to 7lb.ft (1mkg) in the order shown in top diagram. Tighten nuts finally in order shown on lower diagram to 22-23lb.ft., (3-3.2mkg) on each cylinder head**



## To remove Rear Axle and Gearbox

Disconnect earth strap from battery, raise vehicle and support on trestles. Remove engine unit (see Engine section).

Disconnect clutch cable from operating shaft lever, slide off rubber boot and withdraw cable and sleeve from bracket on left-hand final drive cover. Unhook accelerator cable from retainer on gear carrier and disconnect cable from terminals on starter motor. Remove frame end inspection cover under rear seat. Take off rear screw of shifting rod coupling and move gearlever to withdraw coupling from transmission shift rod. Remove nuts at front rubber mounting on transmission case. Place trolley jack under vehicle and clamp axle cradle (VW 609) to axle. Remove two bolts at transmission carrier (27mm) and draw out axle to rear of car. Replacement is reversal of above procedure.

**NB:** with double-jointed axle arrangement, remove socket head screws from drive shaft flanges (transmission end first) and then wheel shaft end. Remove shafts downwards and out of car. Should it not be necessary to move vehicle after removal of transmission, shafts need only be detached at transmission end. Tie

shafts up to body with wire hooks and cover joints with plastic caps to prevent ingress of dirt.

Take off nuts from front transmission mounting and position jack and clamp rear axle in axle bracket VW 609 or 609a. Remove securing screws in transmission carrier.

Replacement of axle is a reversal of dismantling procedure noting following points: align marks made on spring plate and bearing housing, attach bearing housing to spring plate and tighten screws to correct torque. When a new axle frame, spring plate or front transmission

mounting has been fitted, rear wheels **must** be aligned. Track and alignment **cannot** be set without optical alignment gauge. If such a gauge is not available then wheels must be set so that marks on spring plate sides are aligned with marks in bearing housing. When using optical equip-



SPECIAL TOOLS			
	Part No.		
Box wrench 10mm	109	Measuring rod for rear axle	360
Open end wrench 27mm	113/2	Thrust plate	401
'T'-wrench 8mm square socket	114	Thrust plate	402
Circlip pliers	122B	Punch	407
Piston ring compressing tool 75mm	123	Punch	411
Piston ring compressing tool 75mm	123A	Thrust disc	412
Fuel pump wrench 13mm	126B	Tube 60mm dia	415A
Circlip pliers	161A	Tube 31.5mm dia	418A
Socket wrench for cylinder head nuts	165	Tube 28mm dia	421
Socket	170	Tube 28mm dia	422
Spring clip (cam followers)	171	Guide tube tapered	428A
Special wrench 36mm	179	Thrust ring	429
Oil pump extractor	201	Thrust pad 16.5/28mm dia	431
Extractor head piece	202	Arbor 50mm dia	432
Extractor hooks	202S	Thrust pad	433
Fan pulley extractor	203B	Arbor	434
Fan pulley thrust pad	203D	Guide pin tapered	436A
Crankshaft oil seal installing tool	204B	Guide pin conical	437A
Piston pin pilot drift	207	Support ring	440
Flywheel retainer	215B	Thrust pad	442
Flywheel retainer	215C	Drop arm puller—will be deleted and replaced by Kukko 204/	
Drift	240A	Assembly & checking device for roller steering (assembly & adjustment)	236
Driving sleeve	244	50mm wrench—steering roller adjustment	271
Driving sleeve	244B	50mm wrench—steering roller adjustment	277a
Protractor	261	Axial play adjustment (on steering spindle)	278b
Ball joint removal tool	267A		
Torsion arm offset gauge	270A		
Open end wrench 41mm	277		
Wrench for steering worm adjustment	278A		
Lever for checking ball joint play	281A		
Support	307A		
Support clamp	313		

TUNE-UP DATA			
	I-4-3-2		
Firing order		Settings: choke	24mm
Tapet clearance (cold):		main jet	x112.5
inlet	.004in	air correction with	
exhaust	.004in	emulsion tube	125z
Valve timing: inlet opens	7° 30' BTDC	pilot jet	65
inlet closes	37° ABDC	cut off for bypass	
exhaust opens	44° 30' BBDC	mixture	1.8
exhaust closes	4° ATDC	pilot air jet	135
Standard ignition timing	5° ATDC	float needle valve	1.5
Location of timing mark	Mark on c/shaft pulley in line with crankcase halves joint face.	float weight	8.5g
Plugs: make	Bosch	pump delivery	1.2-1.35
type	W 145 TI	power fuel jet	100
size	14mm	Air cleaner: make	VW
gap	.028in	type	Oil bath and pre-heater tube
Carburettor: make	Solex	Fuel pump: make	VW
type	30 PICT-2	type	Mech.
		pressure	1.8-2.5 lb/in <sup>2</sup>

NUT TIGHTENING TORQUE DATA		
	Thread	lb.ft
<b>ENGINE</b>		
Nuts securing crankcase halves	M12 x 1.5	25
Screws and nuts for crankcase halves	M8	14
Cylinder head nuts	M10	23
Con. rod nuts and bolts	M9 x 1	22-25
Generator pulley nut	M12 x 1.5	40-47
Special bolt for fan and crankshaft pulley	M20 x 1.5	94-108
Converter drive plate screws	M8	14
Engine carrier/body self-locking nuts	M8	18
<b>GEARBOX &amp; FINAL DRIVE</b>		
Drive pinion nut	M22 x 1.5	58-65
Main drive shaft nut	M16 x 1.5	30-36
Housing nuts and bolts (see tightening sequence)	M8 x 1.25	14
Axle shaft nut	M24 x 1.5	217
Transmission carrier/frame	M18 x 1.5	166
Big gear screws	M10 x 1.5	43
Selector fork clamp screw	M8 x 1.25	18
Transmission housing nuts and bolts	M8 x 1.25	14
<b>FRONT AXLE</b>		
Inner wheel bearing nut	M18 x 1.5	29
Wheel bearing locknut	M18 x 1.5	50
Wheel bearing locknut	—	50

GENERAL DATA	
	Saloon
Wheelbase	7ft 11.3in
Track: front	4ft 6.3in
Track: rear	4ft 5.3in
Turning circle	31.5ft
Ground clearance (loaded)	6in (approx)
Tyre size: front	5.60-15—4 ply
Tyre size: rear	13ft 4.6in
Overall length	5ft 2.4in
Overall width	4ft 11in
Overall height (unladen)	1808 lb
Weight (unladen)	

ment, axle should be fitted with marks in line first and then rectified accordingly. Movement of bearing housing 1mm is equivalent to a track alteration of 8'.

Fit lower shock absorber screw, and tighten to correct torque, fit push rods for equalizer spring, fit self-locking nuts and tighten. Slotted nuts on axle shafts should be tightened to correct torque, but if split pin cannot be inserted, turn nut on to next slot; nuts to be tightened when vehicle is resting on its suspension.

Brakes should be bled and adjusted; clutch cable fitted greasing cable end slightly. Fit shift rod coupling, tighten screw and secure with wire.

## CHASSIS

### Brakes

Hydraulic on all four wheels, disc/drum layout, tandem master cylinder used. Handbrake operates separate expander unit in each rear wheel assembly.

No adjustment, apart from replacement of pads for front brakes, and rear brakes have starwheel adjusters. To adjust, jack up each of the rear wheels in turn, apply pedal to centralise shoes in drums; insert screwdriver through hole in wheel and brake drum and turn starwheel to right to lock shoes in drum; backing adjustment off as necessary to obtain free rotation of wheel.

Handbrake adjustment will also be effected by above method, but in the event of cable stretch, adjustment is also provided at handbrake lever end of cables to correct this.

To renew brake pads in front

brakes, jack up car and remove road wheels as necessary. With a punch, drive out pad retaining pins and extract friction pads from caliper (special tool facilitates this operation). Note: if pads are to be re-used, mark them for replacement in caliper units from which they were removed; it is NOT permissible to re-use friction pads any other way, and when renewing pads, this should be done not only in pairs as is usual workshop practice, but in complete sets, front and/or rear per vehicle.

To fit pads, push pistons right back in their cylinders, use retaining tool to keep them there and clean seating and sliding surfaces of pads in calipers. Blow out caliper dust with airline, check piston seals for damage, brittle or cracked seals must be replaced, and to do this, caliper must be removed. Ensure that pistons are located correctly (use special setting gauge, which must always be held against lower guide surface in caliper, ie: counter-clockwise to brake's rotation of forward vehicle movement. Replace piston retaining plate; circular part of plates must be firmly pressed into piston crowns, in addition plates must also lie below relieved portion of pistons. Insert friction pads into calipers and fit new pad spreader springs, and fit pad retainer pins into caliper housing.

### Rear Suspension

Independent, torsion bar. Inner ends of each bar are anchored to centre of frame cross member by splined tube welded *in situ*. Outer ends of torsion bars (splined) carry radius arms, hubs are rubber mounted. Rubber stop is screwed to radius arm and axle shaft bearing housing.

Torsion bars are removable for replacement, but are not interchangeable, being handed from side to side. Arrow marks are stamped on outside face showing torque direction.

### Front Suspension

Independent, strut type, telescopic hydraulic shock absorber controlled.

Hubs, integral with brake discs, run on taper roller bearings. Each splash plate is secured to stub axle by three bolts and lock washers. Hubs are secured on stub axles by lock nuts, fitted with locking devices.

**Front wheel bearings:** when checking track or at other overhaul times, check that datum end-float of hubs is .001-.005in, and VW state that although there "will be quite a noticeable amount of rock at the upper limit, this is permissible".

To adjust bearings, loosen screw in clamp nut, and tighten clamp nut so that tapered rollers bear against shoulder of inner race. Rotate wheel while making this adjustment to avoid overtightening bearing. Slacken off clamp nut to achieve datum clearance and retighten clamp nut screw, note that width of slot in clamp nut must be .10-.02in., so that clamping is adequate even when tolerances are not. Recheck adjustment and refit dust cap which should be grease-free.

To remove axle assembly complete with suspension: support vehicle on stands or hydraulic jack (Part VW 610 in addition). Disconnect and remove components in following order: fuel tank, after taking off fuel hose and sealing it. Also remove the earth wire to the horn. Remove brake hoses at brackets and plug them

with suitable caps. Take out cotter pin from speedo. cable in left-hand front wheel and pull cable out of steering knuckle.

Take off cover plate pedal cluster. Remove gearshift rod (engage 3rd. gear and take out gearlever). Undo clutch cable at pedal, and unscrew handbrake cables at lever. Press drag link out of swing lever. Remove steering damper bolt at bracket and turn damper downwards.

Position jack with cradle (VW 610), remove four front axle securing bolts from side plate on each side and lower jack and wheel axle assembly out.

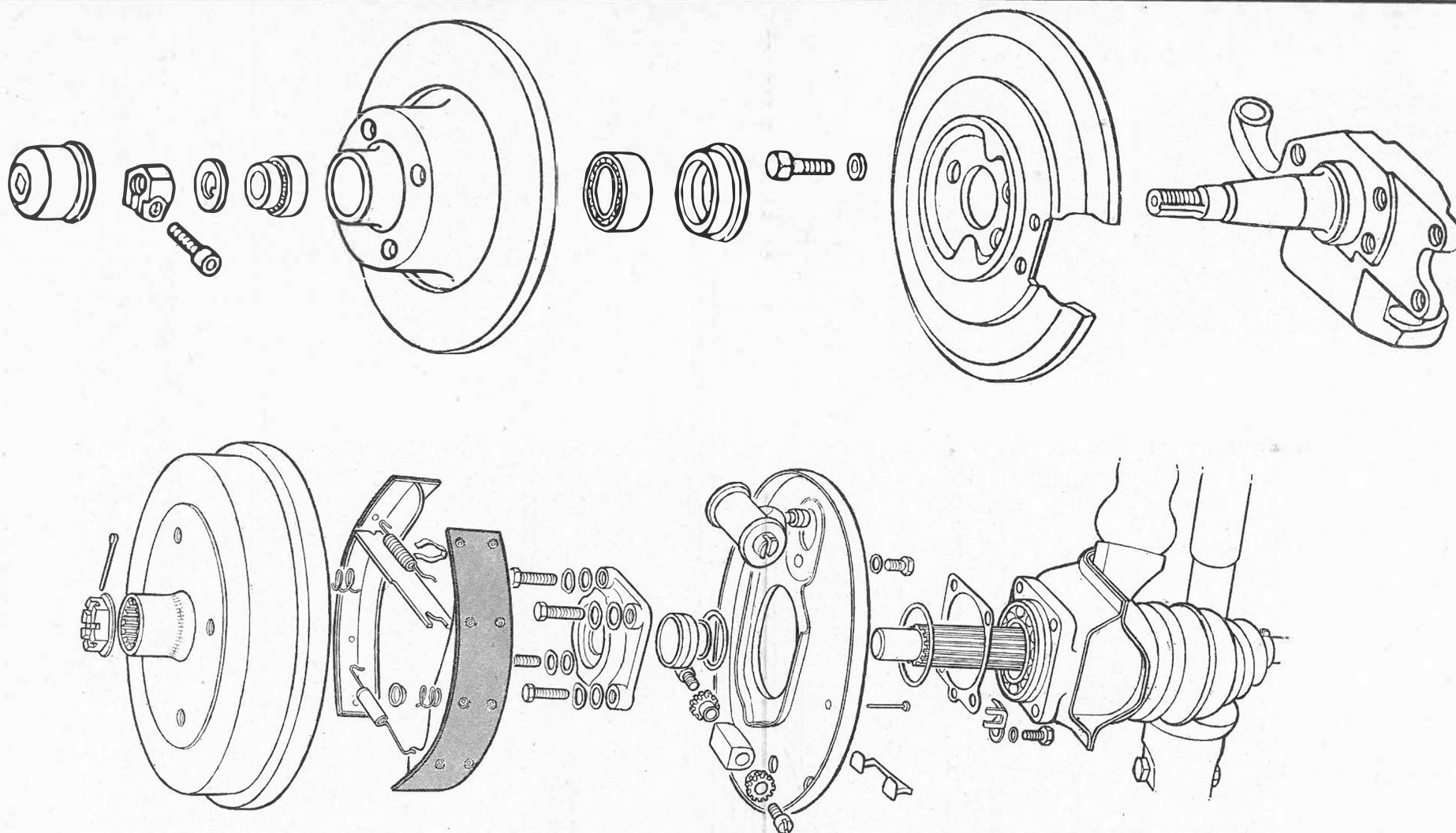
Assembly is, in the main, a reversal of the dismantling sequence. Renew all locking devices and check adjustments to obtain datum conditions.

### Steering

Worm and sector steering unit, adjustable worm carried in ball bearings in box and hemispherical sector freely located in concave recess of sector shaft. Track rods are connected to drop arm ends and transmit motion to steering arms of front wheels. Steering damper, with telescopic tubes, used in this vehicle.

### Shock Absorbers

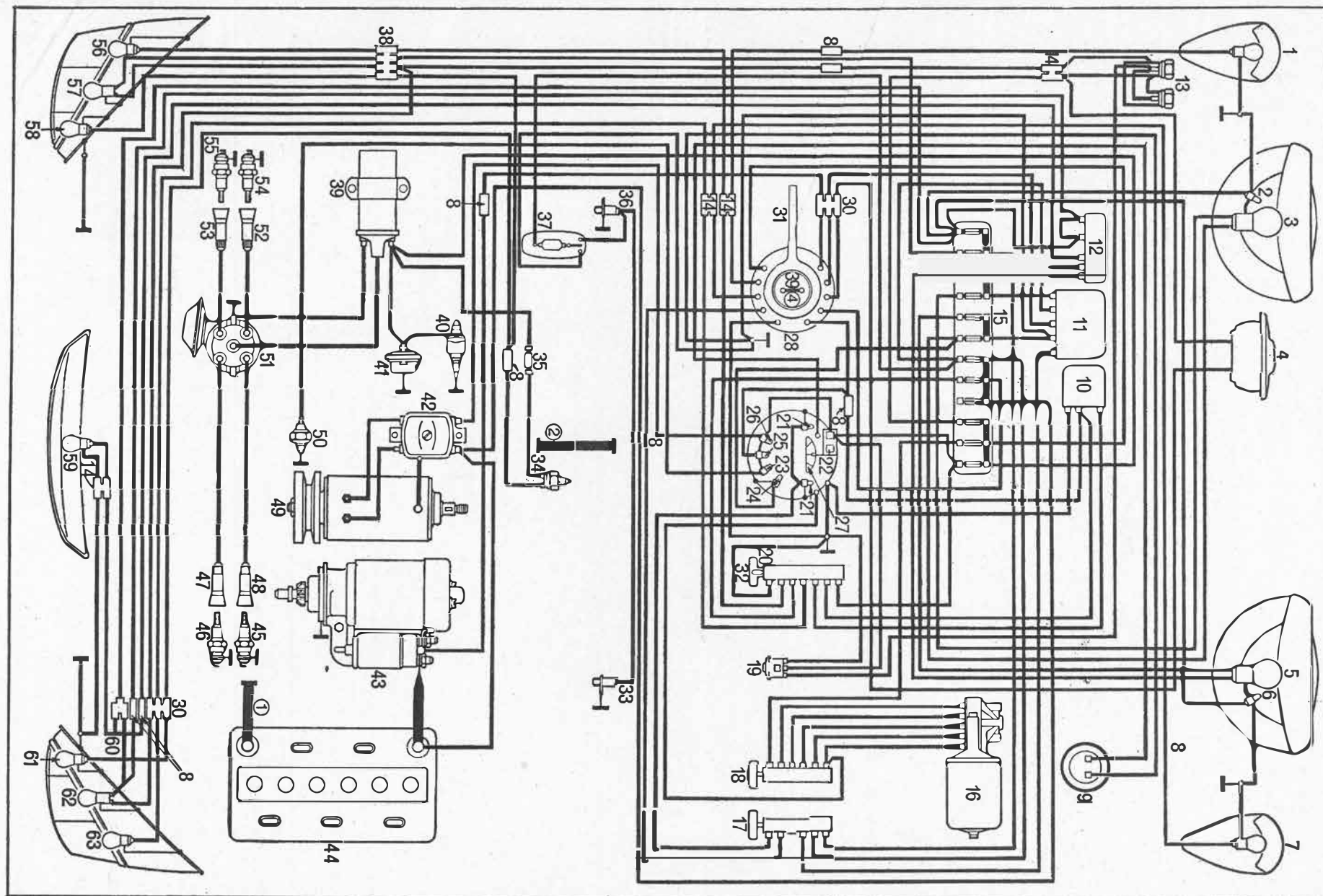
Double-acting piston hydraulic type integral with front suspension units at front of car and double-acting hydraulic units at rear of vehicle. Ensure that if replacements are fitted, they are of the correct pattern.



**Top shows the front disc brake arrangement and below is shown the rear drum brake assembly, with detail of the drive shaft and hub**

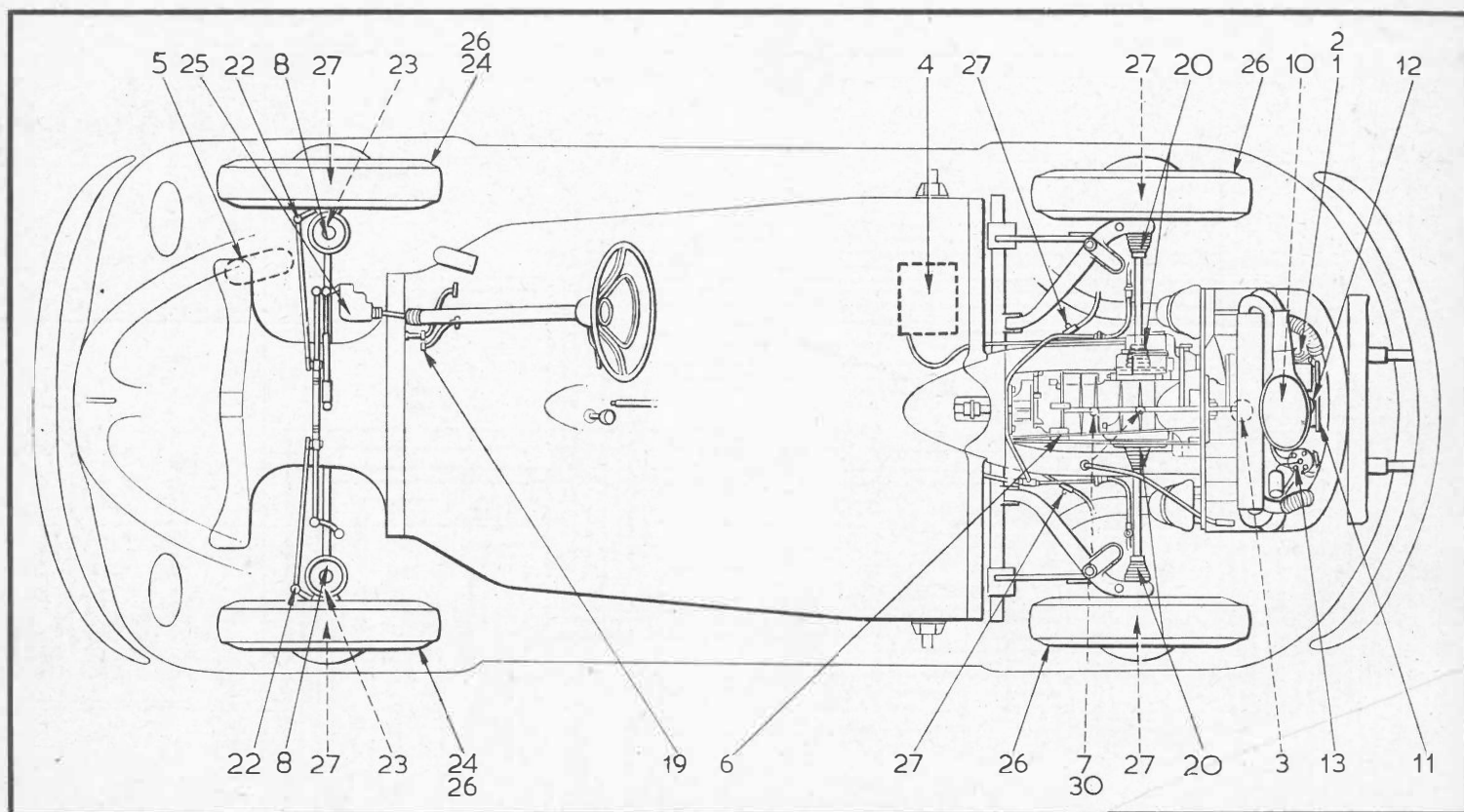
## ELECTRICAL DATA

<b>Generator</b>			<b>Licence plate light bulb</b>	<b>12V: 10W</b>
Maximum current	<b>30 amps</b>		<b>Back-up light bulb</b>	<b>12V: 25W</b>
Mean regulating voltage	<b>14V</b>		<b>Interior light bulb</b>	<b>12V: 10W</b>
Nominal output speed	<b>2000rpm</b>		<b>Parking light bulb</b>	<b>12V: 4W</b>
Cut-in speed	<b>1450rpm</b>		<b>Warning lamp bulb</b>	<b>12V: 2W</b>
Ratio	<b>1.8:1:1.9:1</b>			<b>12V: 1.2W</b>
<b>Battery</b>			<b>Side marker light bulb</b>	<b>—</b>
<b>Starter</b>	<b>12V: 36Ah</b>		<b>Speedometer</b>	
<b>Windshield wiper motor</b>	<b>12V: 0.7hp</b>		<b>Kilometres</b>	<b>Ratio of road speed/revolution</b>
Current draw	<b>12V</b>			<b>Range</b>
	<b>Stage 1: approx.</b>			<b>0.5:1</b>
	<b>2 amps</b>			<b>0-140km/h</b>
	<b>Stage 2: approx.</b>		<b>Miles</b>	<b>Ratio of road speed/revolution</b>
	<b>3 amps</b>			<b>Range</b>
<b>Windshield washer</b>	<b>pneumatic</b>		<b>Clock</b>	<b>—</b>
Maximum pressure	<b>43psi (3kg/cm<sup>2</sup>)</b>		<b>Fuel gauge</b>	<b>thermoelectric</b>
Capacities	<b>2.1 U.S. pints/</b>		<b>Heatable rear window</b>	<b>12V: 60W</b>
	<b>1.75 Imp. pints/</b>		<b>Fresh air fan</b>	<b>—</b>
	<b>1 litre</b>		<b>Current draw</b>	
<b>Headlight bulb</b>	<b>12V: 45/40W</b>		<b>Fuse box</b>	<b>10 fuses</b>
<b>Sealed beam unit</b>	<b>12.8V: 50/40W</b>			
<b>Turn signal bulb</b>	<b>12V: 21W</b>			
<b>Brake/tail light bulb</b>	<b>12V: 21/5W</b>			



## KEY TO WIRING DIAGRAM

- |  |                                     |  |   |   |
|--|-------------------------------------|--|---|---|
| 1 Turn signal: Front left                      | 14 Cable connector, double          | 27 Fuel gauge  | 39 Ignition coil                        | 50 Oil pressure switch                  |
| 2 Parking light, left                          | 15 Fuse box                         | 28 Ignition/starter lock                                       | 40 Electro-magnetic cut-off valve       | 51 Distributor                          |
| 3 Twin-filament bulb, left headlight           | 16 Windshield wiper motor           | 29 Horn half ring  | 41 Automatic choke                      | 52 Spark plug connector, No. 2 cylinder |
| 4 Horn   | 17 Lighting switch                  | 30 Cable connector, treble                                     | 42 Regulator                            | 53 Spark plug connector, No. 3 cylinder |
| 5 Twin-filament bulb, right headlight          | 18 Windshield wiper switch          | 31 Turn signal switch (also hand dimmer and headlight flasher) | 43 Starter                              | 54 Spark plug, No. 2 cylinder           |
| 6 Parking light, right                         | 19 Dual circuit brake warning light | 32 Hazard warning light switch                                 | 44 Battery                              | 55 Spark plug, No. 3 cylinder           |
| 7 Turn signal: Front right                     | 20 Hazard warning light lamp        | 33 Door contact switch light                                   | 45 Spark plug, No. 1 cylinder           | 56 Turn signal: rear left               |
| 8 Cable connector, single                      | 21 Instrument panel light           | 34 Reverse light switch  | 46 Spark plug, No. 4 cylinder           | 57 Tail/brake light: left               |
| 9 Fuel gauge sender unit                       | 22 Fuel gauge vibrator              | 35 Single fuse for reverse light                               | 47 Spark plug connector, No. 4 cylinder | 58 Reverse light, left                  |
| 10 Hazard warning light relay                  | 23 High beam warning lamp           | 36 Door contact switch, left                                   | 48 Spark plug connector, No. 1 cylinder | 59 Licence plate light                  |
| 11 Relay for hand dimmer and headlight flasher | 24 Oil pressure warning lamp        | 37 Interior light  | 49 Generator                            | 60 Cable adaptor                        |
| 12 Parking light relay (only for Austria)      | 25 Turn signal warning lamp         | 38 Cable connector, quadruple                                  |   | 61 Reverse light, right                 |
| 13 Brake light switch                          | 26 Generator charging warning lamp  |  |   | 62 Tail/brake light, right              |
|  |                                     |  |   | 63 Turn signal, rear light              |



## KEY TO MAINTENANCE DIAGRAM

### DAILY

1. Engine sump—check and top up.

### EVERY 3,000 MILES

2. Engine sump—drain and refill.  
3. Engine oil strainer—clean.  
4. Battery  
5. Windshield washer } check and top up.

### EVERY 6,000 MILES (as for 3,000 miles plus following)

6. Full-flow oil filter—replace.  
7. Transmission—check and top up.  
8. Front axle  
9. Door hinges, locks } lubricate.  
10. Air cleaner—clean and refill with fresh oil.  
11. V-belt—tighten or replace if necessary.  
12. Fuel pump—clean filter.  
13. Distributor—Lubricate, check C.B. gap, and attend if necessary, to ignition timing.  
14. Valve clearances—adjust.  
15. Rocker cover gasket—replace.  
16. Sparking plugs—clean, check and adjust gaps; check compression.

- \*17. Carburettor pre-heating—check control flaps.  
\*18. Crankcase ventilation—check rubber valve, replace if necessary.  
19. Clutch—adjust pedal free play.  
20. Rear axle—check bolts of cv joints for tightness.  
\*21. Drive shafts—check seals for damage and leaks.  
22. Tie rod ends—tighten if necessary, check dust seals.  
23. Ball joints—check axial play and seals.  
24. Front wheels—check camber and toe-in.  
25. Steering gear—check and adjust play between roller or peg and worm.  
26. Tyres—check for wear and damage, adjust pressures.  
27. Brakes—check lines, hoses and connections for damage and leaks. Check fluid level and thickness of linings, adjust all brakes.  
\*28. Electrical system—check operation, adjust headlights.  
\*29. Wiper blades—check, replace if necessary.

### ADDITIONALLY AT 30,000 MILE INTERVALS

30. Manual transmission—change oil, clean magnetic drain plug and check for leaks.  
\*31. Brake fluid—replace with clean fluid every two years.

\* Not shown on diagram.

### FILL-UP DATA

	Pints	Litres
Engine sump	4.4	2.5
Gearbox Rear axle }	5.25	3.0*
Fuel tank	9.2galls.	42
Tyre pressures: †front.	16 lb/in <sup>2</sup>	1.1kg/cm <sup>2</sup>
rear	24 lb/in <sup>2</sup>	1.9kg/cm <sup>2</sup>

\* At oil changes—2.5 litres.

† Plus suitable increase according to load and if radial ply tyres are fitted, pressures should be 18 lb/in<sup>2</sup>, front; 27 lb/in<sup>2</sup>, rear.

## APPROVED LUBRICANTS

To SAE Specification	Summer	Winter	—15°C	—25°C
ENGINE	30	30	10W	5W
GEARBOX and FINAL DRIVE	EP 80/90			
FRONT AXLE TIE ROD ENDS	Any multipurpose lithium base grease			

### FRONT-END SERVICE DATA

	Front	Rear
Castor	19.5mm	—
Camber (straight ahead)	1° 20' ± 20'	1° 20' neg ± 40'
King pin inclination	not quoted	
Toe-in	20° ± 15'	0° ± 15'
No. of turns lock to lock	2.65	
Adjustments: castor camber }	shims	
toe-in	screwed track rod ends	