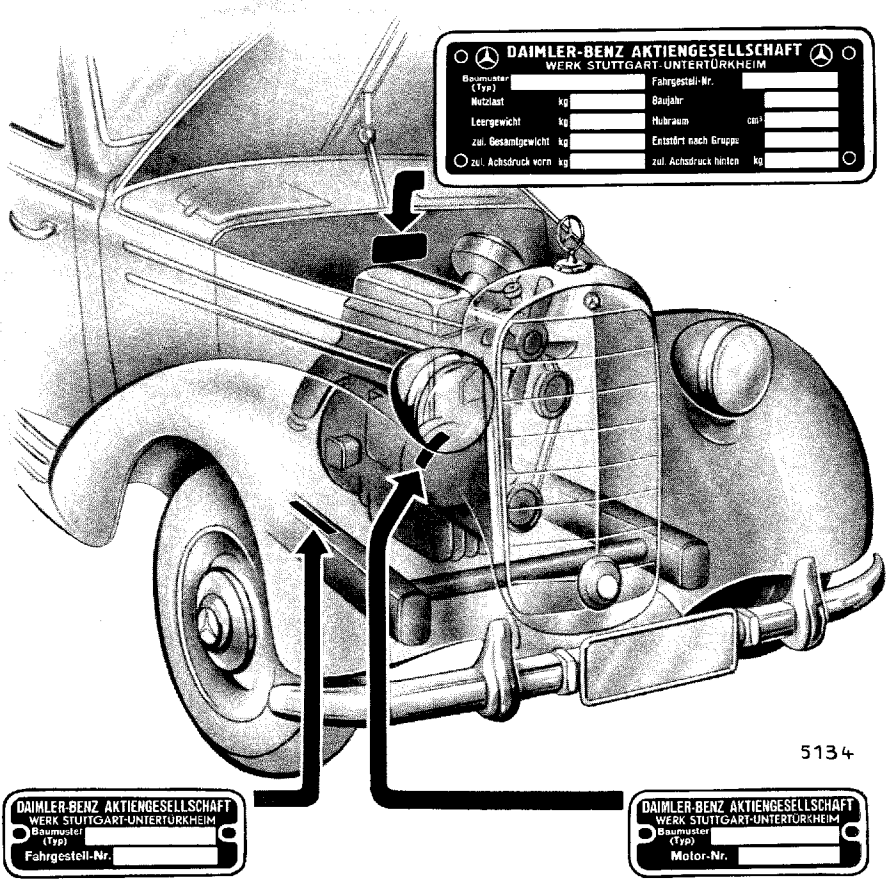
Position of Identification Plate, Engine and Chassis Serial Numbers



Also stamped in the frame underneath the plate

Also stamped on the crank case, dynamo side top right

Make a careful note of the chassis serial and engine number of your car incl. the complete type designation.

A correct and prompt supply of any spare part requirements as well as ignition keys, door keys or luggage boot keys, will be possible only if the chassis serial number, and the engine number together with the complete type designation is stated, when placing the order.

A few general hints

which should be read without fail before making your first trip.

Safety first!

Let this be your unshakable resolve on every journey. Take good care that your car is always completely in order, especially the brakes, the clutch, the steering, the tyres and the entire lighting system.

Adjust your speed according to the traffic as well as to the field of view and road conditions. Always keep in mind that each increase of speed results in a longer stopping distance. For this reason do not fully use the capacity of your car, if any danger may be encountered. You are responsible not only for yourself but for your passengers and for all damages which you might cause to other road users.

Pay attention to the road condition, wet, snow and ice covered roads are very dangerous. Always keep to the left half of the road.

If turning left, the car should be first driven as far to the left as possible and if turning right, as far to the right, i. e. near the center of the road, as possible. This is one of the most important traffic rules which should never be neglected.

Before turning off, give the proper signal with the direction indicator. Do not rely entirely on this, but keep a sharp look out — especially when turning from main roads into country lanes or private roads.

Do not pass without a clear view of the road and above all do not cut off right hand turns. Indeed never leave the left hand side of the road unless it is urgently necessary.

Observe all traffic signals and signs!

Secondly economical running!

As regards running costs, the Diesel engine has always been superior to the petrol engine and with the Type 170 DS it has been possible to increase this advantage even to a considerable extent.

However, even with the Diesel engine the running costs are very much dependent upon the manner of driving.

You drive economically if you:

1. accelerate only enough to keep the car rolling along and drive with the least use of the brakes and the clutch.
2. drive smoothly and steadily and adapt yourself to the terrain. Do not take curves too sharply. Hard driving in narrow curves affects the tyres more than driving long distances in normal cruising speed.
3. Avoid any abrupt changes in speed, i. e. sudden braking or sharp accelerating. Both increases fuel consumption and tyre wear.

Very fast "sporty" driving, however, costs more money. You must therefore consider which is more important at the moment: the saving of travelling time or the saving of money.

But do not forget the care of your car!

The best lubricants are quite good enough for your car. Take care to use those types of oil which correspond to the actual season and to our viscosity specifications.
Dirt in the oil harms the bearings and cylinders. You should, therefore, see that the oil filter is cleaned regularly. Change the oil at the prescribed intervals, as far as possible always immediately after returning from a long trip while the oil is still hot and thin and can wash out the dirt when it is drained off.

Keep the air filter perfectly clean and in good order, for any dirt sucked in with the air wears down bearings and seatings and causes leaky valves. When making long trips over very dusty roads it is advisable to clean the air filter more frequently than is prescribed for normal conditions in the instruction manuals.

You can attend to the central lubrication when driving. Every time the milometer indicates another 62 miles completed, step down firmly twice in quick succession on the central lubrication pedal, which is beside the clutch pedal.

Have the fuel filter cleaned at the prescribed intervals and have the injection pump and the heater plugs checked over and the deposits in the fuel filter resp. the element of the fuel filter replaced.

And do not forget to have the battery attended to. A new battery is expensive.

As prescribed, have the wheels changed and balanced in accordance with the prescribed instructions.

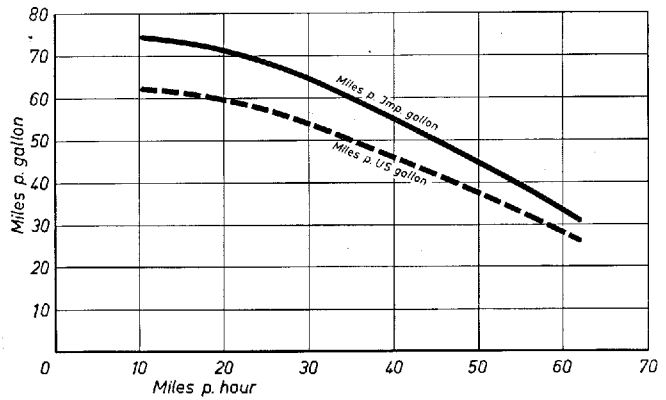
Always adhere to the prescribed tyre pressure. If this is done the wear on the tyres is slight and the steering and springing will always remain equally good.

If you follow these hints

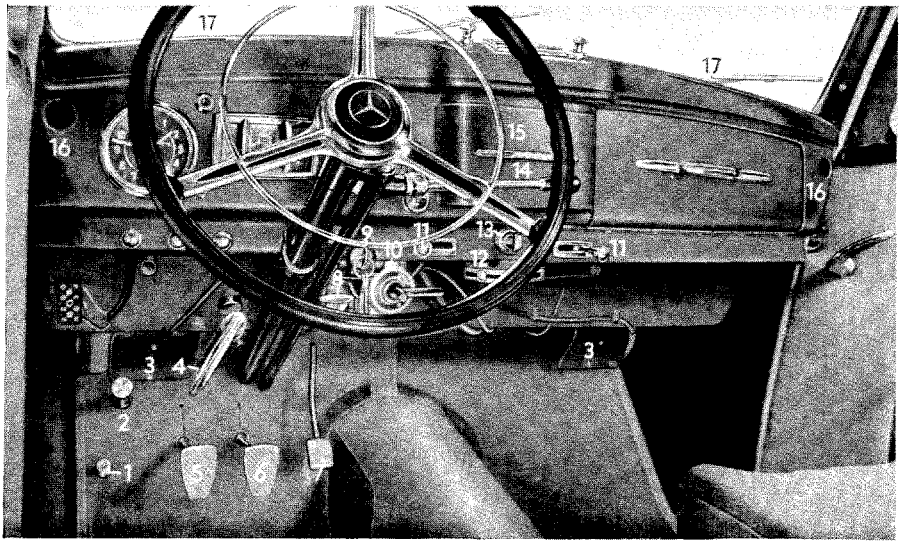
your 170 DS will never let you down.

You will always find, especially if you have to travel long distances regularly, that the 170 DS fully justifies its claim to the following special qualities:

an outstanding performance, safety and comfort in driving together with an exceptional economy of running.



The normal fuel consumption is that consumption measured in miles per gallon for a stretch of flat arterial road there and back at a constant $^2/_3$ maximum speed and with the maximum permissible load and to this result is added 10% to compensate for any unfavourable conditions.



Driver's Seat

1. Foot dimmer switch: depress to switch from dimmed to distance headlights or vice versa; whenever the distance light is switched on, the blue control lamp for distance headlights lights up in the lighting switch (see page 8).

2. Plunger for the central lubricating pump, every time another 62 miles have been completed it should be pushed down twice in succession. All points of lubrication of the chassis are connected to the central lubrication with exception of engine, gears, rear axle housing, hand brake cables, front hubs (see lubrication plan page 24–25).

3. Air exhaust in foot space, left and right each (refer to highpressure air conditioning page 9).

4. Hand brake handle: Pull out to operate the rear wheel brakes, turn clockwise as far as it will go in order to fix the handle in position, to release the handle twist it anti-clockwise and push forward as far as it will go.

5. Clutch pedal.

6. Brake pedal.

7. Accelerator pedal.

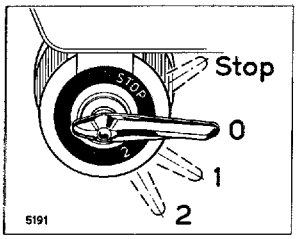
8. Tommy for hood fastener, opening and closing of hood page 28.

9. Security lock for steering, comprising the heating and starter switch, a locking device for the steering column and the red charging control lamp.

   As long as the electrical system is in order, the red charging control lamp lights up when the key is inserted and extinguishes when the engine has exceeded the idle running engine speed (normal driving) three positions of the steering lock:

"Drive", "Garage", "Stop". In position "Stop" turn steering wheel until lock bolt catches.

10. Starter switch: the control has 4 positions:



0 = Driving position: normal position which must always be engaged when the engine is running.

1 = Preliminary heating position: for heating the heater plugs before starting (see page 15).

2 = Starting position: for switching on the starter (see page 16).

Stop = Stop position: for switching off the engine (see page 16).

11. Push-pull knob for ventilation plant, left and right each. Pull out to regulate the supply of air into the inside of the car (see page 9).

12. Temperature regulating lever: pull out to regulate the temperature of fresh air entering the ventilation plant (see page 10).

13. Light turn switch: 3 positions: "day running", "Parking", "Night running". The fog light, which is supplied only upon special request and for additional payment, is operated by this turn switch as well. The fog light is switched on if the light turn switch is set to position 1 — Parking — and pulled out afterwards.

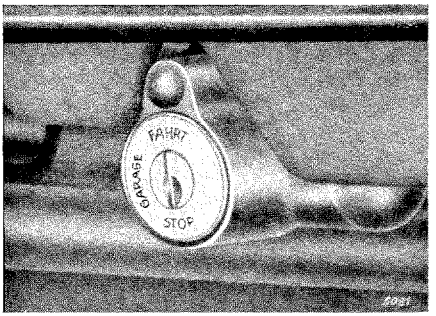
14. Gearshift lever. Gear shifting (see page 18).

15. Contact ring for horn and direction indicator: Press down to sound the horn. Turn right resp. left to raise the indicator arm whereby the red control lamp at the instrument panel lights up as long as the direction indicator is raised (see page 9).

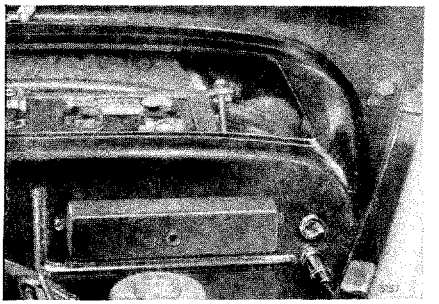
16. Ventilation flap to the front side panes, right and left each (see pressure air conditioning page 9).

17. Ventilation flap for windscreen, right and left each (see pressure air conditioning page 9).

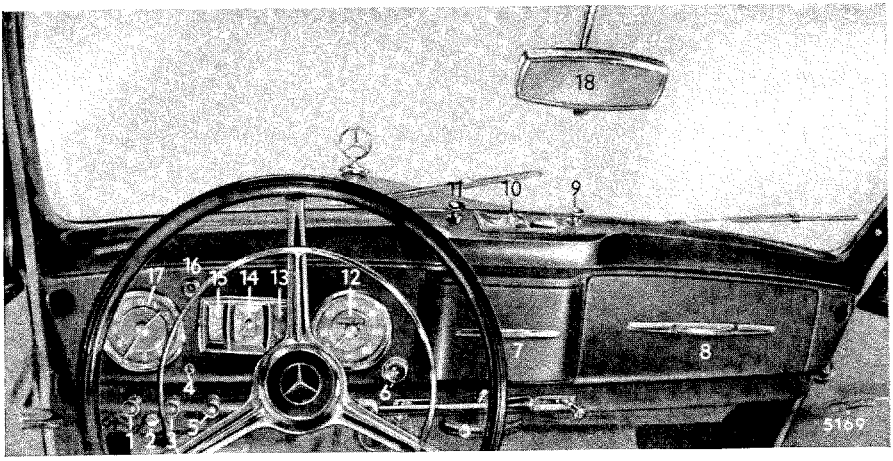
Provision is made to adjust the front seat backwards or forwards as desired. The seat can be adjusted after the lever beneath the seat has been pressed down.



Security lock for steering



Socket for hand lamp



Instrument Panel

1. Push-pull switch for ceiling lighting.
2. Knob for winding up clock and for setting hands.
3. Push-pull knob for instrument panel lighting.
4. Blue distance light control lamp, lights up as long as distance headlights are switched on.
5. Push-pull knob for blower for defrosting when parking (see pressure air conditioning page 10).
6. Glow plug control, red glowing of same indicates that glow plugs are glowing (see starting, page 15).
7. Ornamental panel. Upon special request and for additional payment a radio can be installed in this space.
8. Glove box.
9. Cigar lighter: Press on the knob for 10 seconds until heating coil glows red.
10. Ashtray: Pull out tray to empty, lower part can be easily removed by pressure on the sides.
11. Push-pull knob for electric windscreen wiper.
12. Speedometer: The red marks indicate the permissible speed of first, second and third gear. At the top of the dial is the milometer.
13. Fuel gauge, indicates with switched-on ignition only.
14. Cooling water temperature gauge.

15. Oil pressure gauge, indicates only when engine is running.

16. Red direction indicator control lamp, lights up as long as direction indicator is raised.

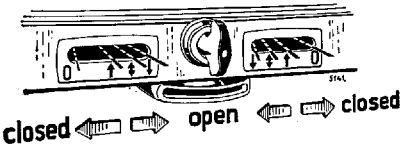
17. Clock, which is wound up by means of the knob (2) beneath the clock, the hands are set by pushing up the knob and twisting.

18. Rear view mirror: By pushing in the mirror, an anti-dazzle effect can be obtained so that the road scenes behind the car can be seen during the night. Furthermore the mirror can be adjusted by turning it round the pin above.

Air Conditioning

A special device serves for draughtless ventilation of the car interior and for defrosting of windscreen and the two front side panes as well. By two large, easily detachable hoses, left and right each, in the engine housing, fresh air is directed into the car interior from the front part of the car, and to the foot space and to the windscreen and the two front side panes as well.

The fresh air supply is controled by two ventilation levers (item 11 page 7) in the center of the instrument panel, the right hand lever serves for the right half of the car and the left hand lever for the left half of the car.



Lever moving from outward to inward opens the air supply.

This results in the following:

Lever extremely outward (0): Fresh air supply cut-off.

When moving levers from outward (0) to center (↑), the entering fresh air is directed only to the windscreen and to the side panes (ventilation flaps 17 and 16 page 7) in increasing quantities.

Lever in center (↑): Ventilation of windscreen and side panes fully opened.

When moving lever from center (↑) to position (↕), the entering air is also directed to the foot space (ventilation flap 3 page 6).

Lever position (↕): Ventilation of windscreen, side panes and foot space is opened.

When moving lever from position (↕) to inward (↓), the air supply is gradually closed towards the upper parts.

Lever extremely inward (↓): Foot space ventilation opened only.

Each ventilation lever can independently be actuated and the fresh air supply be regulated, as desired. It is recommended to keep the levers in position (↕) to provide the passengers constantly with sufficient fresh air. Furthermore one lever, e. g. that at the

driver's side is set to position (↕), i. e. upper and lower ventilation and the second lever to position (↑), i. e. upper ventilation only.

Shut the ventilation flaps when driving immediately behind a vehicle which leaves a trail of dust or exhaust fumes.

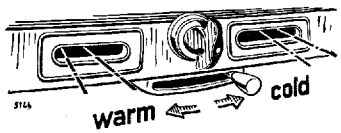
The supply of fresh air can be considerably increased by slightly opening the two rear windows. It increases, for instance, by ¾ in (2 cm) opening of each rear window for 30 percent. Whereby no draught is encountered.

If in hot weather the windscreen inside is dimmed with moisture — e. g. during thundery rain, as long as all windows are shut — then move both levers into the center position (↑), all the incoming fresh air is then directed on to the windscreen and dimming is prevented.

Heating System

By installation of a heat exchanger in each of the two air channels as well as a blower in the left channel — upon special request also in the right channel — the ventilation plant has become a pressure air conditioning system which serves for ventilation of the car interior or for heating of car as well as for defrosting of windscreen and the two front side panes.

The temperature of the entering fresh air is regulated by a temperature regulating lever (page 7) beneath the light switch. Horizontally moving of the levers influences the passage of hot engine cooling water via a throttle valve through the heat exchanger and thereby the temperature of the entering fresh air.



Lever extremely right = heater switched off

Lever extremely left = heater switched on

The lever can be adjusted to any intermediate position thus achieving appropriate temperature in the car.

When adjusting this lever the heating power will be available in a relatively short time, however, some seconds will pass until the desired temperature is attained. For first heating of the cold car interior the regulating lever should be moved to left, i. e. the heating fully switched on, afterwards the heating power may be reduced to the desired temperature by moving the lever to the right. However, do not overheat your car.

With heating installed the regulation of air supply is performed by the two ventilation levers in the same way as described above.

During winter, when driving normally, the levers should be set to position (↓), thereby the heating is thus set up that the air entering the foot space is warmer than the air leaving at the windscreen.

For defrosting of windscreen and side panes the levers are to be set to position (↑).

When driving slowly and especially when the car stops, the air supply is reduced and the heating power diminuishes. In such a case and in strong cold actuate the heating blower if the heating power should be insufficient. The blower switch is at the instrument panel (page 8).

Fuels and Lubricants

Fuel oil

Fuel oils with the following identification numbers give the best results (the identification numbers correspond to USA. standards ASTM — D 975/48 T category 1–D):

Lowest Cetane number	40
Flash point at least	38 °C = 100 °F
Pour point below	−6 °C* = + 21 °F
Viscosity at 38 °C at least	1.4
Coking according to Ramsbottom, weight in percent	0.15
Ebullition: Boiling concluded at most	330 °C = 625 °F
Impurities, max. volume in percent	traces
Percentage of ashes, max. weight in percent	0.01
Sulphur contents, max. weight in percent	0.50

* For winter operation approx. 52 ° F below the working temperature of the engine.

As far as possible do not use any tractor fuel.

Shale oils may not be used.

We warn to use "indiscriminating fuel mixtures" as same often contain residues yielding gum and acids causing corrosion.

Pay special attention when filling up fuel to avoid any contamination. Furthermore take care that the gasket of the filler cap will not be damaged and seals tightly. It is therefore recommended to use a filter cloth or a chamois leather (filter funnel).

Take care not to get Diesel fuel on the floor covering or on the upholstery inside the car, the smell of Diesel oil is dispelled only very slowly.

Capacity of fuel tank approx. 10 3/8 Imp. gals. or 12 3/8 US gals. (47 l). Take care that the 170 DS is not provided with a special reserve fuel cock position and that, after the fuel tank has been completely emptied, the whole fuel system should be bleeded prior to further operation (see page 31).

For this reason never empty fuel tank completely.

Cooling water

Capacity of the cooling system is in all about 15 7/8 Imp. pts. or 19 US pts.; with DB heating installed about 17 3/4 Imp. pts. or 21 3/8 US. pts.

Use clean water with as little lime content as possible or well filtered river water. The cooling water must always be specially treated from the first time the car is used. If you drive constantly with cooling water that has not been specially treated, then scale and rust will be formed, and the efficiency of the cooling system will, therefore, be gradually lessened. The use of distilled or rain water is no protection against this.

For specially treating the cooling water the following means may be used:

a) Ferroxan manufactured by Farbenfabriken Bayer, Leverkusen. 10 Tablets should be used for the whole cooling system; when topping up (filling up) 1 tablet should be used for every 1 3/4 Imp. pints (2 1/8 US. pints).
For further details see the special instructions provided with the Ferroxan.

b) Hydrochromium solution manufactured by Fa. Bran & Lübbe. $^{5}/_{8}$ cu. in. should be used for the whole cooling system and $^{1}/_{16}$ cu. in. for every $1\,^{3}/_{4}$ Imp. pints ($2\,^{1}/_{8}$ US. pints) of water when topping up. For further details see the special instructions provided for the hydrochromium process.

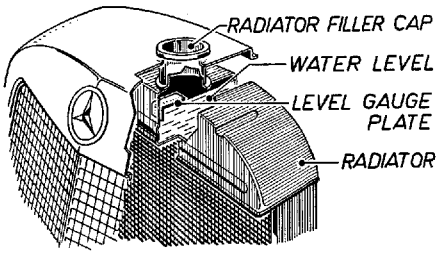
c) Shell anti-corrosion oil; 1.5 cu. in. for the whole cooling system. Specially suitable for winter driving.

Note. Shell anti-corrosion oil may be used together with anti-freeze mixtures, but Ferroxan and Hydrochromium solution may not.

When using the latter two, the cooling water must be drained off and the cooling water compartments well rinsed out, before using an anti-freeze mixture.

Take care to **pour in the cooling water slowly**.

If the cooling water is poured in too quickly the radiator may overflow before the cooling system is completely full of water.



Therefore wait about another 2 minutes after filling and then fill right (completely) up as follows:

a) if the cooling water is cold, as far as the level indicator plate which is visible through the radiator filler cap (about 2 ins. below the filler cap),

b) if the cooling water is warm, as far as the edge of the filler cap.

Only put cold water into a hot engine, when the latter is running; on the other hand hot water can be poured into a cold engine without more ado.

If the cooling water temperature rises gradually above the normal level, this is an indication that the cooling system is dirty. The latter must then be cleaned of grease and scale (see page 41), an operation best carried out at a service station.

Lubricants

In order to ensure operational safety and economy we have to ask for certain quality requirements of the lubricants used. Their task is as important as that of a structural part. Structural part and lubricant with their special properties must keep pace with any arising strains in the engine resp. the vehicle and must guarantee for correct functioning.

For this reason do not use any lubricants for our units but only such which are suitable. We can therefore name only those lubricants which we have been able to test and found in order. Further details concerning this matter will gladly be furnished by our Central Service Station.

Engine

HD (Heavy Duty) engine oils are specially suitable for Diesel engines.

These new engine oils contain chemically active ingredients which give very valuable protection against premature thickening of the oil and the engine troubles caused by this. They also dissolve the combustion residue of the pistons and piston rings and prevent by-passing when the engine is running. Above all it helps to overcome the harmful effects of the high sulphur contents in Diesel fuel.

You are particularly urged to use only HD oils for the engine of the 170 DS.

The HD oils used should fulfil the conditions of USA. Test Mil. 2104 (formerly US-Army-Test 2/104 B).

As regards viscosity, you should use
in winter and between season HD oils of the SAE 20 group
in summer those of the SAE 30 group

In emergency cases lubricants of group SAE 10 can be used in summer and lubricants of group SAE 20 in winter as well.

SAE 10 corresponds to a viscosity of 3—4 Engler at 122 ° F
SAE 20 corresponds to a viscosity of 4—6 Engler at 122 ° F
SAE 30 corresponds to a viscosity of 6—9 Engler at 122 ° F

For the first filling of new or reconditioned engines in workshops the special instructions for oil, known to all our service stations, should be adhered to.

It may be assumed that HD oils will mix with one another. Nevertheless it is best with the HD and premium oils as well as with ordinary oils not to mix the different brands of oil, unless there is some real necessity.

HD oils take on a dark colouring more quickly than the normal previously used engine oils, because the carbon produced while the engine is running is not deposited on the walls of the crankcase and on the transmission parts, but remains in solution in the oil. An HD oil should not, therefore, be changed prematurely on account of the dark colouring, but must be changed immediately that it becomes dirty or abnormally thick.

Special caution! When changing from an ordinary engine oil to an HD oil the following procedure must be carried out:

1. Drain off the old engine oil while the crankcase is still warm from the engine, carefully clean the oil filter (see page 28).

2. Fill up with new HD oil up to just above the lower mark on the dipstick and then with this oil run the engine for at most 5—8 hours. The engine must nevertheless run really warm during this time.

3. Drain off the first filling of HD oil and again carefully clean the filter.

4. Put in a second filling of HD oil and then drive the car for 300 miles. If after this distance there is an unusual film on the wick of the oil filter, then this second filling must be drained off and replaced.
   If the oil filter is still clean after 300 miles, the car may be driven for 600 or even 900 miles with the second filling.

5. Drain off the second filling of HD oil and put in a third filling of HD oil. With this drive the normal distance of about 1800 miles before changing.

6. Carry out further changes of oil in accordance with the lubrication scheme given on page 24.

If, when changing over from ordinary lubricating oil to an HD oil, large quantities of carbon sediment appear in the first fillings of HD oil, this is due to the fact that these products of the decomposition of fuel and lubricating oil have been deposited to an abnormal extent on the inside walls and transmission parts during the previous running period.

HD oils therefore clean the engine!

Water pump:	Mobilgrease No. 5 W, Renolin 2.
Injektion pump:	Engine oil (see above).
Dynamo:	Engine oil (see above).
Gear box:	$2^1/_2$ Imp. pints or 3 US pints (1.4 l) irrespective of season: Veedol Transmission Fluid Type A or Mobilfluid 200.
Rear axle:	$4^1/_2$ Imp. pints ($5^1/_2$ US pints) (2.6 l), irrespective of seasons: Shell-Hypoid light, Mobiloil GX 90, Veedol SAE 90 (Hypoid).
Front wheel hubs:	Each hub 4.23 oz. (0.12 kg) Roller bearing grease Mobilgrease No. 5 W, wheel hub grease Renolin 2, Shell roller bearing grease W; for tropical countries Shell Retinax H, Mobilgrease No. 5 or a grease similar in quality of the same consistency.
Steering (Type Ross):	$^1/_4$ Imp. pint ($^5/_{16}$ US pints) (0.15 l) Shell Transmission Oil HDL, Mobiloil CW.
Central lubrication:	$^3/_4$ Imp. pint or $^7/_8$ US pint (0.40 l) engine oil (see above).
Flexible casings of hand brake and heating cables:	Wire cable grease Shell-Ambroleum.
Hydraulic brakes:	$^7/_8$ Imp. pint or $1^1/_{16}$ US pint ATE blue original brake fluid. Caution! Brake fluid corrodes, spoils paintwork, must not get on brake linings.
Direction indicator switch:	0.04 oz. special grease (Kollagfett M $^1/_2$ manufactured by Mrssrs. Riedel-de Haën AG., Seelze, Hannover).
Grease nipple at rear three-legged flange of drive shaft:	Roller bearing grease Mobil Compound No. 5 W, wheel hub grease Renolin 2, Shell roller bearing grease W; for tropical countries Shell Retinax H, Mobilgrease No. 5 or a grease similar in quality of the same consistency.

Starting and Stopping

Before making any long cross country trip and at regular intervals check:

1. amount of fuel in tank;

2. amount of water in radiator;

3. oil level in the crankcase — but do not measure it when the car is on an incline — wipe the dipstick before measuring. The oil level should be between the upper and lower marks on the dipstick;

4. wheel nuts to see that they are securely attached;

5. tyre pressure (for details of tyre pressure see page 36);

6. to see that brakes are effective;

7. freeplay on steering wheel;

8. distance headlights and dimmed lights;

9. state of charge of batteries. It is of utmost importance that the batteries are fully charged, especially in winter.

After the car has been laid up for some time and if the fuel tank has run dry, the fuel filter and injection pump must be cleared of air by operating the hand primer on the fuel supply pump (see sections I and II on page 31).

To start

1. The gear lever must be in neutral.

2. Turn the key in the security lock to position "Drive" — serrated edge up: the red control lamp in the security lock will then light up.

3. Turn the starter switch to position "1" (preliminary heating) and keep it there. When the control lamp goes dim and the tell tale light for the heater plugs lights up, this shows that the heater plugs are glowing. The duration of the preliminary heating depends on the engine temperature and on the outside temperature.

   The average times required for preliminary heating in a cold engine are:

Outside temperature	68 °F	about 20 seconds
	32 °F	about 40 seconds
	23 °F	about 1 minute

   at lower temperatures up to 2 minutes (see page 22).

   The tell-tale light should only glow **red.** If it glows white, then there is a short circuit in a heating plug, and this should be remedied as quickly as possible (see Emergency Repairs, page 42).

4. Push the accelerator pedal right (all the way) down.

5. Turn the starter switch around to position "2" and keep it there — not more than 20 seconds — until the engine starts up. Once the engine has started release the switch immediately and bring it back to position "0".
   If the engine does not fire after three successive attempts to start, then you should look for the cause of trouble (see Emergency Repairs, page 42).
6. Release the accelerator pedal as soon as the engine has started.

Running the engine warm:

It is harmful to let the engine run idly until the normal working temperature is reached (approx. 158 °F–184 °F (70–90 °C) cooling water), since this takes a very long time owing to the small amount of heat produced by the engine when running idly. You are, therefore, recommended at outside temperatures down to 32 °F (0 °C) to drive off at a moderate speed directly the engine has started up. The engine will then reach the working temperature in the most favourable manner within 4–5 minutes. Only at lower temperatures should the engine be run idly for at most 1 minute before you drive off, in order to assure the lubrication of the engine when the oil is quite cold.

To drive off

1. Push down the clutch pedal.
2. Engage the gear lever in position "1" (first gear).
3. Release the hand brake.
4. Slowly release the clutch pedal, and at the same time with the right foot slowly press down on the accelerator. The car will move off.
5. After driving off press down further on the accelerator in an even manner, not jerkily, and change up into 2nd, 3rd and 4th gear.

To switch off

1. Turn the starter switch to position "Stop", whereupon the fuel supply will be cut off and the engine will stop.
2. Turn the key in the security lock on the steering to position "Garage" or "Stop" and pull it out. If in position "Stop" turn a little on the steering wheel until the bolt of the lock snaps into place.

Running-in (breaking-in) instructions for the "first" 900 miles

Engine is not lead-sealed

It is of the utmost importance for the length of life, the safe driving and running economy of the car not to use the engine to its full capacity during the running in period of 900 miles.
During the running in period the following speeds are not to be exceeded. When driving longer distances use varying speeds and revolutions.

Mileage	Speed in m.p.h. in			
	1st gear	2nd gear	3rd gear	4th gear
up to 300 miles . . .	9	15	25	37
300 to 900 miles . . .	11	19	31	43
900 to 1200 miles . . .	can be gradually increased to maximum speed			

5. Turn the starter switch around to position "2" and keep it there — not more than 20 seconds — until the engine starts up. Once the engine has started release the switch immediately and bring it back to position "0".
   If the engine does not fire after three successive attempts to start, then you should look for the cause of trouble (see Emergency Repairs, page 42).
6. Release the accelerator pedal as soon as the engine has started.

Running the engine warm:

It is harmful to let the engine run idly until the normal working temperature is reached (approx. 158 °F–184 °F (70–90 °C) cooling water), since this takes a very long time owing to the small amount of heat produced by the engine when running idly. You are, therefore, recommended at outside temperatures down to 32 °F (0 °C) to drive off at a moderate speed directly the engine has started up. The engine will then reach the working temperature in the most favourable manner within 4–5 minutes. Only at lower temperatures should the engine be run idly for at most 1 minute before you drive off, in order to assure the lubrication of the engine when the oil is quite cold.

To drive off

1. Push down the clutch pedal.
2. Engage the gear lever in position "1" (first gear).
3. Release the hand brake.
4. Slowly release the clutch pedal, and at the same time with the right foot slowly press down on the accelerator. The car will move off.
5. After driving off press down further on the accelerator in an even manner, not jerkily, and change up into 2nd, 3rd and 4th gear.

To switch off

1. Turn the starter switch to position "Stop", whereupon the fuel supply will be cut off and the engine will stop.
2. Turn the key in the security lock on the steering to position "Garage" or "Stop" and pull it out. If in position "Stop" turn a little on the steering wheel until the bolt of the lock snaps into place.

Running-in (breaking-in) instructions for the "first" 900 miles

Engine is not lead-sealed

It is of the utmost importance for the length of life, the safe driving and running economy of the car not to use the engine to its full capacity during the running in period of 900 miles.
During the running in period the following speeds are not to be exceeded. When driving longer distances use varying speeds and revolutions.

Mileage	Speed in m.p.h. in			
	1st gear	2nd gear	3rd gear	4th gear
up to 300 miles . . .	9	15	25	37
300 to 900 miles . . .	11	19	31	43
900 to 1200 miles . . .	can be gradually increased to maximum speed			

It is at all times harmful to rev up the engine when the car is stationary and this should be avoided. Take care also not to overstrain the engine at the lower engine speeds, and therefore change gear in good time.

It is of the **utmost importance** for the whole length of life and later smooth running of the engine as well as for the safe driving of the car to carry out the following maintenance work during the running in period:

After the first 30 to 60 miles	See that all wheel nuts are secure and if necessary tighten
After the first 300 miles	1. Drain off oil from sump and replace with fresh oil 2. Tighten up evenly the screws of the cylinder head (for sequence see page 29) and nuts of the intake and exhaust manifolds [1] 3. Check tension of fan belt, if necessary retighten 4. Drain off cooling water, rinse out radiator and cooling water compartments, and refill with specially treated water [2] (page 11) 5. Clean oil filter and see that housing is firmly attached 6. Clean fuel antefilter, at chassis 7. Bleed the brakes, if necessary adjust the brake shoes
After the first 900 miles	1. Drain off oil from sump and replace with fresh oil 2. Clean oil filter element 3. Tighten up evenly nuts of intake and exhaust manifolds 4. Check valve clearance and if necessary adjust 5. Check oil level in the injection pump and if necessary top up with oil 6. Check tension of fan belt, if necessary retighten 7. Drain off the oil in the gear box and in the rear axle casing and replace with fresh oil 8. Bleed the brakes and if necessary adjust the brake shoes 9. Tighten up the securing bolts of the shock absorbers 10. Check the front wheel gather [1] (toe-in) 11. Grease bonnet hinges, grease nipples of the door hinges, outside door handles at the rosette, hinges of the luggage boot 12. Check the alignment of the headlamps
After the first 1800 miles	Carry out the maintenance and lubrication scheme given on page 24

[1] Can only be carried out at one of our service stations.
[2] If an anti-freeze mixture was added at the time of delivery then this work need not be done until spring when the anti-freeze mixture is drained off.

The oil should always be changed immediately after a journey while the oil is still hot, so that all impurities that may still be present may be washed out with it.

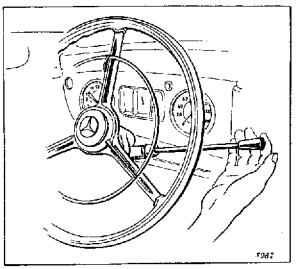
It is, in general, important to watch the engine closely and to carry out the maintenance work as prescribed (see page 24) during the running in period. Sheets 1, 2 and 3 of your service book are specially provided for the running in period. You are therefore requested always to take in your car to the service station at the correct time.

Changing gear

The gearbox has compulsory synchronisation for all speeds, i. e. a special device in the gearbox obliges the relevant gearwheels to engage smoothly by a series of couplings. Consequently the annoying process of double declutching with an intermediary acceleration becomes unnecessary. The procedure for changing up or down is as follows:

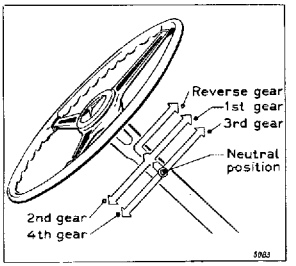
Remove pressure from the accelerator, press the clutch pedal right down, push the gear lever fluently and without slowing down the engine from one gear position to the next (see below), re-engage the clutch gently and at the same time press on the accelerator.

The gear lever itself is placed in a readily accessible position on the steering column beneath the steering wheel. It can be brought out of its central position (neutral) into 3 "gear levels" one above the other and can be pushed round towards the desired gear at these different levels.

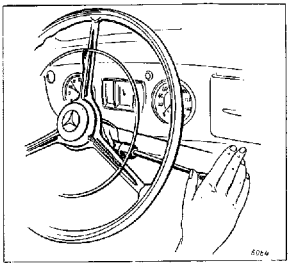


1st and 2nd gear

When engaging these gears pull up gently and push forward for 1st gear or backward for 2nd gear. **Reverse gear.** Press up hard as far as it will go and push the gear lever forward.



Gear changing guide



3rd and 4th gear

When engaging these gears press the gear lever gently down and then push forward for 3rd or backward for 4th gear.

When you reach the middle and top "gear level" a slight resistance is clearly perceptible.

Neutral is in the centre position between the gears and the gear levels and the gear lever is automatically pulled down by a spring from the centre to the lower gear level. When changing from 1st to 2nd gear you must guide the gear lever exactly along the stop and when you come to the halfway position you must resist the downward pull of the spring—otherwise you might get into 4th gear—and you must not press up too strongly either—otherwise you will push right up into reverse gear.

All gear changing movements can be carried out without exerting any force. The only things to worry about are therefore:

1. Before any gear change: release the accelerator and push the clutch right down.
2. Always move the gear lever in straight lines exactly at right angles to one another, shift gear lever fluently and without momentary retardation.
3. Always engage the next gear and never miss out a gear.
4. Only engage the reverse gear when the car is at a standstill.

Driving Hints

It should be accepted as a fact that a Diesel engine runs with a little more noise than a petrol engine, although our type 170 DS has achieved quiet running qualities not previously possible with Diesel engines. The typical sound of the Diesel is only noticeable when the engine is running idly and disappears as soon as the idle running engine speed has been exceeded.

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The gearbox has compulsory synchronisation for all speeds, i. e. a special device in the gearbox obliges the relevant gearwheels to engage smoothly by a series of couplings. Consequently the annoying process of double declutching with an intermediary acceleration becomes unnecessary. The procedure for changing up or down is as follows:

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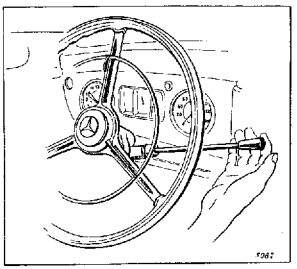

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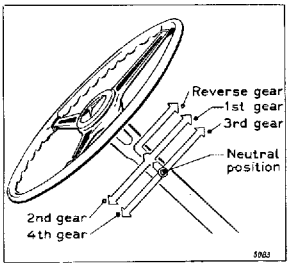

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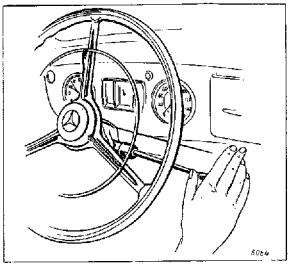

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4. Only engage the reverse gear when the car is at a standstill.

Driving Hints

It should be accepted as a fact that a Diesel engine runs with a little more noise than a petrol engine, although our type 170 DS has achieved quiet running qualities not previously possible with Diesel engines. The typical sound of the Diesel is only noticeable when the engine is running idly and disappears as soon as the idle running engine speed has been exceeded.

A Diesel engine should always "run full revolutions", i. e. it should be run to full capacity **within the prescribed limits,** especially in the lower gears — even an engine which is straight from the factory. If you drive to full capacity you will save the clutch and bearings and the sprayers will function satisfactorily for a longer time.

Therefore take advantage of the fully synchronised gear by gear shifting in due time, especially in urban traffic and when driving upgrades. The speedometer is provided with red marks, indicating the permissible max. speeds in the 1st, 2nd and 3rd gear. Change into the corresponding gear by the time the pointer has reached the red mark.

It is recommended to change into lower gear when driving in the mountains, especially on long and steep gradients. When driving downhill use the engine as brake by releasing accelerator pedal but not declutching. On no account switch off the ignition.

When driving, even on steep hills, use the footbrake only. Avoid jerky or sharp use of the brakes, and, therefore, do not press down too harshly on the brake pedal. If you brake too sharply you might cause the car to skid or come to collision with a following vehicle, besides the tyres suffer from stronger wear. Only when there is a great danger you should brake sharply and hard.

If you use the handbrake alone when the car is driving fast, this in itself will harm neither the brake nor any other parts of the car. The rear wheels, however, may become locked and especially on a slippery surface, this may cause the car to skid. The hand brake should normally be used only to keep the car stationary.

If you have to leave your car parked on a slope, it is advisable for safety's sake to engage 1st gear or reverse gear in addition.

Watch regularly the fuel gauge at the instrument panel, for the 170 DS has no reserve indicator and if the fuel tank has been emptied, the fuel system should be ventilated prior to refilling (see page 31). Have, therefore, the fuel tank never emptied completely.

In new engines **the oil pressure** amounts to 43 psi (3 atm.) under normal conditions; after a long hard drive, too, at high or medium number of revolutions per minute, the oil pressure does not sink below this figure. When running idly the oil pressure drops to about 15 lbs./sq. in. (1 atm.) with hot oil.

If the engine has been run in properly and all bearings have been completely worn smooth, then a smaller oil pressure is sufficient to force the same amount of oil through the bearings. The pressure may then drop to 31 psi (2,2 atm.) at maximum engine speed and to 3,5 psi (¼ atm.) when running idly, without causing any danger to the safety of operation.

If the engine is greatly cooled down, then the oil pressure indicated will rise only some time after starting, because the pressure is slow in taking effect in the narrow connecting tube to the oil pressure gauge.

If the oil pressure should drop suddenly though the engine speed remains constant, or if from one day to the next it does not attain its normal level, then you should stop and proceed in accordance with the section "Emergency Repairs" (see page 44).

The cooling water temperature should normally be 158°—184° F (70—90° C). After starting, this temperature will be reached after a short drive of 4–5 minutes at a moderate speed. At particularly high outside temperatures and with a heavily loaded car the temperature may rise to 212° F (100° C) without harm when making a long climb. In this case the cooling water temperature can be brought down if necessary by changing down into a lower gear. If you make a halt after a long continuous climb, then you should let the engine run idly for a short time, as the radiator might boil over if the engine is switched off immediately.

If the temperature rises above 212° F (100° C) this means that there is a defect in the cooling system, and you should stop and proceed according to the section "Emergency Repairs", page 44.

Winter driving

In cold weather, it is necessary to take certain precautions to protect the engine and radiator as well as to see that the engine starts up readily. Special care should also be taken when driving.

Precautions

The summer oil should be replaced by the oil for the cooler seasons in due time (see page 14). When the car remains outdoor in strong cold, it is recommended to use an oil of Group SAE 10 (see page 13).

The thermostat fitted keeps the cooling water in the engine automatically at the correct temperature by allowing the water to circulate from the engine into the radiator only when the temperature of the water has reached about 167 ° F (75 ° C) and by cutting the radiator out of the cooling water circuit at lower temperatures. Consequently, in winter the water in the radiator core may be frozen even though the car is being driven.

During frost an anti-freeze must therefore be added

As a protection against the frost only one of the reputable brands of antifreeze on the market should be used, and the amount to be added, which is dependent on the outside temperature, is laid down in the instructions of the particular manufacturer. The following table gives the quantities of water and Glysantin or Genantin or Dixol required for the correct mixture for different degrees of frost.

The capacity of the radiator and engine together, filled up to the mark on the radiator filler, is about (10,1 l) if a DB heating system is installed.

Freezing point	Dixol Genantin/Glysantin in pints		Water in pints	
	Imp.	U. S.	Imp.	U. S.
approx. −14 ° F	4.4	5.3	13.4	16.1
approx. −5 ° F	6.2	7.4	11.6	14.0
approx. −4 ° F	7.1	8.5	10.7	12.9
approx. −13 ° F	8.0	9.6	9.8	11.8
approx. −22 ° F	8.8	10.6	9.0	10.8
approx. −40 ° F	9.7	11.7	8.1	9.7

Before putting in an anti-freeze the cooling system should be well flushed out, especially if the cooling water has been specially treated with an additive.

Warning. An acid type of anti-corrosion agent or a radiator cleansing agent should not be used together with anti-freeze. An anti-corrosion oil may however be used. You should not fill in the cooling water above the mark to be found on the radiator filler (about 4 inches below the brim of the filler), otherwise nearly 2 pints of the cooling water will be expelled through the excess pressure valve and lost when the cooling water becomes warm owing to the expansion (see page 12).

After an anti-freeze has been used, the radiator and the engine must be well washed out. You should also filter the remaining cooling liquid through a clean cloth some time in the Spring, and keep it in an air-tight container until the next winter. Before putting the anti-freeze mixture back again, its ability to withstand freezing should be tested by a Glysantin/Genantin or Dixol hydrometer.

If for some reason an anti-freeze is unobtainable, the radiator must be covered up, even when the car is being driven, without blocking the air intake for the heating and ven-

tilation system. It is best to use the radiator shutter designed by us. This, however, will only be fitted if specially ordered and at an extra cost.

If in this case the car is put in a warm garage, the cooling water must be drained off while the engine is warm and as far as possible in a sheltered spot. For this purpose open drain cock, right, at the bottom of radiator and — with DB heating installed — loosen the lower cap nut at each heating unit to ensure correct draining out the whole time, and if the drain cock should become frozen up or blocked, poke it clear with a piece of wire.

Next run the engine again for a short while, so that none of the cooling water remains in the cooling system. Leave the drain cocks open until you want to fill up the radiator again and do not forget to put on the radiator a warning notice "water drained off".

Before filling up do not forget to tighten the lower cap nut at each heating unit and to close water drain cock.

To ensure engine operation in extremely cold weather, a mixture of Diesel fuel (gas oil) with petroleum or tractor fuel, eventually fuel of the filling station should be used, which in low temperatures shows a sufficient cold flow contrary to the unmixed Diesel fuels.

As not everywhere winter-Diesel-fuels with a sufficient cold flow are available, it may happen that after a longer stop of the Diesel vehicle in the open air with temperatures of about — 17,6 ° F to 12 ° F (8—10 ° C) the engine cannot be started right away. This is due to a blocked filter or stopping of gas oil in the pipes.

The following table shows the ratio of mixture of the various additional fuels with Diesel fuel in percent and the corresponding outdoor temperatures. The fuel parts are given in liters.

Ratio of mixture

Outdoor temperature ° F	Diesel fuel %	Petroleum resp. tractor fuel or fuel of the filling station %
+ 17,6 ° F–12 ° F *	approx. 80—90	approx. 20—10
+ 8,8 ° F	approx. 70	approx. 30
— 4 ° F	approx. 50	approx. 50
— 22 ° F	approx. 30	approx. 70

* Mixture at this temperature is only required if the Diesel vehicle remains outdoor for several hours or even for some days.
Take care, however, that in these cases the additional fuel to be mixed up is filled into the tank in due time before stopping the engine, so that all pipes are filled up with the mixture.

A mixture **with filling station fuel** instead of petroleum or tractor fuel should **only** be used **in emergency** cases, as difficulties in operation, due to fuel vapor lock, may be encountered. A **benzine-benzene mixture** should **not** be used because it reduces the ignition quality of the Diesel fuel.

With the above-mentioned mixtures for cold weather the engine output is lower than with gas oil, i. e. the lower, the greater the portion of admixture is. Considering the respective outdoor temperature some admixture should be added to the Diesel fuel.

When refuelling the specific lighter additional fuel should be filled in before the Diesel fuel and then both fuels should be thoroughly mixed by stirring with a clean stick.

The additional fuels should be on hand in appropriate quantities in canisters to be available if need be.

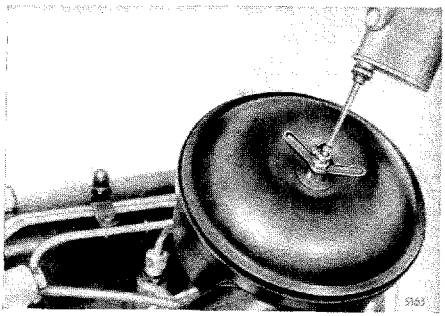
Measures to ensure starting in cold weather:

At low temperatures it is necessary on the one hand to give sufficient preliminary heating, and on the other hand the Diesel engine must be able to attain a sufficiently high engine speed, in order to get the engine to start up at all.
For this it is essential to use winter oil (with extreme cold temperatures, oil of group SAE 10) and to keep the batteries (see page 38) and the heater plug system in perfect order. Care must be taken to see that comparatively little is taken out of the batteries by the preliminary glowing, but a great deal on the other hand by the starting.

a) **Starting at moderately cold temperatures:**

1. Keep the starter switch 1–2 minutes in position "1" (preliminary heating).
2. Declutch – press the accelerator pedal right down.
3. Turn the starter switch to position "2" (starting) and keep it there – but not more than 10 seconds. The engine will start up –.
4. If the engine has not started up, turn the switch back to position "1" (preliminary heating) and give the engine another minute's preliminary heating, then repeat the attempt to start. Carry out the same procedure if the engine speed falls after the engine has started up.
5. If after a third attempt to start there is still no combustion in the engine, then after a pause of about 2 minutes carry out the measures for severe cold weather (see below).

b) **Measures for severe cold weather:**



1. Keep the starter switch for two minutes in the preliminary heating position.
2. Declutch and press the accelerator pedal right (all the way) down.
3. Keep the starter switch up to 20 seconds in position "2" and at the same time get someone else to inject a little petrol (in all a few drops only) through the aperture in the air filter provided for this purpose (use an oil can).

If the engine is cold throughout and at a temperature below 5 °F (–15 °C), starting is generally impossible without further aid. At these temperatures the driver must, therefore, take the following precautions beforehand, and it is best to take them when switching off the engine at the end of one run ready for the next:

a) Take out the batteries and store them in a heated room.

b) Drain off the cooling liquid, after switching off, and before starting again warm it up and pour it back into the cooling system. It is quite harmless to pour boiling cooling liquid into the cold engine.

This procedure even though it entails a lot of bother considerably spares the engine, starter and the batteries.

Winter driving

As has already been mentioned on page 4, wet, snowy or icy roads are treacherous. Adjust your speed, therefore, to these road conditions and always be swayed by the necessary caution.
It may so happen on clear winter days that ice will form in places of transition from sun to shade, e. g. under bridges and at the edge of a town or wood. Ice may also form on the road passing over a bridge, especially at the beginning of frosty weather, whereas

the roads themselves are free from ice owing to the warmth of the ground. In such places, therefore, you must drive with particular care.
The windscreen may be defrosted quickly and without fail if DB heating is installed and if the temperature regulating lever is pulled left out (on "warm") and both ventilation levers are kept in center position, and the blower of the defroster for parking is switched on, if need be (see page 10). All the heated air is then directed to the windshield and front panes.
During the Spring and Autumn ground mist may occur in the morning and evening. For such an event it is advisable to use a fog lamp. If none is available, then the dimmed lighting must be switched on. You should on no account drive with distance headlights as the tiny drops of vapour reflect the strong beam of the distance headlights and the driver will be dazzled.
It is insufficient to drive with the parking lights only as they are too weak to be noticed in time by an oncoming vehicle.
If you stop the car in the open in frosty weather, you should not put on the hand brake, nor should you put the car in gear, in case it should freeze up. In this case the car should be secured by putting chocks under the wheels. You can avoid icing over of the windscreen in a stationary vehicle, by putting a piece of canvas or newspaper of the size of the windscreen (-shield) under the windscreen (-shield) wiper.
In general it is not necessary to use snow chains with tyres that still have a good tread. They cause an increased fuel consumption. In districts where there is much snow it is advisable to use tyres with a special snow tread; our service stations can give information as to where such tyres are obtainable. Only in particularly unfavourable conditions, if there is deep snow on the ground and it is necessary to climb hills, it is advisable to put on snow chains. It is however important to use chains which have small links and grip sufficiently at the sides (so-called "square track chains"); ladder type chains are unsuitable.
On ice-covered roads it is better to drive without chains, and chains should be taken off again immediately the roads are clear of snow, since they cause much wear and tear.
For fitting and handling of chains the manufacturers issue detailed instructions which should be followed closely.

Maintenance

You are urgently recommended to leave all maintenance work and servicing to the skilled mechanics of our service stations. It is in your own interests to see that this work is carried out in good time and without any omissions in accordance with the service book. If you do this you will not only ensure that your car is kept in excellent condition but also have any small defects put right which might later develop into major faults. *In this connection you are reminded that claims on the guarantee will not be met if all the maintenance work, which should have been carried out up to the time when the claim on the guarantee is made, has not been carried out at the correct time by a service station recognised by us.* Any claims on the guarantee will also not be met if the lead seal on the speedometer shaft has been damaged or removed by unauthorized persons.
In case you wish to service your car yourself or should be obliged to take it to some other garage, the following hints should act as a guide in the essentials:

For the regular attention and protective treatment of the paintwork and chromium plated parts see pages 26–27.

In addition to the following work which should be carried out at regular intervals, there are after the first 300 miles and after the first 900 miles also the individual jobs mentioned on page 17.

Tools

The tools such as lifting jack, the brace for the lifting jack and wheel nut wrench as spare wheel are, easily accessible, kept in the luggage compartment.

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After every (miles)	Page	Part of car	Work
1	–	Tyres	Test tyre pressure; with **cold** tyres (permissible pressures on page 36)
60	–	Central lubrication pump	When driving push down twice on the pump plunger
300	–	Oil dipstick	Wipe dipstick, check oil level, if necessary top up; do not overfill
	–	Central lubrication reservoir	Check oil level (up to 0.4 in. below the edge) if necessary top up with oil
1200	–	Crankcase	Unscrew drain plug, drain off oil while the engine is warm, screw in drain plug, fill up with 7 Imp. pts. or 8.5 U. S. pts. (4 l) of oil
	28	Oil filter	Remove element and clean
		Central lubrication reservoir	Fill up to $^3/_8$ in. below the edge Caution! fine-meshed sieve!
1850	38	Battery [2]	Check level and density of acid, test and grease terminals
	25	Dynamo	Put a few drops of engine oil in the oiler
	29	Water pump	Grease
	30	Injection pump	Check oil level and if necessary top up with oil
	29	Air filter	Clean and moisten interior filter with oil. Clean frequently when driving over dusty roads
	28	Fan belt	Check and if necessary adjust tension
	–	Levers and controls of injection pump and handbrake	Check and grease
	–	Exhaust	Tighten flange nuts on manifold
	30	Fuel prefilter	Remove element and clean
	32	Clutch	Test free movement of clutch pedal, and readjust, if necessary
	–	Pedal, brake compensator, joints and supports of steering column gear shift	Lubricate with some drops of oil
	25	Transmission	Check oil level (should reach the top of the filler opening)
	33	Rear axle housing	Check oil level (should reach the top of the hexagon plug situated at the back of the rear axle wall on the right when facing the direction of travel)
	33	Rear axle	Test siphon of rubber sleeves for cracks, list car
	34	Wheels	See that the wheels are properly balanced on a test run and rebalance, if necessary [3]
	–	Front ventilation ducts	Clean insect screen. To do this remove the air tube after unscrewing the clamp on the heat exchanger

[1] Every week and before setting off on a long drive.

[2] At the latest every 4 weeks.

[3] This can only be carried out in a service workshop.

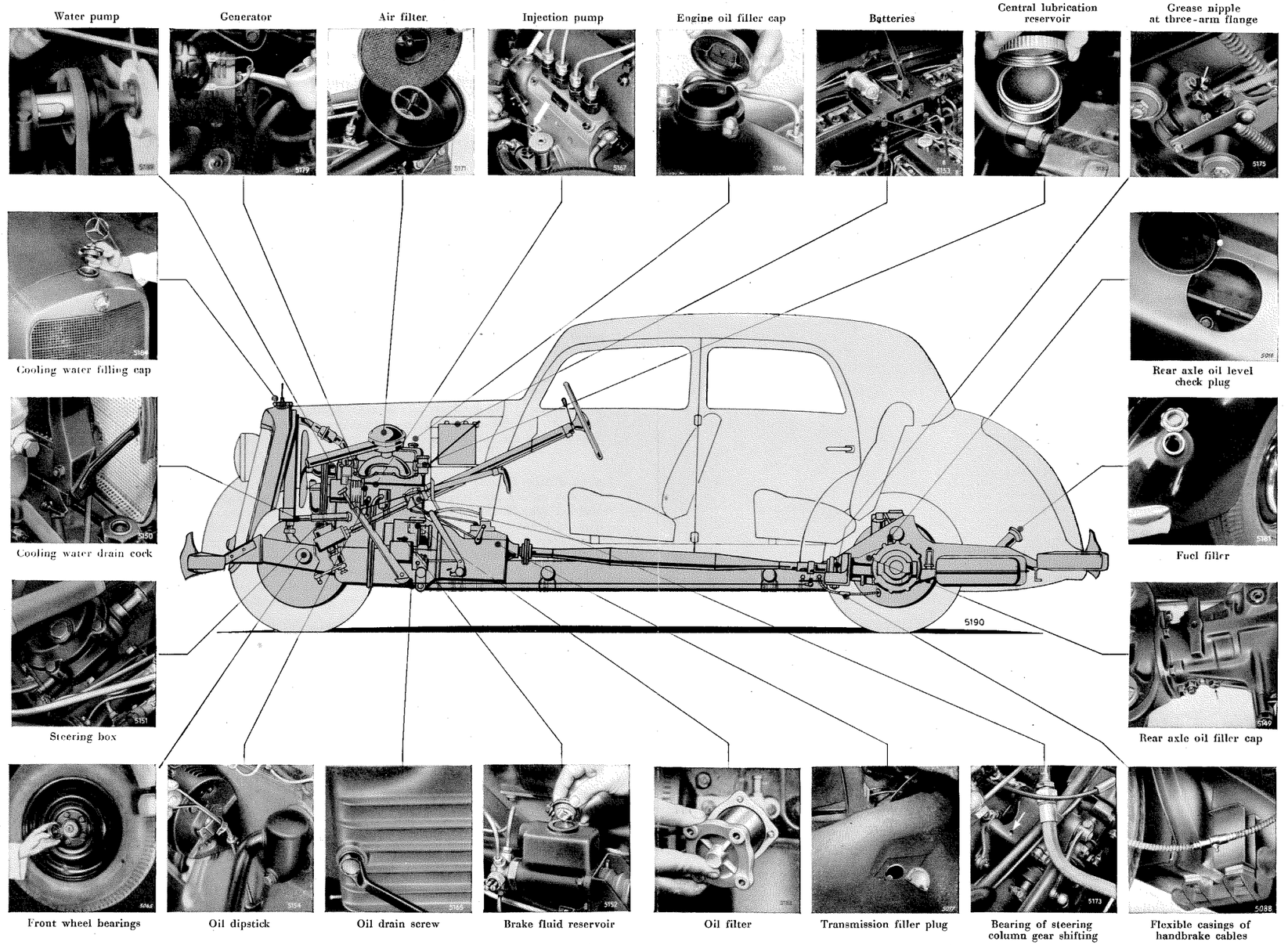
After every (miles)	Page	Part of car	Work
	29	Valves	Check clearance and if necessary adjust
	28	Exhaust and intake manifolds	Check nuts and if necessary tighten
	25	Steering box [1]	Check oil level
	25	Brake oil reservoir	Fill with brake fluid to $^3/_8$ in. below brim
	25	Flexible casing of hand brake cables	Grease, cleaning grease nipples beforehand
	33	Propeller shaft	Press grease in the nipple of the rear 3-arm flange. Retighten castle nuts of front and rear rubber coupling [4]
	32	Brakes	Adjust
	34	Wheels	Check and balance up [1], change (incl. spare wheel)
	–	Central lubric.	Check and see that all parts contain oil
3700	–	Door locks, lock on luggage boot and hood closing	Clean with petrol and then grease catch plates on coachwork and bolts and levers in door locks but do not put any oil in the keyhole [2]
	–	Hood hinges, outer door handle at rosette, hinges of luggage boot lid	Lubricate, but do not put any oil in the keyhole of the security lock [2] of the steering
	–	Door hinges	Press red grease in the nipples by means of a Tecalemit grease gun
	–	Direction indicator	Clean with a small brush
	–	Window guide rails	Remove dust with a small brush and apply a little tallow
	–	Draught excluders	Rub in a little tallow or vaseline
	40	Headlamps	Check alignment
	29	Heater plugs and heater plug ports	Clean
	30	Fuel filter	Drain off deposits, check element
	25	Transmission	Change oil when oil is still warm
	25	Rear axle housing	
7450	25	Front wheel bearings	Top up with grease
	–	Direction indicator switch [1]	Grease stop and roller [1]
	–	Windscreen wiper [3]	Grease shafts of controls
	–	Shock absorber	Check if oiltight, retighten attachment screws
	40	Cooling system	Rinse
14900	36	Front wheels	Check gather [1]
	30	Fuel filter	Replace paper element
29800	33	Rear axle rubber sleeves	Replace

[1] Can only be carried out in a service workshop.

[2] These locks may be provided with flocculent graphite (Messrs. Krystagon-Graphit-Kompanie Driever KG., Düsseldorf 10).

[3] Furthermore it is recommended to replace the rubber inserts of wiper blades acc. to their wear within 6 months or a year.

[4] First after the first 1850 miles.



Attach to the Instruction Manual "Type 170 DS" between page 24 and 25.

"First" Lubrication and Maintenance Work

After the first 30–60 miles (50–100 km):

Check all wheel nuts for tight seat and retighten, if necessary.

After the first 300 miles (500 km): (Service Book sheet No. 1).

1. Drain off oil in crankcase (when oil is still hot), replace by fresh oil according to oil schedule.
2. Remove and clean oil filter element, check housing for tight seating.
3. Clean the element of fuel pre-filter.
4. Check tension of fan belt and adjust, if necessary.
5. Check cylinder head bolt tension by means of a torque wrench and adjust, if necessary (See numbered plan on page 29).
6. Check valve clearance and adjust, if necessary.
7. Drain off cooling water, flush radiator and water jackets, refill with specially treated water (see page 11). If an antifreeze-agent has been added on the delivery of the car, these jobs have not to be carried out until when draining off the antifreeze agent in spring time.
8. Check brakes and adjust, if necessary.
9. Check wheel nuts and retighten, if necessary.
10. Check tire pressure and correct.

After the first 1250 miles (2000 km): (Service Book sheet No. 2).

1. All lubrication and maintenance jobs regularly due every 1250 miles (2000 km) (see page 24).
2. Check lube oil level in injection pump and refill, if necessary.
3. Change oil in transmission (when the oil is still hot).
4. Change oil in rear axle housing (when the oil is still hot).
5. Check tension of fan belt and adjust, if necessary.
6. Check all nuts of intake and exhaust lines for tight seat.
7. Check valve clearance and adjust, if necessary.
8. Retighten securing bolts of shock absorbers.
9. Check toe-in (can be done only in a service-workshop).
10. Bleed the brake system, adjust brake shoes, if necessary, and check brakes during a test trip.
11. Check wheel nuts and retighten, if necessary.
12. Check tire pressure and correct.
13. Lubricate hood hinges, grease nipples of door hinges, outer door handles at the rosette, and hinges of trunk compartment lid.

After the first 2500 miles (4000 km): Service Book sheet No. 3).

1. All lubrication and maintenance jobs regularly due every 2500 miles (4000 km) (see page 24).
2. Check free travel of clutch pedal.
3. Check toe-in (can be carried out only in a Service-Workshop).

Periodical lubrication and maintenance work

After every . . . miles (km)	Page	Part of car	Work
[1])	36	Tires	Test tire pressure, when tires are cold
100	—	Central lubrication pump	When driving push pump plunger down once
1,250 (2000)	28	Oil filter	Remove element and clean
	—	Crankcase	Drain off oil while the engine is warm, refill [2]) with 7 Imp. or 8.5 U.S. pts. (4 l) of oil
	25	Central lubrication reservoir	Fill up to 3/8 in. (1 cm) below the edge with oil. Caution: fine-meshed sieve!
2,500 (4000)	30	Injection pump	Check lube oil level and refill, if necessary. Refill about .06 cu. in. (1 ccm) of engine oil into flap oiler of governor housing
	—	Joints and bearings of pedal assembly and steering column gear shift as well as cables and leverage of hand brake and injection pump	Check and lubricate
	38	Battery [3])	Check level and density of electrolyte
	—	Elec. consumer points	Check for perfect functioning
	29	Air filter	Clean and moisten element with engine oil, when driving over dusty roads clean more frequently
	30	Fuel pre-filter	Remove element and clean
	28	Fan belt	Check and adjust tension, if necessary
	—	Exhaust system	Check flange nuts on manifold for tight seat
	33	Brakes	Check
5,000 (8000)	25	Generator	Put some drops of engine oil into oiler
	29	Water pump	Lubricate
	25	Brake fluid reservoir	Check level of fluid and refill up to 3/8 in. (1 cm) below the edge with brake fluid, if necessary
	25	Hand brake cables and conduits	Grease, cleaning before the grease nipples
	—	Front ventilation ducts	Clean insect screen. To do this remove the air hoses after unscrewing the clamps on heat exchanger
	29	Valves	Check clearance and adjust, if necessary
	34	Wheels	Re-balance [4]); interchange (incl. spare wheel)
	32	Brakes	Re-adjust

[1]) Weekly and before starting on a long trip.
[2]) Adhere to viscosity regulations.
[3]) Every 4 weeks, at the latest.
[4]) This can be carried out only in a Service-Workshop.

After every . . . miles (km)	Page	Part of car	Work
	—	Direction indicators	Clean with a brush
	—	Door weather strips	Rub in some tallow or vaseline
5,000 (8000)	—	Hood hinges, outer door handles at rosette, hinges of trunk compartment lid	Lubricate, never put any oil in the keyhole of security lock [1]) of steering
	—	Door locks, lock of trunk compartment lid, hood fastener	Clean with washing gasoline and then grease strike plates on body and latch-catches at the doors; neve put any oil in the keyhole [1])
	—	Door hinges	Press red grease (condensation grease) into the nipp les by means of a "Tecalemit" grease gun
	—	Transmission [2])	Check oil level [2]) (up to the edge of filler opening)
	25	Transmission	Change oil (when the oil is still **hot**)
	33	Rear axle housing [2])	Check oil level (up to the height of the small hex plug, fitted in the rear on the rear axle housing to th right, as seen in the driving direction)
	25	Rear axle housing	Change oil (when the oil ist still **hot**)
	25	Steering gear housing [3])	Check oil level
	33	Propeller shaft	Press grease into the nipple of the rear 3-arm flang
	—	Central lubrication	Check and see that all points contain oil
10,000 (16000)	25	Front wheel bearings	Refill with grease
	—	Direction indicator switch [3])	Grease stop and roller
	—	Windshield wiper [4])	Grease ball joints of linkage
	38	Battery	Clean terminals, check for tight seating and greas
	—	Intake and exhaust lines	Check all nuts for tight seating
	30	Fuel filter	Drain off deposits; check paper screen
	29	Glow plugs and glow plug ports	Clean
	32	Clutch	Check free travel of clutch pedal and re-adjust, i necessary
	—	Shock absorbers	Check if oiltight, retighten securing bolts

[1]) On the contrary, these locks may be provided with flocculent graphite (Messrs. Krystago Graphit-Kompanie Driver KG., Düsseldorf 10).
[2]) First time after the first 5,000 miles (8000 km), then every 10,000 miles (16 000 km).
[3]) Can be carried out only in a Service-Workshop.
[4]) We further recommend to have the rubber inserts in the wiper arms replaced according the depreciation rate at intervals from ½–1 year.

After every ... miles (km)	Page	Part of car	Work
10,000 (16000)	—	Nuts, bolts and split pins of steering gear, engine and body mounting brackets, propeller shaft and rear axle housing	Check, after placing car over pit or on ramp, and retighten, if necessary
	—	Window runners	Remove dust with a brush and apply some tallow
	40	Head lamps	Check aiming
12,500 (20000)	37	Front wheels [1]	Check toe-in [1]
20,000 (32000)	33	Rear axle	Check corrugated part of rubber sleeves for cracks and jack up car for that purpose
	—	Brakes	Remove brake drums and check drums and brake linings
30,000 (48000)	41	Cooling system	Flush
	—	Fuel filter	Replace paper screen
	—	Generator [1]	Remove; replace carbon brushes; inspect commutator, if in perfect condition, and recondition on a lathe [1], if necessary
	—	Rear axle	Replace rubber sleeves
	—	Front axle [1]	Remove and clean threaded bolts and bushings for lower wishbone adjustment, clear the lubrication bores in the spindle assembly [1]; replace gasket rings, if necessary
	—	Steering wheel shaft [1]	Replace [1] joint disk after driving the car over 30,000 miles (48 000); check free movement of steering wheel shaft and adjust [1], if necessary
	—	Tie rods [1]	Inspect joints and gasket
	—	Brakes [1]	Dismantle [1] master brake cylinder and wheel brake cylinders, inspect check valve; replace rubber sleeves and piston cups; check all fluid lines of the hydraulic brake system for tightness and tension [1]

[1]) Can be carried out only in a Service-Workshop.

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Cleaning the car and care of the coachwork

Mercedes-Benz cars of the type 170 DS are supplied with synthetic resin paintwork. The surface of the paintwork shows porcelainic gloss, if getting dull this finish cannot be renewed by grinding or polishing. The maintenance of such a polished car is therefore limited to a thorough cleaning, i. e. removing of dirt, dust, oil, soot and the like, and a careful and thorough washing.

Washing: At first rinse vehicle, when hood is cold, with cold water with a gentle spray and then clean thoroughly with a soft and clean sponge and cold water as usual. During this process the vehicle should not directly be exposed to the sun. Special care should be taken that the surface will not be scratched by dust and grit, if any, in the sponge, as such scratches cannot be removed completely. Squeeze sponge frequently in clean water, for cleaning of chassis and wheels use a separate sponge or a soft brush. The windscreen and the other windows should always be cleaned with a clean chamois leather used solely for this purpose. The whole car should be rubbed dry.

Any **tar marks** should only be removed with Mercedes-Benz Tar Remover. When using different commercial tar removers, we cannot assume any responsibility for damages incurred, as these tar removers often contain solvents which are harmful to the paintwork.

From time to time the car should be shampooed. Our service stations will gladly inform you of the respective shampooes and the concentrations recommended by us. After shampooing, the car should thoroughly be rinsed. It is necessary to rub the car dry afterwards.

When required or after about six months the paintwork should be treated with a resin polish recommended by us which can be obtained at our service stations. On no account apply such polishes as they are used for nitropolished vehicles which usually contain grinding and polishing agents. By this procedure the existing oil and grease film will be removed and the original gloss of the paintwork reestablished. Apply the synthetic resin polish with polishing cotton on car and afterwards remove with new and clean cotton always again. Now the paintwork should appear in its original gloss. In case the original gloss does not show up after this treatment, a specialist should be consulted, on no account, however, apply any other grinding or polishing agents.

Chromium plated parts

All chromium plated parts should, after washing down with a sponge or brush and water, be rubbed dry and then any tar stains should be removed with "Mercedes-Benz" Tar Remover (see above). On no account should you use a sharpedged tool such as a knife for this purpose in order to prevent any damage to the chromium plating. The chromium plated parts should be covered with a thin film of the Chromium preservative "Mercedes-Benz-Brillant" using a soft piece of flannel; let it dry for a moment and then rub clean with a clean piece of cloth. Any pores that might be present will be closed up by this treatment and consequently corrosion and spoiling prevented. This treatment should be given as far as possible every time the car is washed, and at least every time the paintwork is treated (see above and also service book). At little cost it gives a lasting effect.

The hood and upholstery should only be cleaned with a brush that is not too stiff. Do not try to remove oil or grease stains with any kind of cleaning agent, as unsightly

marks which come through from underneath the upholstery may possibly be produced as a result.

There is no universal solvent for removing stains, and it depends on the particular case which solvent is most suitable. In most cases it will be sufficient to rub the upholstery, when it has been brushed with dilute liquid ammonia (1 part of commercial liquid ammonia to 3–4 parts of water) until it is damp but not wet using a piece of gauze, soft muslin or something similar and then to dry it.

Remove sugar stains with warm water. Rub off grease stains with a little soap solution, but no liquid soap should be used for the purpose as it usually contains alkali, which will attack the paintwork. Oil colours and resinous substances can be removed with a little turps. Rust and inkstains are often treated with a dilute solution of citric acid. In each case you should finish up by rubbing on a little dilute liquid ammonia.

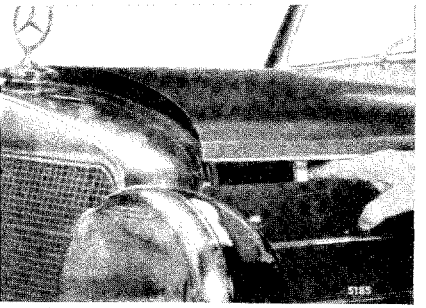
Principally it is recommended to contact one of our service stations for removing of stains.

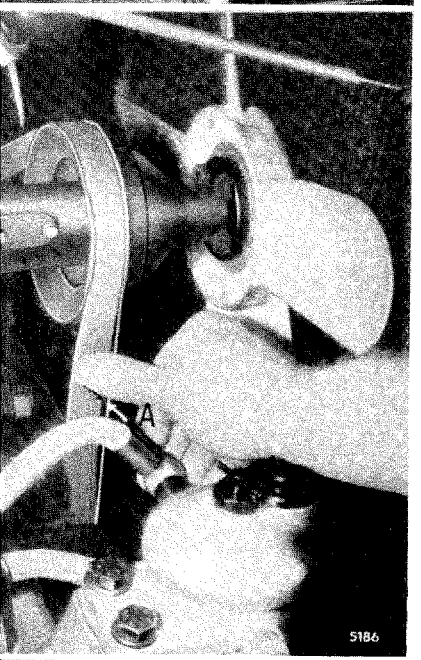
Leather upholstery should only be treated with the leather cleaner "Mercedes-Benz-Karneol" which cleans and preserves the leather at the same time. This product should be applied thinly with a soft piece of flannel, should be allowed to dry slightly and then rubbed clean with a clean piece of the cloth.

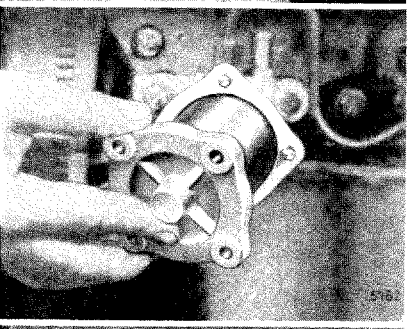
Cleaning of windows and windscreen. It is advisable to clean the panes with a sponge with lukewarm water to which either some fuel alcohol or a soft soap solution is added. Finally rub the windows with a soft cloth. When using commercial window cleaning agents, do not apply agents containg grinding material. Insects, flies, butterflies etc. are to be soaked in a soft solution.

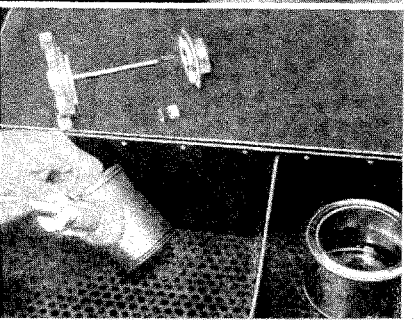
Rubber sleeves on the rear axle housing should only be cleaned with warm water or methylated spirits and not with petrol.

Also clean the chassis and occasionally spray it with a little oil from underneath.









To open the engine bonnet: Pull out the bonnet lock control knob beneath the facia panel. The bonnet will then open as far as the stops on the two securing hooks situated at the front on the left and right beneath the bonnet. Push the securing hooks forward thereby releasing them, and the bonnet will then automatically open up completely.

To close the engine bonnet: Hold the bonnet in the middle, press down and slam it with the hand.

To remove the side panel of the bonnet (normally unnecessary): Unscrew the holding nuts at the top of the dash and on the radiator. Pull the side panel upwards and out. Replace in the reverse manner.

Points for particular attention

Engine:

Check the fan belt: If this shows signs of wear, replace it by a new one.
The tension of the fan belt should neither be too strong nor too loose. Check tension therefore regularly: When moderate pressure is applied by your thumb, the measure A should be $^3/_4$ in. out of straight. Otherwise tension of fan belt must be readjusted.

To adjust: Slacken the adjusting screw on the dynamo support and the front and rear securing bolts underneath the dynamo mounting.
Pivot the dynamo until the correct belt tension is obtained and finally tighten up the bolts.
The procedure is the same for putting on a new belt. Caution! **Do not try to lever** the belt on to the pulley by means of a screw driver or similar tool as you may damage it in the process.

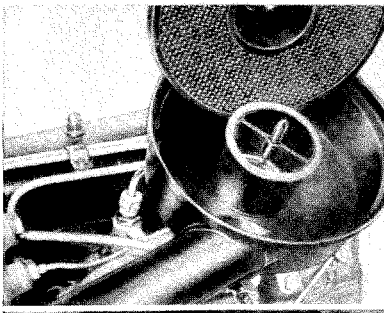
To clean the oil filter: Unscrew the nuts of the securing bolts of the housing cover and remove the latter together with the filter element. Dismantle the filter element—to do this unscrew the retaining nut in the ring base so that the latter and the filter coil can be removed separately from the filter housing—wash the filter coil in petrol with a soft brush, on no account with a wire brush, both inside and out and then blow it through with compressed air. Reassemble the filter element and attach it to the housing cover and insert into the housing, taking care that the packing washer on the housing is in good condition. Tighten up evenly the nuts of the securing bolts.

Exhaust and intake pipes: Check to see that all nuts especially the flange nuts on the exhaust manifold are tight. Defective gaskets can be recognized:

a) in the exhaust pipe: by blowing out

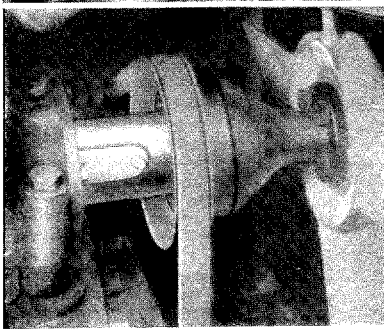
b) in the intake pipe: by faulty idle running.

To clean the air filter: Unscrew the clamp, remove the cover and together with the filter pack move it round to and fro in some petrol. Allow it to dry for a short time, and moisten the filter pack evenly with 4 tablespoonfuls of motor oil (about 1¾ ozs.). Replace the cover and tighten ring nut.



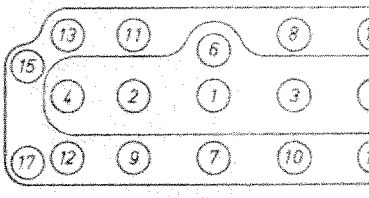
Cooling water pump

Press only $^{1}/_{16}$ cu. in. of Mobilgrease No. 5 into the grease nipple first after 1800 miles and then after every 1800 miles see page 14 (1 ccm is equivalent to 2 shots with the high pressure grease gun "Hydraulik Tecalemit" No. 1304).
Caution! On no account put in more than 2 shots ($^{1}/_{16}$ cu. in.); with too much grease there is a risk of the water outlet hole becoming blocked.
If water comes out at the discharge opening then the gasket in the pump housing is defective. Have a new gasket fitted at a service station workshop. You should on no account try to block up the discharge opening in a leaky pump or else the ballbearings in the housing will be damaged.

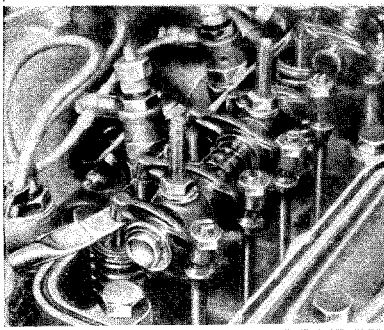


Side of injection pump

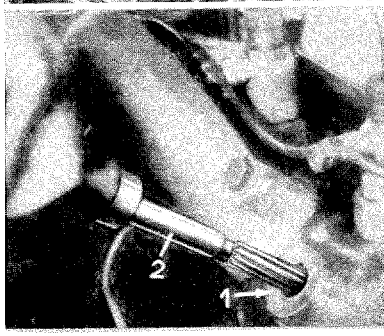
To tighten cylinder head screws: Remove at first cylinder head cover, rocker arm, mounting support and cooling water outlet at engine, and turn lube oil pipe at exhaust side upwards as well, after the rear attachment screws have been removed and the front screws loosened. Tighten up only with a torque wrench and adhere to the order given in the accompanying illustration. Basic principle for the permissible force to be used for tightening the screws should not exceed 58 ft. lbs. (8 mkg) with cold and warm engine.

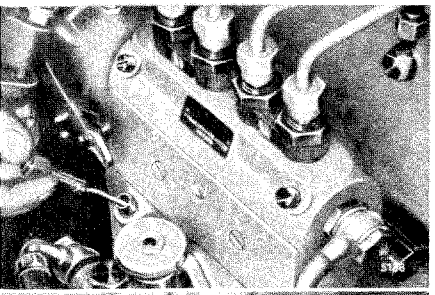


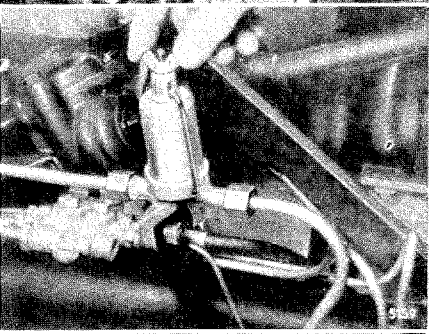
To check the valve clearance. The gap between the pressure point of the rocker arm and the valve stem in a cold engine should be 0.0078 ins. on the inlet valves and 0.0059 ins. on the exhaust valves. The rocker arms are accessible after the upper valve gear housing has been removed. To measure the clearance, the appropriate strip of metal is used as a feeler gauge.
Caution! You should take the measurement on the rocker arm only when that particular valve is completely closed and its push rod can be turned freely. By engaging 4th gear and pushing the car forward you can obtain the necessary position of the push rod. You are strongly advised to have the adjustment of valve clearance carried out at a service station workshop.

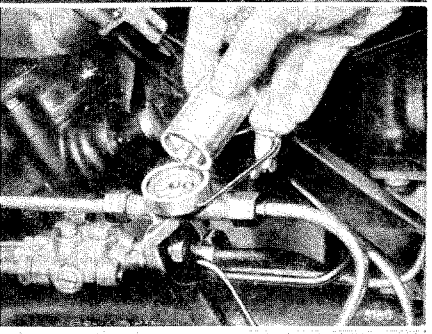


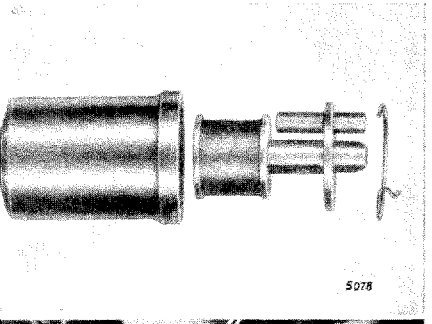
To clean heater plugs and heater plug ports: This should only be carried out at a service station. In case of emergency screw out the heater plugs, wash off the carbon carefully with a brush in fuel.

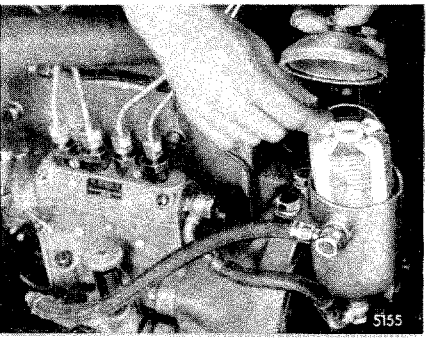












Clean the heater plug ports as follows: The grooves of a blunt friction type awl 0.432 ins. in diameter should be filled with grease and the latter twisted carefully in the port. After removing the awl turn over the engine a few times with the starter so that any carbon deposits remaining may be removed.

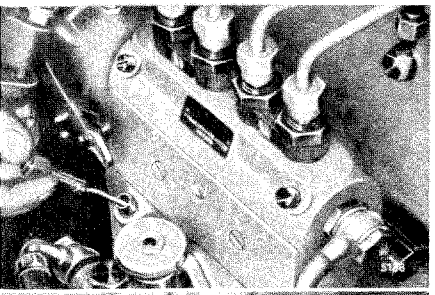
Injection pump: At regular intervals check with the dipstick to see that the oil reaches to the upper mark on the dipstick. If necessary top up with engine oil. Before measuring wipe the dipstick. Every 1850 miles fill in lubricator at governor approx. $^1/_{16}$ cu. inch.
Have a defective injection pump as well as **injection nozzles** changed **only** at a service station; the adjustment of the injection should be also checked over at a service station only.
The spray-off pressure of the injection nozzles should be the same at all nozzles, i. e. with new engines normally 1635 psi (115 atm), with run-in engines about 1420 psi (100 atm) at least.

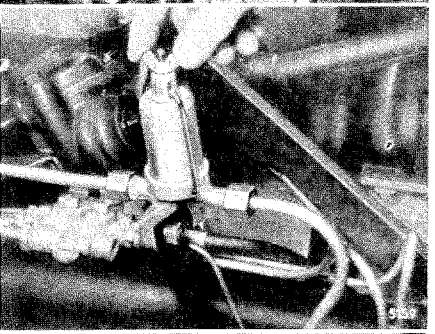
Fuel system

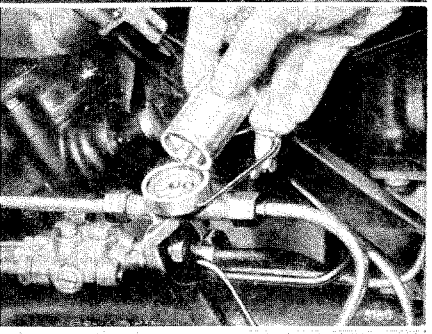
To clean fuel antefilter: This filter is located on the left engine side behind the steering gear housing. For cleaning loosen tommy screw, let down clamp, remove upper part. Slightly press retainer spring on bottom of upper part and remove it. Remove sieve, and clean it thoroughly with a brush, **no wire brush,** in pure gasoline used for cleaning purposes, likewise flush filter protecting cap in gasoline. Clean gasket at lower part and check for proper condition. Assemble in reverse order; take care that clamp is set up vertically and the tommy screw is tightened closely.

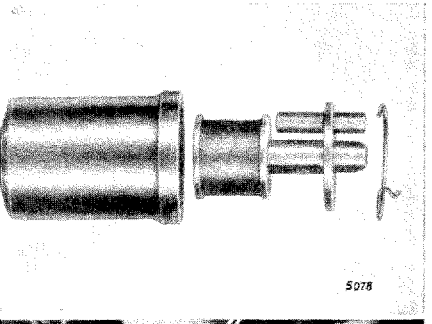
Fuel filter in the engine

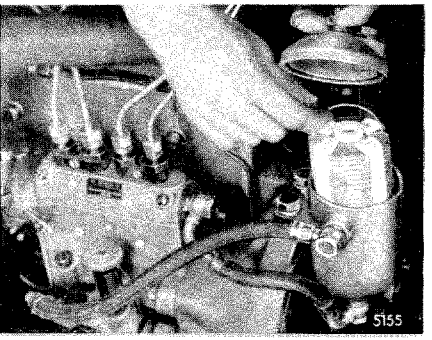
This filter has a paper element which cannot be disassembled and cleaned when contaminated, but will be replaced by a new paper element. A technically complete cleaning of this paper element is not possible. The time of replacement depends upon the degree of contamination of the element. When using properly filtered fuel of a normal filling station replacement will be necessary after every 30 000 miles, in case of heavy contamination correspondingly earlier.
Every 7450 miles check the degree of contamination: Remove vent screw and tension nut on the housing cover. Unscrew the sediment drain plug at the bottom of filter housing and drain deposits in the filter housing. Remove paper elements, replace, if necessary. Insert paper element, put up filter cover, screw on tension nut and vent screw. Then vent fuel filter (see page 31).











Clean the heater plug ports as follows: The grooves of a blunt friction type awl 0.432 ins. in diameter should be filled with grease and the latter twisted carefully in the port. After removing the awl turn over the engine a few times with the starter so that any carbon deposits remaining may be removed.

Injection pump: At regular intervals check with the dipstick to see that the oil reaches to the upper mark on the dipstick. If necessary top up with engine oil. Before measuring wipe the dipstick. Every 1850 miles fill in lubricator at governor approx. $^1/_{16}$ cu. inch.
Have a defective injection pump as well as **injection nozzles** changed **only** at a service station; the adjustment of the injection should be also checked over at a service station only.
The spray-off pressure of the injection nozzles should be the same at all nozzles, i. e. with new engines normally 1635 psi (115 atm), with run-in engines about 1420 psi (100 atm) at least.

Fuel system

To clean fuel antefilter: This filter is located on the left engine side behind the steering gear housing. For cleaning loosen tommy screw, let down clamp, remove upper part. Slightly press retainer spring on bottom of upper part and remove it. Remove sieve, and clean it thoroughly with a brush, **no wire brush,** in pure gasoline used for cleaning purposes, likewise flush filter protecting cap in gasoline. Clean gasket at lower part and check for proper condition. Assemble in reverse order; take care that clamp is set up vertically and the tommy screw is tightened closely.

Fuel filter in the engine

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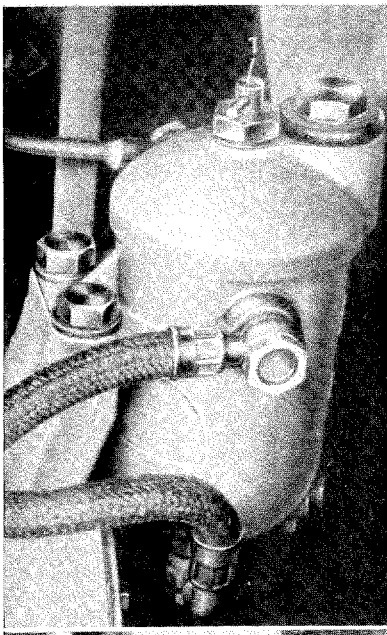
To vent fuel system

It is a prerequisite for proper operation of the Diesel engine that the entire fuel system is completely free of air bubbles. During operation the fuel system is vented by an overflow line at the fuel filter. However, air may enter, if the fuel tank has been emptied during the drive. In such a case, as well as after each considerable overhaul or upon the initial operation, the entire fuel system should, therefore, be vented (I-III).

I. To vent fuel filter

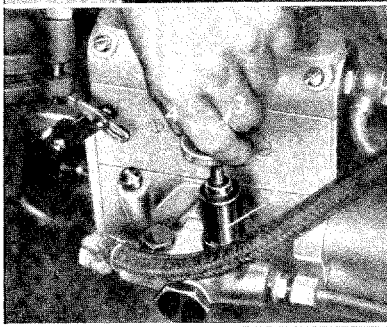
Turn out vent screw (1) at fuel filter for one to two threads. Loosen hand pump (2) by turning in direction (3) and then pump so long until fuel leaves without bubbles at the vent screw. Close vent screw again.

The fuel pump is set by turning in direction (4).



II. To vent injection pump

Loosen both vent screws (5,6) at injection pump for some turns, actuate hand pump so long until fuel leaves without bubbles at the vent screws. Tighten vent screws again.



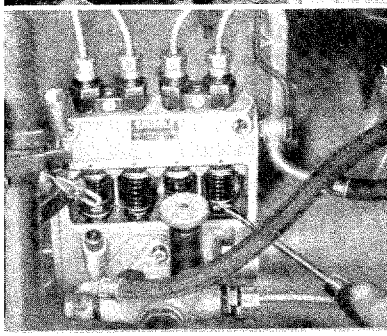
III. To vent injection lines

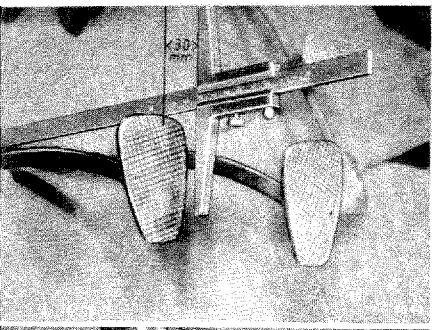
The injection lines and nozzles need not be separately vented, when the tank has been emptied, as they hardly contain any air.

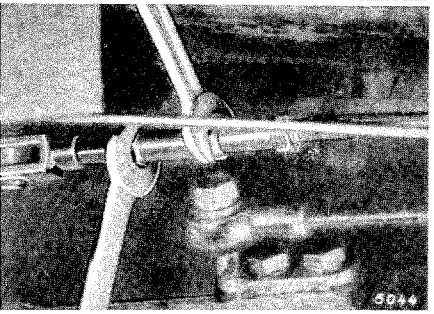
If, however, the lines are dismounted and thus have completely been emptied, it will take at least one minute until they are fully pumped by means of the starter. Such a long operation of the starter naturally strains the batteries. For careful treatment of the batteries vent the injection lines as follows:

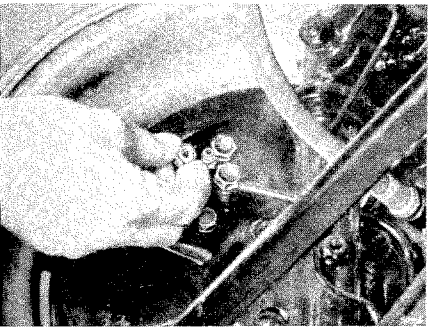
Remove lateral cover of injection pump, pump at each pumping unit at the bottom with a short screw driver so long until the spatter of the respective nozzle can be heard. In case that one of the pumping units works irregularly or fails to work, the injection pump should be replaced in a service station.

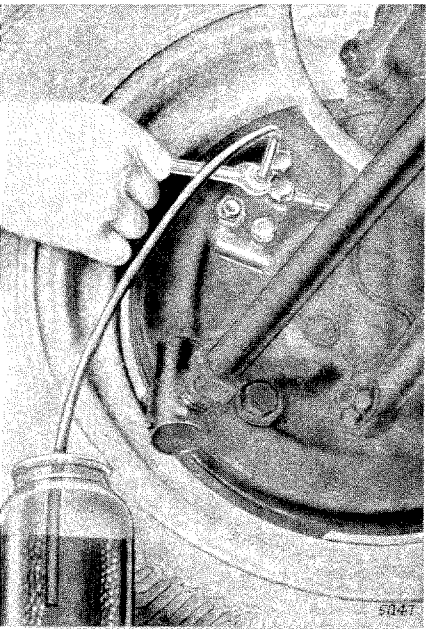
Mount lateral cover again.











Clutch

To check the free movement of the clutch pedal: This should be $1^3/_{16}$ ins. measured from the top edge of the foot plate before any pressure is exerted. If less than this, adjust the clutch. To do this unscrew the lock nut from underneath, give the adjusting nut a few turns anti-clockwise, until the clutch rod is lengthened enough to give free movement of $1^3/_{16}$ ins. Tighten up the lock nut. If the clutch cannot be adjusted any more, apply to your service station.

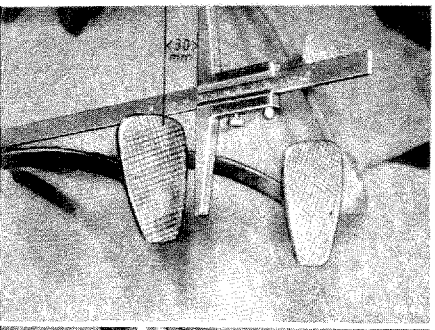
Brakes

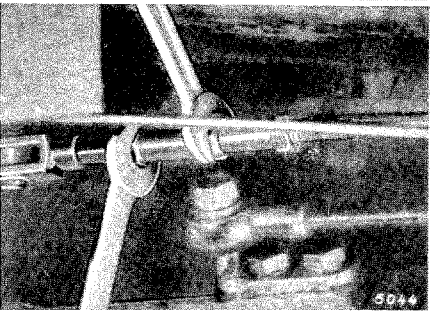
The reservoir should always be three quarters full. If the resistance at the brake pedal is reduced, actuate the pedal several times, then bleed the brakes and see that there is no leak in the system. Never adjust the stop screw for the brake pedal. Never clean the rubber parts of the braking system. Use only the **original brake fluid ATE blue.** Caution! The brake fluid is corrosive, attacks the paintwork and should not come into contact with the brake linings.

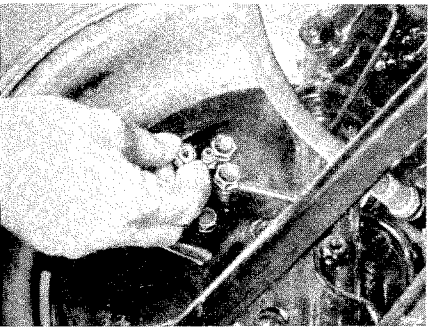
To bleed the brakes:

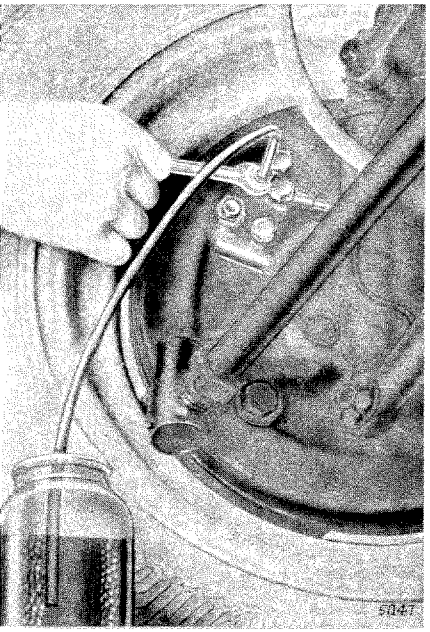
Special equipment required for this purpose:
1 bleeder tube, 1 glass jar.

1. The brake fluid reservoir must be at least three quarters full.
2. On one of the front wheels: remove the screw cap from the wheel brake cylinder and attach the bleeder tube to the nipple thus exposed.
3. Slip a spanner over the bleeder tube and place it on the bleeder screw.
4. Put the other end of the tube into the glass jar and fill the jar with enough brake fluid to cover the end of the tube.
5. Unscrew the bleeder tube a few turns but do not screw it right out.
6. Press down sharply on the brake pedal and release it slowly and repeat this process until no more air bubbles can be seen in the glass jar. Caution. The level of the brake fluid in the jar must not drop right down, otherwise air will be pumped back into the system.
7. When the brake pedal is pressed down for the last time it should be held or clamped down until the bleeder screw has been tightened up again. Only then should the brake pedal be released.
8. Remove the bleeder tube from the nipple and replace the screw cap.
9. Proceed in the same manner with the other wheels.
10. Fill up the main reservoir, screw down the top of the reservoir.









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10. Fill up the main reservoir, screw down the top of the reservoir.

To adjust the brakes

Footbrake: by turning both adjusting bolts:

1. Jack up the wheel;
2. Turn both adjusting bolts downwards until you can feel the linings just grazing the brake drums;
3. Turn back the bolt a little until the wheel runs freely. This can be determined by turning the wheel.

Handbrake: Turn in a clockwise direction the adjusting nut on the hand brake lever in the engine space front left. Adjust it only until the rear wheels will still turn freely when the handbrake is released.

Adjust the handbrake in good time, otherwise the brake handle may be pulled out too far and this will make it difficult to get in and out of the car. A handbrake which has not been adjusted in good time will not brake well enough in an emergency.

Final check: When the brakes are released the car should run freely without a jerk when coasting.

There should also be no sign of heat on the sides of the wheels when you feel the wheels after driving several miles without using the brakes.

Propellor shaft

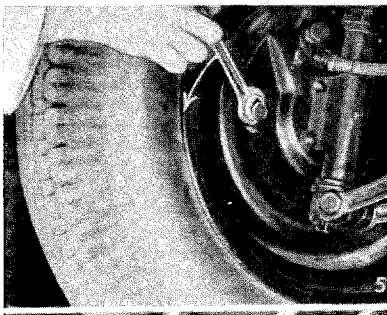
There is a grease nipple situated in the universal joint of the propellor shaft — in front of the rear axle housing. By means of a grease gun a little grease should be forced every 3.700 miles into this nipple, which is accessible from underneath.

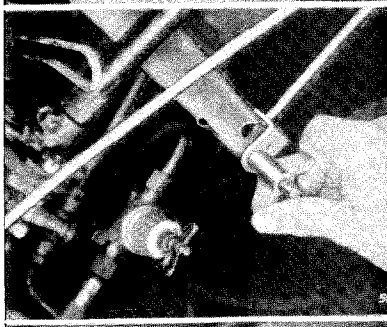
Furthermore tighten castle nuts of front and rear fabric universal joint for the first time after 1850 miles and later on regularly after 3700 miles.

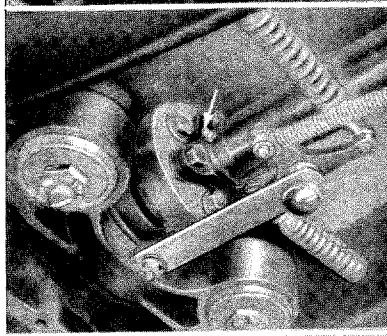
Rear axle housing

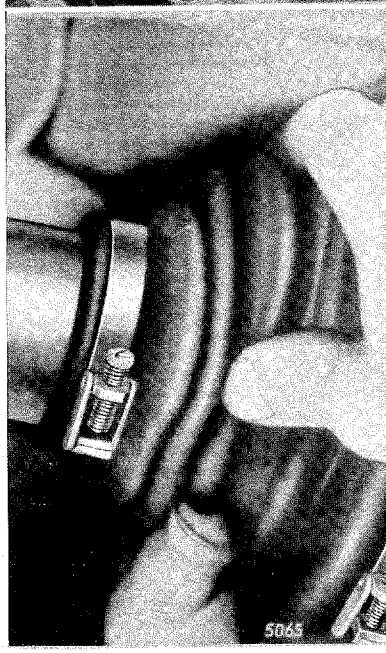
After every 1850 miles check oil level in rear axle housing. It should reach up to the small hexagonal plug which is fitted in the rear of the rear axle housing at the right-hand side in the driving direction. After 900 miles for the first time and every 7450 miles change oil at rear axle housing, drain the old oil at the drain plug fitted on the bottom of the housing.

After every 1850 miles make sure that the rubber sleeves on the rear axle are in perfect condition. To do this jack up the car and from underneath press the separate folds of the sleeves apart and examine for splits. The rubber should not be cracked or brittle. After every 29.800 miles have the sleeves replaced in a service station workshop.









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Adjust the handbrake in good time, otherwise the brake handle may be pulled out too far and this will make it difficult to get in and out of the car. A handbrake which has not been adjusted in good time will not brake well enough in an emergency.

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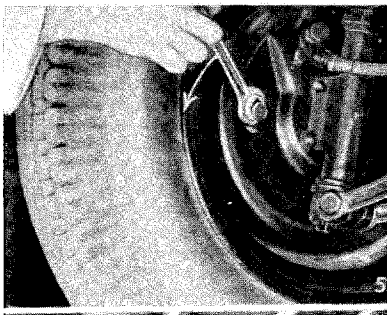

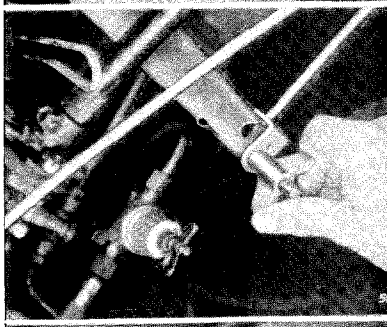

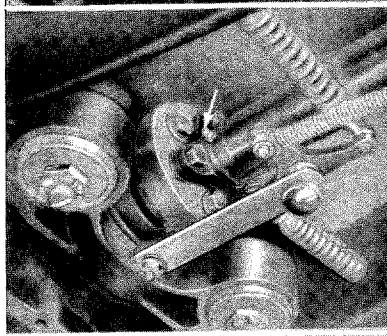

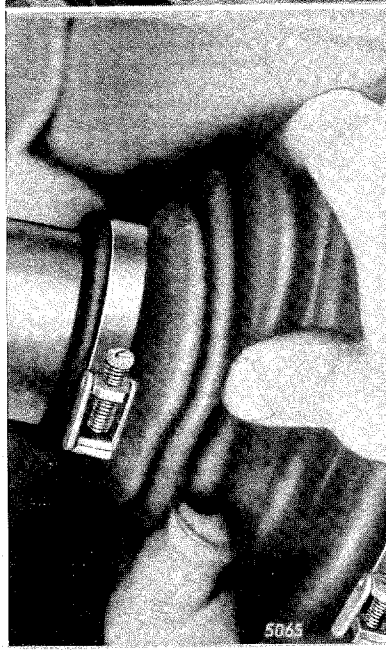

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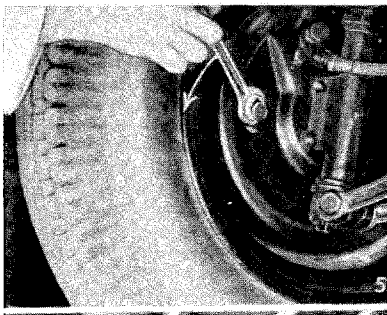

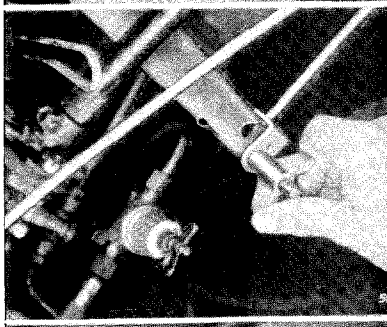

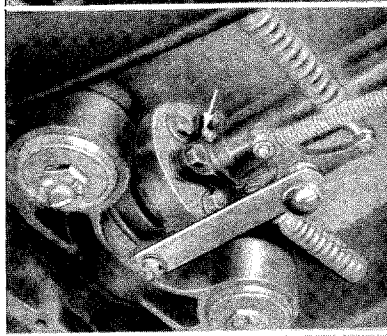

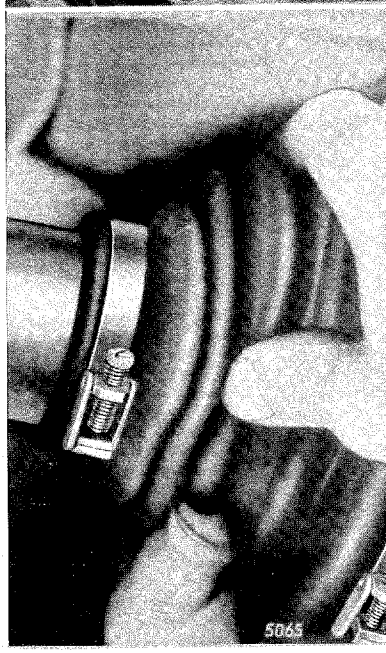

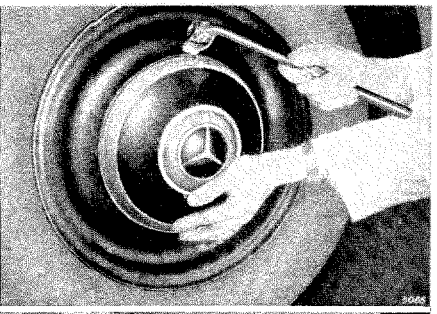

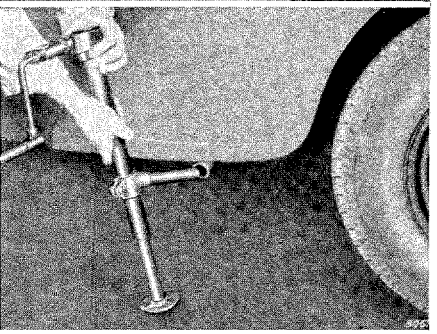

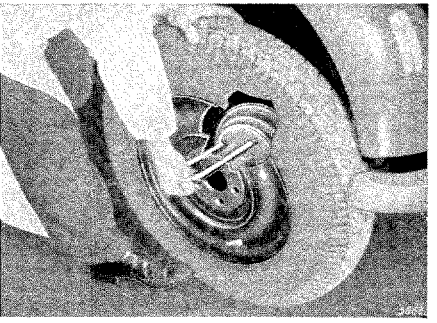

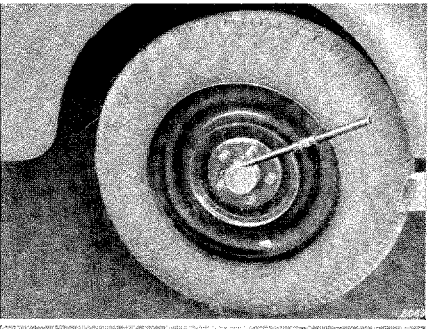

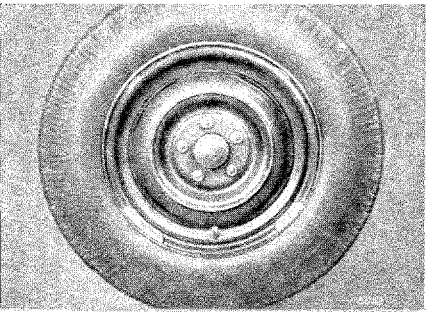

Wheels

Lubrication of the front wheels: Remove the ornamental cap and hub cap with the aid of the nose piece of the wheel brace which must first be opened out. Fill the hub cap with grease and press in thereby forcing the grease into the ball bearings. Replace the ornamental cap (see the illustration attached to the lubrication scheme on page 25).

The lubrication of the rear wheels is effected directly from the rear axle.

To change wheels

The spare wheel, lifting jack and a combined spanner, which serves as crank for the jack, as wheel spanner and for removing the ornamental hub cap, are to be found in the lower luggage compartment.

With the lever arm bent round the spanner may be used as crank for the jack and for screwing up the wheel nuts, with straight arm for slackening and tightening the nuts.

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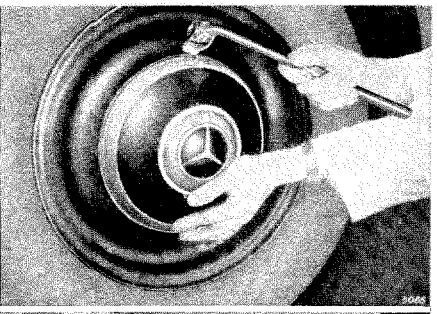
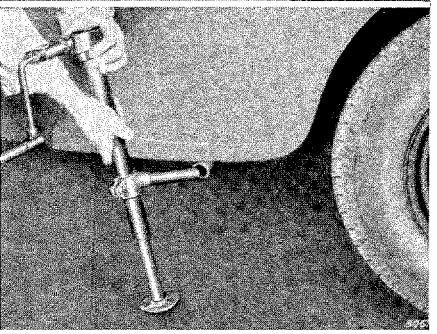
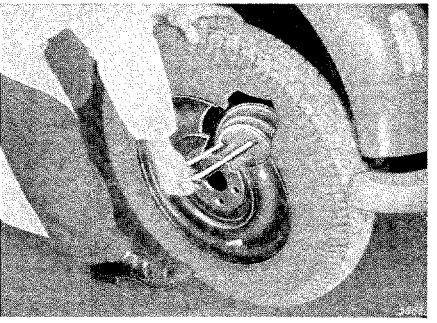
Screw up all the wheel nuts but do not tighten them. Lower the jack, tighten right up the wheel nuts in succession. Inflate to the correct tyre pressure (see page 36). Have any damaged tyres repaired.

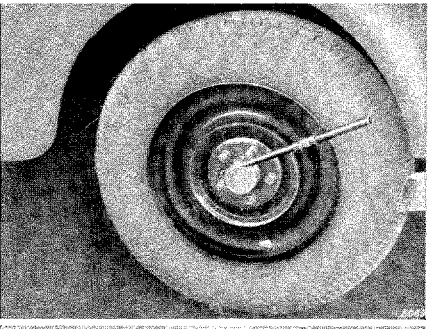
To balance the wheels

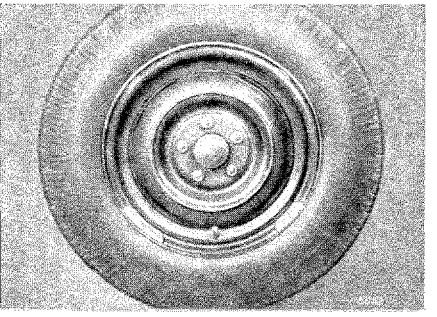
An uneven distribution of material and weight in a rotating body—wheel and tyre—is known as lack of balance. Excess lack of balance in the wheels may at speeds over 50 m.p.h. lead to steering difficulties and cause the coachwork to vibrate and the wheels to jump even over smooth roads. As a further consequence there is greatly increased wear and tear on the tyres. After putting on a new tyre or a tyre which has become deflated through a defect in the valve or inner tube, you must balance











Wheels

Lubrication of the front wheels: Remove the ornamental cap and hub cap with the aid of the nose piece of the wheel brace which must first be opened out. Fill the hub cap with grease and press in thereby forcing the grease into the ball bearings. Replace the ornamental cap (see the illustration attached to the lubrication scheme on page 25).

The lubrication of the rear wheels is effected directly from the rear axle.

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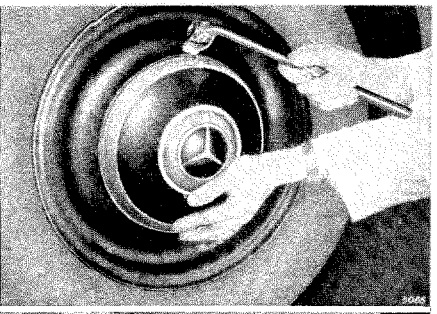

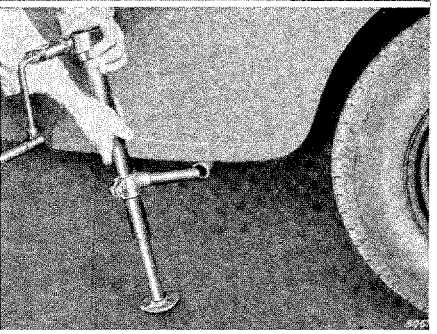

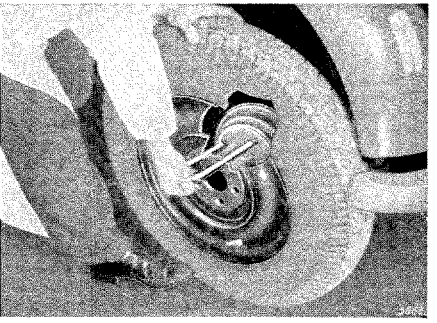

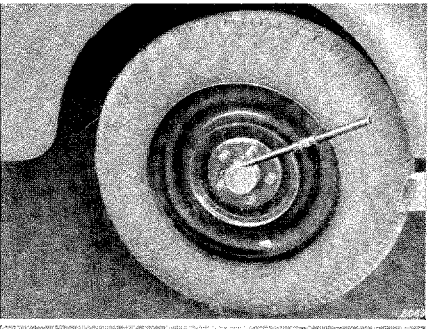

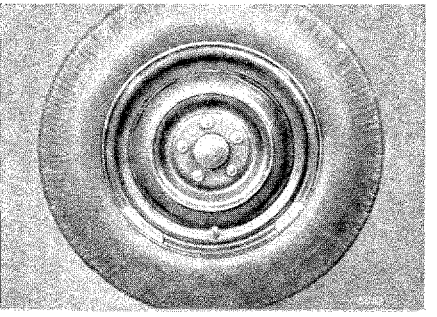

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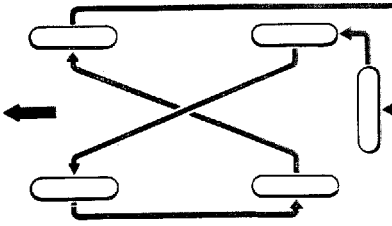

Interchanging of the wheels

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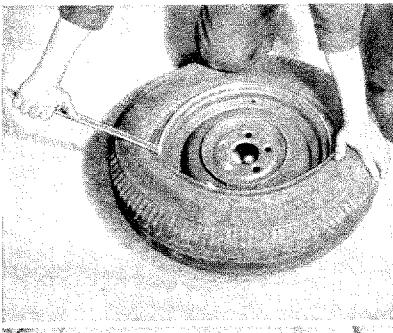

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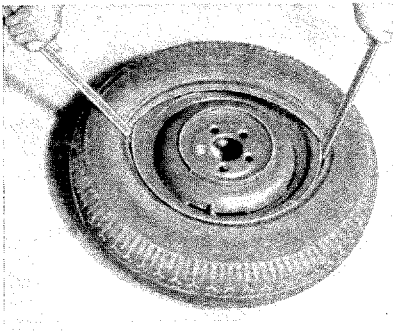

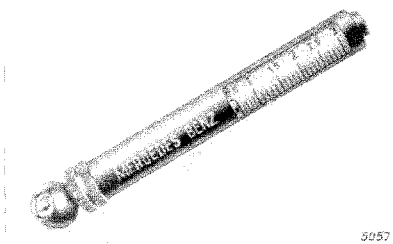

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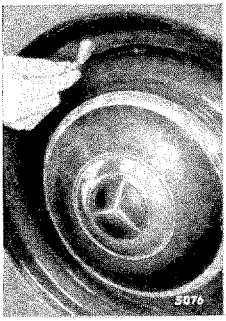

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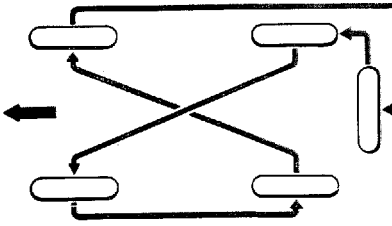

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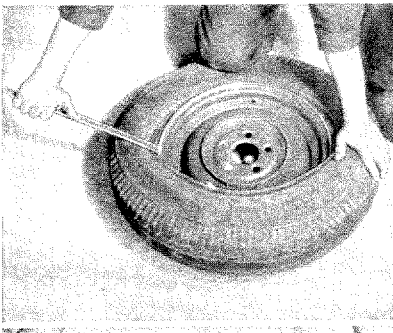

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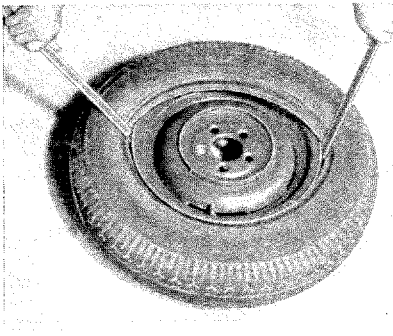

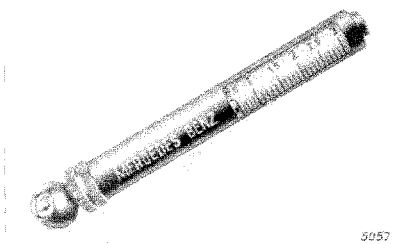

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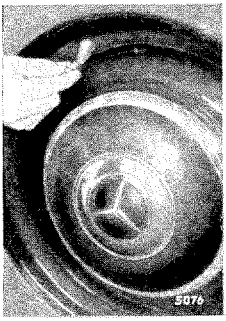

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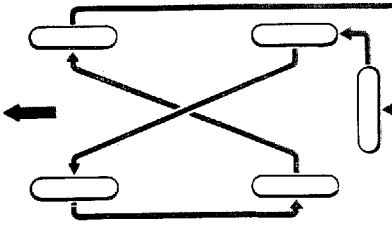

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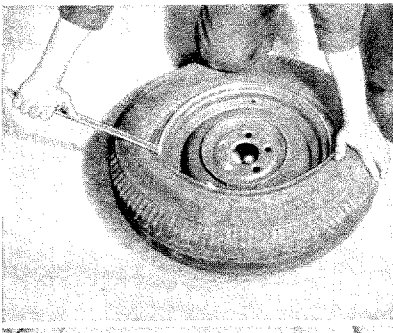

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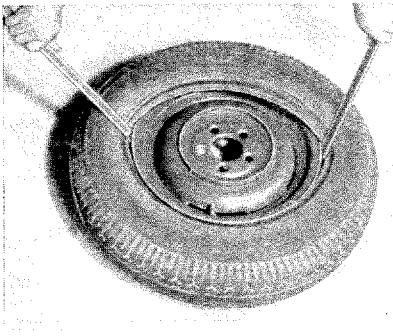

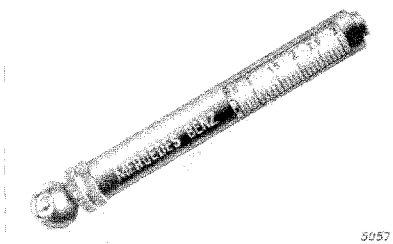

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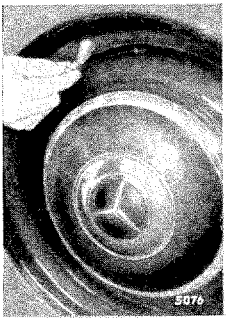

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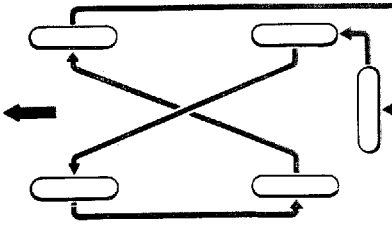

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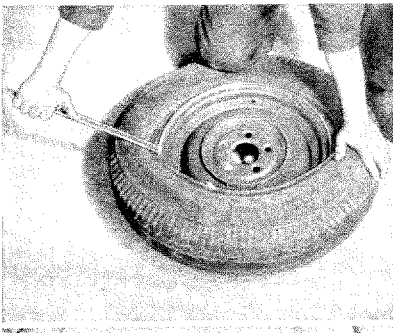

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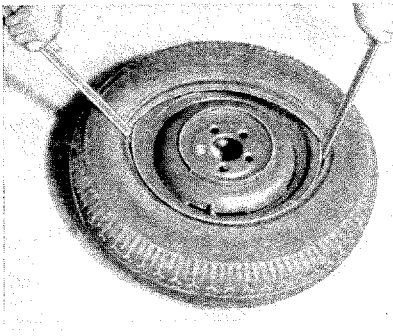

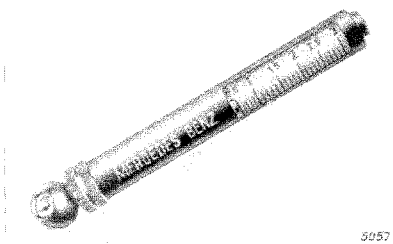

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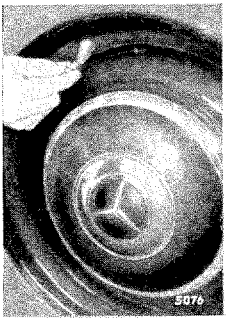

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Therefore, if in the course of a long drive, while the tyres are still warm, you check the tyre pressure and find that there is a higher pressure, then you should on no account reduce the pressure to the figure prescribed for **cold** tyres. On the other hand, if you have to inflate the tyres in the course of a long drive, i. e. when they are warm, the pressure required is higher than that needed for cold tyres. See the following table:

	Cold tyres	After a long drive in a town or a moderate drive across country	After a hard drive across country
Front wheels	23 lbs./sq. in. (1.6 atmos.)	26 lbs./sq. in. (1.8 atmospheres)	27 lbs./sq. in. (1.9 atmospheres)
Rear wheels and spare wheel	28 lbs./sq. in. (2.0 atmos.)	31 lbs./sq. in. (2.2 atmospheres)	33 lbs./sq. in. (2.3 atmospheres)

With a short drive at moderate speed, e. g. from the garage to the tyre service station the temperature of the tyre is practically unchanged. In this case the pressure prescribed for cold tyres will be the correct one.

If after a long drive you are not sure about the temperature of the tyres, then you are recommended to keep to the highest pressure prescribed and at the next opportunity when the tyres are cold again, to obtain finally the correct pressure.

Before starting out on a long drive, and at least once a week, you should check the tyre pressure.

As the pocket pressure gauge, which is normally available, is not always in good condition, you are recommended to have the tyre pressure checked with a precision pressure gauge. From time to time this instrument should be checked at one of our service stations.

If the tyre pressure drops by more than 0.2 atmospheres (3 lbs./sq. in.) within a week then there is an air escape in the valve or inner tube, and this must be repaired as soon as possible. It has been found from experience that nails stuck in the tyre do not immediately lead to a complete loss of air, but to a slow drop in pressure. On a long drive the hole made in the tube by the object stuck in the tyre becomes greater and greater through the movement of the tyre until finally the air escapes suddenly.

The tyre flattened on the ground more when the tyre pressure is low than when normal. Even the comparatively inexperienced driver can clearly notice the difference after a little practice, if he looks closely at the tyres. You are therefore strongly recommended to give a quick glance at the tyres before every trip.

Wear and tear on tyres

Every driver has himself the greatest effect on the length of life of his tyres, for the wear and tear of the tyres depends essentially on the manner of driving:
Hard cornering, hard braking, hard driving off all increase the wear of the tyres to a considerable extent. However, tyre wear is not excessive if, for example, you drive only straight ahead on an arterial road even at the fastest speeds. In this respect study the hints on economical driving given on page 4. In summer wear of tyres is necessarily greater than in winter, since rubber when warm is less resistant to friction than when cold.

Rough road surfaces wear out the tyres more quickly than do smooth ones.

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	Cold tyres	After a long drive in a town or a moderate drive across country	After a hard drive across country
Front wheels	23 lbs./sq. in. (1.6 atmos.)	26 lbs./sq. in. (1.8 atmospheres)	27 lbs./sq. in. (1.9 atmospheres)
Rear wheels and spare wheel	28 lbs./sq. in. (2.0 atmos.)	31 lbs./sq. in. (2.2 atmospheres)	33 lbs./sq. in. (2.3 atmospheres)

With a short drive at moderate speed, e. g. from the garage to the tyre service station the temperature of the tyre is practically unchanged. In this case the pressure prescribed for cold tyres will be the correct one.

If after a long drive you are not sure about the temperature of the tyres, then you are recommended to keep to the highest pressure prescribed and at the next opportunity when the tyres are cold again, to obtain finally the correct pressure.

Before starting out on a long drive, and at least once a week, you should check the tyre pressure.

As the pocket pressure gauge, which is normally available, is not always in good condition, you are recommended to have the tyre pressure checked with a precision pressure gauge. From time to time this instrument should be checked at one of our service stations.

If the tyre pressure drops by more than 0.2 atmospheres (3 lbs./sq. in.) within a week then there is an air escape in the valve or inner tube, and this must be repaired as soon as possible. It has been found from experience that nails stuck in the tyre do not immediately lead to a complete loss of air, but to a slow drop in pressure. On a long drive the hole made in the tube by the object stuck in the tyre becomes greater and greater through the movement of the tyre until finally the air escapes suddenly.

The tyre flattened on the ground more when the tyre pressure is low than when normal. Even the comparatively inexperienced driver can clearly notice the difference after a little practice, if he looks closely at the tyres. You are therefore strongly recommended to give a quick glance at the tyres before every trip.

Wear and tear on tyres

Every driver has himself the greatest effect on the length of life of his tyres, for the wear and tear of the tyres depends essentially on the manner of driving:
Hard cornering, hard braking, hard driving off all increase the wear of the tyres to a considerable extent. However, tyre wear is not excessive if, for example, you drive only straight ahead on an arterial road even at the fastest speeds. In this respect study the hints on economical driving given on page 4. In summer wear of tyres is necessarily greater than in winter, since rubber when warm is less resistant to friction than when cold.

Rough road surfaces wear out the tyres more quickly than do smooth ones.

It is impossible to combine in **one** tyre at the same time the greatest resistance to skidding with the greatest resistance to wear. When choosing tyres you should always bear in mind that tyres with particular non-skid qualities are more liable to wear.

Premature and uneven wear of tyres may have the following causes:

1. Tyre pressure is too small. This is also indicated if the tread is worn more at the sides than at the middle.
2. Unsuitable tyres: Our service stations will at all times advise you scrupulously which makes of tyres are best suited to given conditions.
3. Faulty wheel gather on the front axle. This will be the case if the tyres are worn prematurely though evenly along the circumference. In extreme cases the tyre may be worn in a saw shape across the tyre.
   The gather is correct if the distance between both front wheels measured at the edge of the rim, is $^{5}/_{32}$ ins. less in front than behind. To compensate for any distortion of the rim, the average of two measurements should be taken, when the wheel is turned round a further 180° for the second measurement.
4. Wheels out of balance.
   To balance see page 34.
5. Faulty shock absorbers.
6. The brakes are pulling unevenly.
7. Incorrect camber of the front wheels, or a buckled rim or pin caused by driving into something.
   Defects 3 to 7 can be checked with precision and put right only at a service station.

Care of tyres

Examine the tyres as often as possible for any nails or flints etc. which are stuck in and, if necessary, remove any that you might find. The best time to do this is every 3700 miles when the wheels are interchanged. Have severe damage and slits repaired by an expert.

The non-skid qualities of badly worn tyres can be increased by special retreading (providing a fine tread across the direction of travel).

Have the tyres vulcanised at the latest when the tread is completely worn away.

You are strongly recommended, however, to have this done only in a vulcanising establishment recommended by our service stations.

To brighten up the colour, do not use a nitro-cellulose lacquer but only a special tyre paint to be found on the market.

Check over the rims!

Buckled, bent or rusty rims cause damage to the beaded edge. Have rust removed from the rims once a year.

Electrical System: wiring diagram see page 39.

Battery: 12 Volts – Two separate batteries each of 6 Volts and 75 Ah connected in series are situated in the engine room in front of the dashboard.

Keep the batteries clean and dry on the outside. The acid level must be $^{3}/_{8}$ to $^{5}/_{8}$ in. above the top edge of the plates. Only use distilled water for topping up.

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We warn against using special electrolytes as same may cause a diminution of the durability of the battery. The acid concentration discloses the state of charge, therefore check the state of charge with a hydrometer:

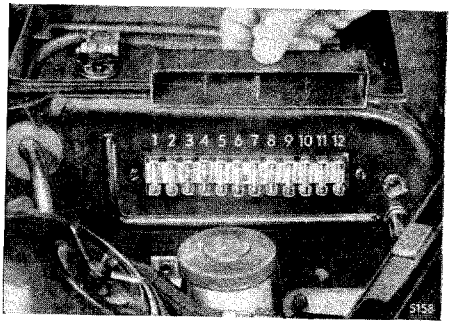
charged: specific gravity of the acid 1.285 = 32 ⁰ Bé

half charged: specific gravity of the acid 1.23–1.21 = 27 ⁰–25 ⁰ Bé

discharged: specific gravity of the acid 1.14–1.11 = 15 ⁰–14 ⁰ Bé

If too low, charge the battery over an outside source of current.

Wash terminals with hot soda lye (caution! No lye solution in the battery). Flush with cold water. Grease terminals with acid protective grease.



Fuses: These are situated on the front left side of the dashboard (when looking forward).

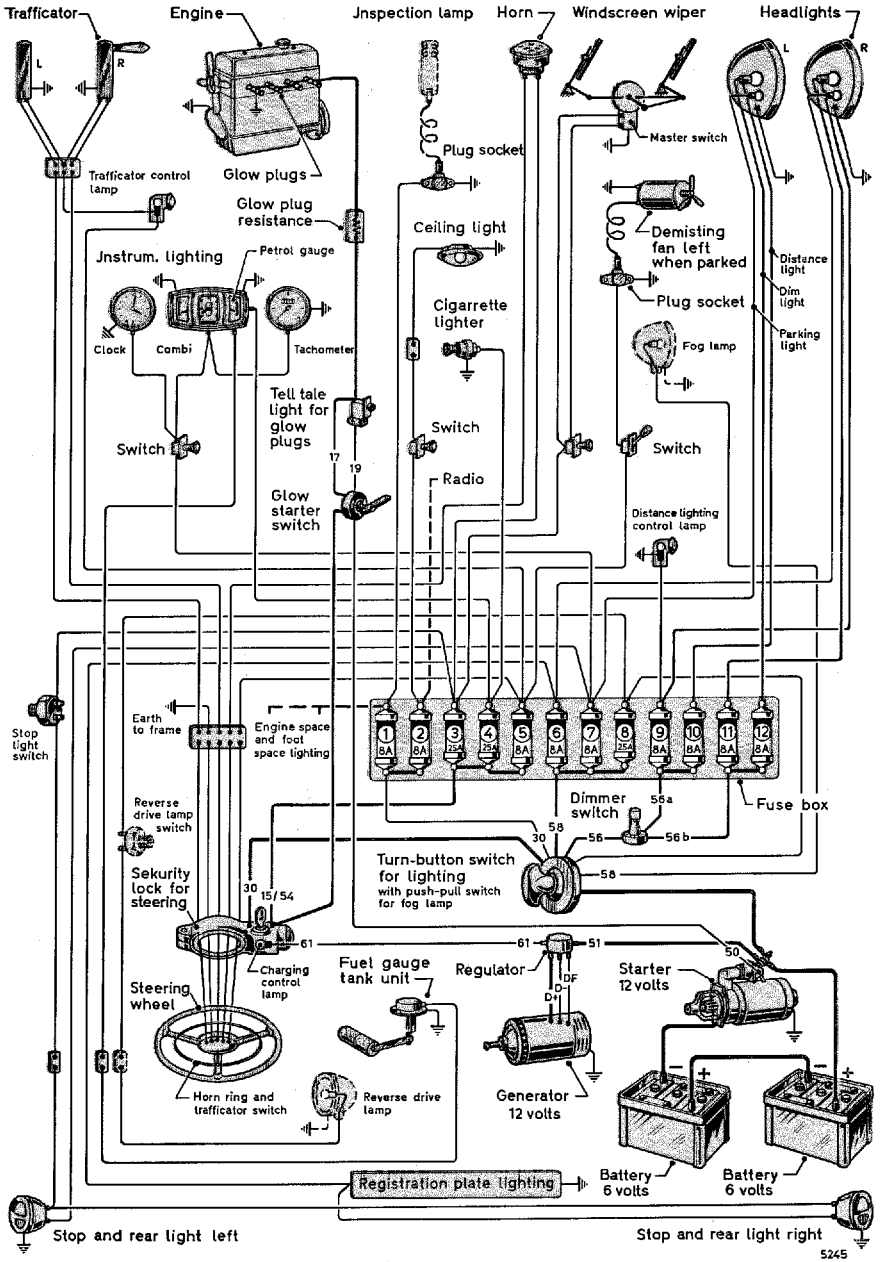
The lead to the glow system does not pass through a fuse.

If a fuse repeatedly burns through, have the leads examined for earthing at a service station and have any defective ones replaced.

A list of the fuses in order from left to right (as you face the fuse box) is given below:

No.	Amp.	Lead	Consumer point(s)
1	8	30	Plug socket for inspection lamp, foot space lighting [1], engine space lighting [1]
2	8	30	Dome lighting, radio [1]
3	25	54	Stop lights, horns, windscreen wipers
4	25	54	Fuel gauge, cigar lighter
5	8	54	Fan for demisting left when parked, trafficators, or blinker lights, trafficator control lamp
6	8	58	Registration plate lighting, parking light right, rear light right
7	8	58	Rear light left, instrument lighting, parking light left
8	25	58	Reverse drive light, fog lamp
9	8	56a	Distance headlight right and distance headlights control lamp
10	8	56a	Distance headlight left
11	8	56b	Dimmed light right
12	8	56b	Dimmed light left

[1] This is supplied only if specially ordered and at extra cost.



Wiring diagram of the electrical fittings

Note: If the key has been withdrawn from the security lock for the steering, then the horn, starter switch and heater plug system, direction indicator, windscreen (-shield) wiper, stop light and charging control lamp are all switched off. On the other hand the ceiling lighting and cigarette lighter can be used independently of the lighting switch and security lock, and so can the wireless and socket for the inspection lamp, both of which, however, will be supplied only if specially requested and at an extra charge.

Headlights

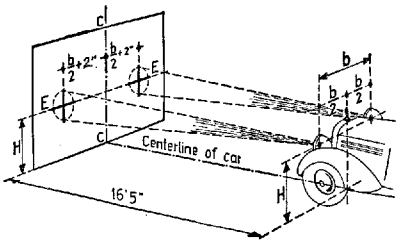
Do not clean the inside reflector of the headlights. Any contact damages the surface of the reflector. It is necessary to open a headlamp only to replace an electric bulb (see "Emergency Repairs" page 46).

To check the alignment of the headlights

Place the normally loaded car on level ground at 16' 5" from a vertical wall.

I. Take these measurements at the headlight glasses:

1. Height of the centre of the glass from the ground = (H) ins.
2. Horizontal distance between the two = (b) ins.
3. Horizontal distance of each headlight from the centre of the car: this should be half of b $\left(\frac{b}{2}\right)$.



II. Mark on the wall:

1. A centre line perpendicular to the longitudinal axis of the centre of the car (C-C),
2. Two crosses for the alignment in the following position:
   a) height from ground = H ins.
   b) each cross is $\frac{b}{2} + 2$ ins. from the centre line measured in a horizontal direction.

III. Switch on distance headlight:

The spots of light projected by the headlamp on the wall should coincide with the crosses. If this is not the case adjust each headlamp independently by slackening the retaining nut underneath the mudguard, and in doing so black out the other headlamp and any other lights. Tighten up the retaining nut.

Cooling system

To clean the cooling system

If the temperature of the cooling water gradually rises above the normal level, this is an indication that the cooling system is dirty. The cooling system must then be cleaned of grease and scale deposit, and well washed.

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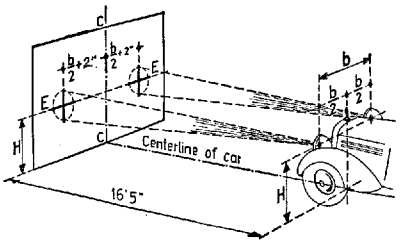

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a) **To remove grease:** Sprinkle two handfuls of soda or P 3 or Imi into the cooling system through the radiator filler. With this added to the water run the car for a day. Drain off the solution at both drain cocks—on the left under the radiator and on the left under the engine. With the engine running and with fresh water running into the radiator at the same time thoroughly rinse out the cooling system.

b) **To remove scale deposit:** You are particularly recommended to have the fur deposit removed only at a service station. The deposit is best removed by means of a hydrochromium treatment, as the different stages of the process can be controlled with the aid of the testing strips supplied by the manufacturer. Follow closely the instructions for the hydrochromium treatment. Put approx. ½ pints of the Hydrochromium solution into the cooling system, filled up with untreated water, with the engine running. After driving some distance, in any case after a day, dip a testing strip through filler opening into the cooling water for a moment. The colour scale supplied by the manufacturer together with the testing instructions and the testing strip, will show you clearly, to which p-H value the colour shade of the used testing strip corresponds. If this exceeds 6, drain off cooling water, flush cooling system again thoroughly and repeat this procedure. The treatment is complete if, after driving some distance, the p-H value will be under 6. Then once more drain off the cooling water, thoroughly wash out the cooling system, refill with cooling water which should be specially treated in accordance with the instructions on page 11.

c) **To clean:** Blow through the engine with compressed air from the engine end or squirt water through and so clean the radiator ribs thoroughly of all foreign bodies. See that the rubber hose connection between the radiator and the pipe is water tight and replace if found to be torn or brittle.

Remove and thoroughly clean the thermostat.

To store and lay up the car

Use as garage an airy and dry place, which is ventilated regularly and sufficiently.

Caution! Never let the engine run in a closed garage.

If the car is to be laid up for a considerable time, then it must be cleaned thoroughly inside and out and well greased. Drain off the cooling water completely. When doing this, remove the radiator drain plug, so that the cooling water can all drain off. Drain off the fuel from the fuel tank and the injection system. In addition, after removing the valve cover plate, the valve rockers, valve springs and valve stems should be oiled with a brush and engine oil.

The batteries should be taken out and stored in a place protected from frost. They should be recharged every 4—6 weeks without fail, since they become useless if this is not done.

To take the weight off the tyres, raise up the car but only put supports under the four rests for the lifting jack, on no account put them under the rear axle. Rub vaseline on all bright metal and chromium plated parts.

When you put the car into use again, you must clear the fuel system of air (see page 31). It is advisable to drain off the engine oil, rinse out the crank case thoroughly and fill up with fresh oil.

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Hints on Emergency Repairs

If, as we continually advise you to do, you have your car serviced regularly and checked over at a service station, and adhere strictly to the maintenance instructions, you will hardly ever run the risk of being let down by your 170 DS, apart from tyre trouble. Should the car, however, not function properly, the following hints should enable you to find the possible cause of trouble, from the symptoms and thus to remedy the defect.

The toolkit supplied as part of the equipment and the lifting jack together with a combined jack crank and wheel nut spanner are stored in the lower luggage compartment.

The tell-tale light for the heater plugs does not light up, when the starter switch is in position "1", or else **the starter does not turn over,** when the starter switch is in position "2". The causes may be:

a) The key in the security lock on the steering wheel is not in position "Drive".

b) The batteries are not in order:

As a check turn starter switch for a moment to position "2": if the starter turns over, then the batteries are in order and there is a defect in the heater plug system (see under c).

If however the starter does not turn over, then check the batteries. To do this, switch on the distance headlight and turn the starter switch to position "2".

If then

1. the lights go out, there is a bad contact on one of the battery terminals or on the connections of the starter: thoroughly clean the terminals and connections so that the metal is bright;
2. the lights go out slowly, then the battery is run down: have the battery charged over an outside source of current;
3. the brightness of the lights is unchanged, then there is a defect in the starter itself, and this should only be put right at a service station.

c) If the test made under b) shows the batteries to be in perfect order, then there is a defect in the heater plug system itself.

Test to see that each plug when switched on in turn is receiving the current: have the starter switch held by someone else in the position "1" and see if you can obtain sparks by holding a screw-driver across the wall of the crankcase and each circuit conduit of a heater plug. If there is no spark with a heater plug then that particular plug is defective. This test should also be made if **the tell-tale light glows with a white light** when the starter switch is in position "1". By this means you can discover the heater plug that is earthing. Defective heater plugs must be replaced.

d) Series resistances or the tell tale light are themselves defective. Have them replaced at a service station.

The engine does not start up, although the starter turns over and the heater plugs are in order. In this case the cause is almost always lack of fuel.

a) No fuel in the tank: Fill up; after refilling a completely empty tank first clear the fuel system of air (see page 31).

b) The engine is still too cold: see precautions for low temperatures page 22.

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a) No fuel in the tank: Fill up; after refilling a completely empty tank first clear the fuel system of air (see page 31).

b) The engine is still too cold: see precautions for low temperatures page 22.

c) The fuel system has been insufficiently cleared of air, clear of air once again (see page 31). When carrying out this process make sure that the fuel pipes are not leaking and that the fuel filter is not too dirty. If necessary clean the fuel filter (see page 30) and if need be replace the paper insert of the fuel filter at the engine (see page 30). Tighten up the connections of leaky pipes.

d) If there is no ignition in one or several cylinders, the respective heater plug may have body contact, i. e. there is passage of current, but the heater plug does not glow up. This can be recognized if the heater plug remains wet or sooted.

The engine stalls

The cause is almost always lack of fuel:

a) Insufficient fuel in tank: Refill tank at once. Attention! If the tank has been emptied completely make sure to bleed fuel system thoroughly after having refilled the tank, see page 31.

b) The prefilter is dirty: for cleaning see page 30.

c) Fuel filter on engine is dirty: replace paper element, see page 30.

d) Fuel pipes are leaking: tighten up the connections of the pipes.

e) Fuel supply pump is not supplying fuel. If the fuel supply pump should fail, pump the fuel filter full to overflowing with the hand primer on the supply pump and clear the injection pump of air. You can then drive on a few miles by using the fuel filter as an auxiliary tank, but in doing so you must leave the vent screw on the top of the fuel filter open.

f) Sprayers are dirty or damaged: this is particularly liable to happen with unsuitable fuel. Have the nozzles exchanged and cleaned at a service station.

The engine suddenly starts to knock very loudly:

A nozzle is left hanging because of dirt.

Remedy: First de-clutch then press hard down on the accelerator several times. If the knock occurs frequently, it is advisable to have the nozzle and the whole fuel system cleaned as soon as possible at a service station.

Engine gives off thick black clouds of soot:

This may be attributed to the following causes:

a) Air filter blocked: clean air filter (see page 29).

b) One or more nozzles are coked up or defective, a nozzle needle is catching: Check over the nozzles, and also test the fuel filter.

c) Injection pump out of order.

d) Insufficient compression.
Defects b) to d) should only be put right at a service station.

c) The fuel system has been insufficiently cleared of air, clear of air once again (see page 31). When carrying out this process make sure that the fuel pipes are not leaking and that the fuel filter is not too dirty. If necessary clean the fuel filter (see page 30) and if need be replace the paper insert of the fuel filter at the engine (see page 30). Tighten up the connections of leaky pipes.

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d) Fuel pipes are leaking: tighten up the connections of the pipes.

e) Fuel supply pump is not supplying fuel. If the fuel supply pump should fail, pump the fuel filter full to overflowing with the hand primer on the supply pump and clear the injection pump of air. You can then drive on a few miles by using the fuel filter as an auxiliary tank, but in doing so you must leave the vent screw on the top of the fuel filter open.

f) Sprayers are dirty or damaged: this is particularly liable to happen with unsuitable fuel. Have the nozzles exchanged and cleaned at a service station.

The engine suddenly starts to knock very loudly:

A nozzle is left hanging because of dirt.

Remedy: First de-clutch then press hard down on the accelerator several times. If the knock occurs frequently, it is advisable to have the nozzle and the whole fuel system cleaned as soon as possible at a service station.

Engine gives off thick black clouds of soot:

This may be attributed to the following causes:

a) Air filter blocked: clean air filter (see page 29).

b) One or more nozzles are coked up or defective, a nozzle needle is catching: Check over the nozzles, and also test the fuel filter.

c) Injection pump out of order.

d) Insufficient compression.
Defects b) to d) should only be put right at a service station.

c) The fuel system has been insufficiently cleared of air, clear of air once again (see page 31). When carrying out this process make sure that the fuel pipes are not leaking and that the fuel filter is not too dirty. If necessary clean the fuel filter (see page 30) and if need be replace the paper insert of the fuel filter at the engine (see page 30). Tighten up the connections of leaky pipes.

d) If there is no ignition in one or several cylinders, the respective heater plug may have body contact, i. e. there is passage of current, but the heater plug does not glow up. This can be recognized if the heater plug remains wet or sooted.

The engine stalls

The cause is almost always lack of fuel:

a) Insufficient fuel in tank: Refill tank at once. Attention! If the tank has been emptied completely make sure to bleed fuel system thoroughly after having refilled the tank, see page 31.

b) The prefilter is dirty: for cleaning see page 30.

c) Fuel filter on engine is dirty: replace paper element, see page 30.

d) Fuel pipes are leaking: tighten up the connections of the pipes.

e) Fuel supply pump is not supplying fuel. If the fuel supply pump should fail, pump the fuel filter full to overflowing with the hand primer on the supply pump and clear the injection pump of air. You can then drive on a few miles by using the fuel filter as an auxiliary tank, but in doing so you must leave the vent screw on the top of the fuel filter open.

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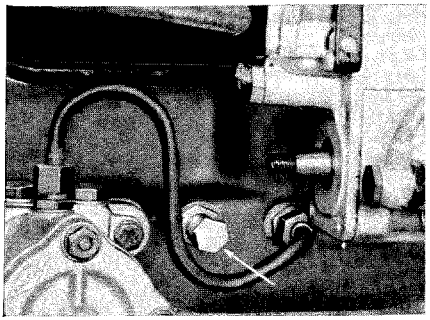
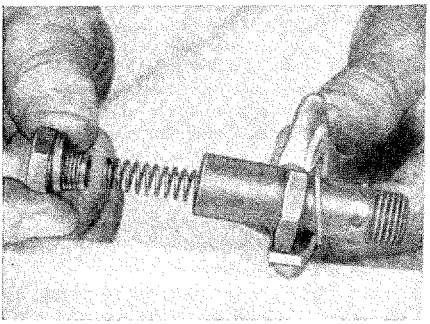
The oil pressure suddenly drops

The cause of trouble may be:

a) Too little oil in the crankcase.
The lack of oil may be noticeable by a drop in the oil pressure, see page 19, when cornering, whilst the gauge indicates normal pressure when driving straight: The oil level in the crankcase should at least come up to the 1st mark on the dipstick.

b) The oil excess pressure valve on the engine is dirty or leaky.
Remove the excess pressure valve, dismantle it and clean.





c) The pipe between the crankcase and the oil filter is leaking. Tighten up the connections.

If sections a–c are in order:

d) Test the oil pressure gauge itself:
Unscrew the connection pipe on the filter. If oil escapes from the point of connection when the engine is running, it is only the oil pressure gauge itself or else the pipe leading to the pressure gauge that is defective. Otherwise there is a defect in the engine which can only be put right at a service station.

The engine becomes too hot

Possible causes of trouble:

a) too little water in the radiator. Be careful when taking off the radiator cap as boiling water may spurt out. Top up with water only when the engine is running and slowly.

Test the hose connections at the top and the bottom between the engine and the radiator to see that they are firmly attached and if necessary tighten;

b) the radiator may be covered up too much by the radiator muff;

c) the fan belt operating the fan and water pump is not tight enough or torn. Test the tension (see page 28);

d) radiator is dirty; clean (see page 41);

e) the water pump is defective; this can only be put right at a service station;

f) the gasket on the cylinder head is leaky; this can be detected by gas bubbles in the cooling water. A new cylinder head gasket should only be fitted at a service station.

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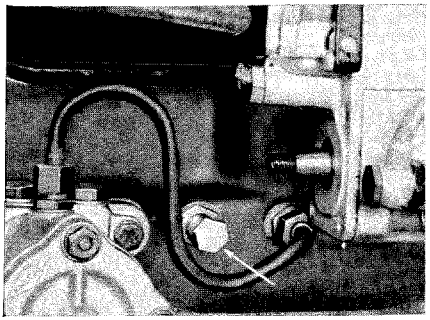

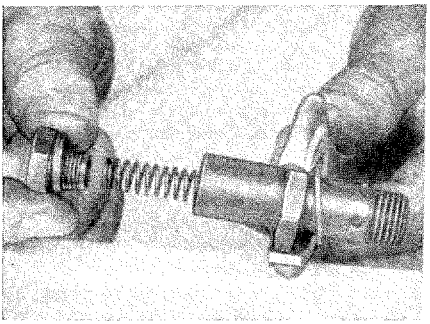

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The red charging control lamp lights up when driving:

If the red charging control lamp lights up when you are driving, i. e. at medium and high engine speeds, this is an indication that the electrical system is not in order. Stop immediately and look for the cause of trouble: Possible causes are:

a) the cable from charging control lamp to dynamo or from charging control lamp to battery is earthing;

b) the fan belt is loose or defective; to tighten see page 28;

c) a defect in the dynamo, which should be put right as quickly as possible at a service station, as the battery will no longer be charged once the dynamo is out of action.

The clutch is slipping:

If you discover that the engine speed is increased when you press down the accelerator, without any acceleration in the travelling speed, then the clutch is slipping. If necessary you can drive on slowly to the nearest service station, taking care however to press lightly on the accelerator so that the clutch does not slip. This can be done mostly by engaging a lower gear.

Possible causes of trouble:

1. **The clutch pedal has not the prescribed amount of free play.** To adjust see page 32.
2. **Clutch is oiled up.**
3. **Defective clutch lining or clutch,** which can best be put right at a service station.

Brakes

If the brakes are functioning perfectly, the brake pedal should have a pressure point when you test them **before starting on a journey.**

If this is not the case, the following symptoms may be found:

a) **The brake pedal can be pressed right down quickly or slowly.**
Possible causes of trouble:
   1. A leaky wheel cylinder or brake pipe. Before starting out, seal up the leaky part by tightening the connections, or else get help from a service station.
   2. The master brake cylinder is defective. This can not be detected by any external leakage. The master brake cylinder can only be put right at a service station.

b) **The brake pedal can be pushed right down against an elastic perceptible resistance.** In this case there is air in the braking system: To bleed the brakes see page 32, and if necessary top up the reservoir with brake fluid.

If you find that the brake pedal can be pushed right down when driving down a long hill: release the pedal for an instant and actuate it twice in quick succession, and you should then again feel the resistance.

If, however, the brakes still do not work, stop the car by means of the handbrake and, if necessary, by changing down to a lower gear.

Check to see whether there is a defect as in a) or b) and adjust the brakes. Have the braking system checked over as soon as possible at a service station workshop.

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Defects in the electrical system

All the fuses are to be found in two fuse boxes on the dashboard under the left half of the bonnet (see page 38).

Possible causes of failure of some electrical fitting:

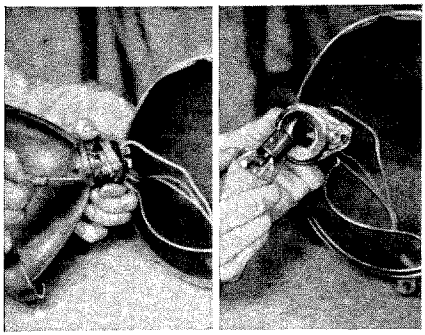
1. The fuse has a faulty contact: turn the fuse round, clean up the contacts, if necessary bend the contact spring.
2. The fuse is defective; it is either burnt out or else the fuse wire is not making contact inside the fuse, and this cannot be defected for certain from the outside. Only use soldered fuses as replacements.
3. A faulty contact at a connection: tighten up the terminals.
4. A lead is earthing: check over the cables for the fault.
5. The fitting itself is defective: defects 3—5 are best dealt with at a service station workshop.

Headlamps

A lighting defect in a headlamp may have the following causes:

1. Headlamp not properly aligned. For alignment of headlamps see page 40.
2. Fuse is defective or has a bad contact. Replace the fuse.
3. The Bilux bulb is defective. This can be detected by a black or bluish mark on the glass. To replace a Bilux (anti-dazzle bulb.) bulb see below.
4. A fault in the manufacture of the Bilux bulb, the filament is not in the focal point. This defect cannot be detected in the bulb externally. To replace the Bilux bulb see below. The correct alignment of the bulbs can be checked as on page 40.
5. A faulty contact on the supply lead and the earth lead of the headlamps: Test, clean and tighten the terminals.

To change a headlamp bulb:



Unscrew the retaining screw underneath the headlamp. Push the front part of the headlamp upwards and then lift the lug — on its top edge — out of the back part of the lamp and remove. Unscrew the bulb holder out of the front part of the lamp, press the bulb in, twist it left and pull out. Take care not to touch the bulb with dirty or oily fingers, otherwise the heat of the bulb will later vaporize the oil, which will then form a deposit on the reflector and considerably reduce the efficiency of the lamp.

Press the new Bilux bulb in, turn it right and pull it back as far as it will go. Reinsert the front of the lamp — first putting the lug in the slot in the back part of the lamp —, tighten up the retaining screw.

Technical Data

Engine

Model	M-B Type OM 636 VI
Type of engine	Diesel 4-stroke
Continous output	40 BHP at 3,200 r.p. m.
Engine speed at 62 mph	3330 r.p.m.
No. of cylinders	4
Bore/stroke	$2^{61}/_{64}/3^{15}/_{16}$ ins. $^{75}/_{100}$ mm
Cylinder capacity	107.8 cu. ins. (1767 c.c.)
Compression ratio	19 : 1
Valve clearance with cold engine	Intake valve 0.0078 ins. Exhaust valve 0.0059 ins.
Injection order, cyl 1 at radiator end	1-3-4-2
Injection beginns for cyl 1	30° B.U.D.C.
Injection pump:	Bosch
Injection nozzles with holder:	Bosch
Working pressure of injection nozzles	1635 psi (115 atm) with run-in nozzles at 1420 psi (100 atm)
Glow plugs:	Bosch and Beru
Fuel supply:	feed pump at injection pump
Starter:	Bosch EJD 1,8/12 R 56
Dynamo:	Bosch RJH 130/12-2000-R 1
Cooling:	water circulation by pump
Operating temperature of water:	by thermostat 158-194° F
Capacity of cooling system: without DB heating, approx.	$15^7/_8$ Imp. pts. or 19 US pts.
with DB heating, approx.	$17^3/_4$ Imp. pts. or $21^3/_8$ US pts.
Oil capacity in crankcase	max. 7 Imp. pts. or $8^1/_2$ US pts. min. $4^1/_2$ Imp. pts. or $5^1/_3$ US pts.

Chassis

Transmission	four-speed gear fully synchronised
Steering	Ross steering type 542 with divided track rod
Camber of front wheels	1°
Gather of front wheels (toe-in)	$^1/_8$ to $^5/_{32}$ ins.

	1st gear	2nd gear	3rd gear	4th gear
Travelling speed in mph	16,5	29,3	46,8	62,5
Climbing ability	1 in 2,8	1 in 5,7	1 in 10	1 in 15.4

Wheels	Disc wheels	Size of tyres	5.50 × 16
Type of rim	Well base rim	Tyre pressure front / Tyre pressure rear	see page 36
Size of rim	3.50 D × 16		

Car

Max. length	$175^3/_8$ ins.
Max. width	$66^1/_4$ ins.
Max. height, unloaded	$63^3/_8$ ins.
Wheelbase	112 ins.
Track, front	$51^3/_4$ ins.
Track, rear	$56^{13}/_{32}$ ins.
Ground clearance	$7^1/_4$ ins.
Diameter of turning circle, approx.	36 ft
Max. clocked speed, approx.	62 mph
Autobahn cruising speed	62 mph
Lube oil consumption	235 m/Imp. pt. or 196 m/US pt.
Standart fuel consumption	46 m/Imp. gal. or 39 m/US gal.
Fuel tank capacity approx.	$10^1/_2$ Imp. gal. $12^1/_2$ US gal.

Weights

Chassis, approx.	1880 lbs.
Curb weight of vehicle (unloaded acc. to Din 70020), approx.	2810 lbs.
Max. permissible weight, approx.	3610 lbs.
Max. permissible load, approx.	870 lbs.
Axle load front, approx.	1570 lbs.
Axle load rear, approx.	2050 lbs.

Subject to modification

Alphabetical Index

VII. 52. 1000. engl.