

*Change: Further modified valve control added.*

**Note:** The exhaust attachment shown is for left-hand drive cars. For right-hand drive cars the exhaust is freely suspended.

**Installation:**

2. Test gasket (3) for intake pipes and exhaust manifold. Damaged gaskets should be replaced. For this purpose, remove intake pipes (Fig. 01-4/19).
3. Hold exhaust manifold to cylinder head and tighten hexagon nuts. Tighten hexagon nuts on screw of three-hole flange (11) and hexagon screw (5 a) which hold bracket (10) to support (8).

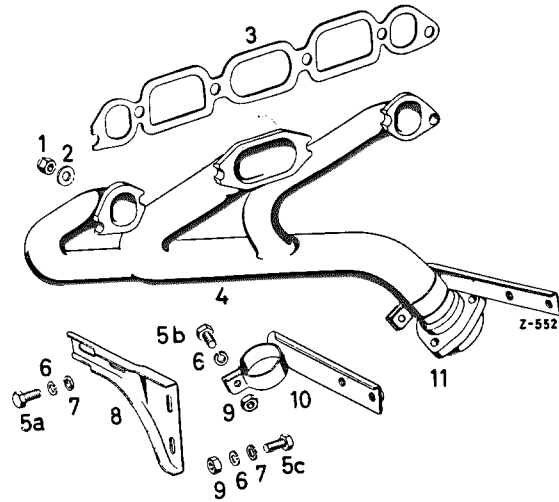


Fig. 01-4/19

- |                    |                     |
|--------------------|---------------------|
| 1 Hexagon nut      | 6 Spring washer     |
| 2 Washer           | 7 Washer            |
| 3 Gasket           | 8 Support           |
| 4 Exhaust manifold | 9 Hex nut           |
| 5a Hex screw       | 10 Bracket          |
| 5b Hex screw       | 11 Threehole flange |
| 5c Hex screw       |                     |

**C. Removal and Installation of Cylinder Head,**

**Valves, Camshaft, Chain Tensioner, Tension Sprocket Bearing and Rocker Arms**

Repair procedures see Job No. 01-5 and 05-5.

Removal and installation of cylinder head, valves, camshaft, chain tensioner, tension sprocket bearing and rocker arms for Models 180 a, 180 b, 190 SL, 220 a, 219, 220 S and 220 SE is substantially similar to Model 190. Deviations are described in section I to III.

Unless the cylinder head requires disassembly for reconditioning, the intake pipe with the carburetor system and the exhaust manifold should suitably remain attached to the cylinder head during removal and installation. This applies particularly to Model 190 SL, because the loosening and re-attachment of these components in built-in condition is difficult.

**I. Removal and Installation of Cylinder Head on Model 190 SL**

Also refer to Section III.

**Removal:**

1. Loosen choke cable on air suction tube and on choke valve levers, as well as the hot-start cable on bearing block and angle lever.
2. Remove air hose from air intake silencer to air suction tube, and vent tube from cylinder head cover to air intake silencer.
3. With built-in ATE power brake disconnect vacuum line at the threaded union of rear intake pipe.

**Note:** With built-in idle cutout valve disconnect cable on rear carburetor.

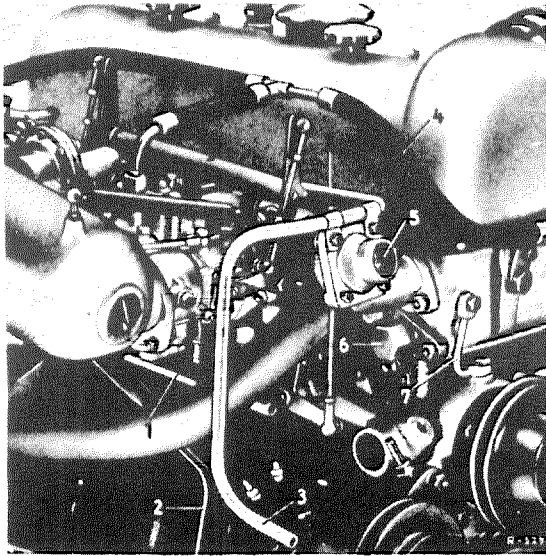


Fig. 01-4/20

**Die-Cast Carburetor**

- |                      |                             |
|----------------------|-----------------------------|
| 1 Water return pipe  | 5 Cooling water drain union |
| 2 Leak-off pipe      | with cool. water thermostat |
| 3 Fuel overflow line | 6 Chain tensioner           |
| 4 Fuel line          | 7 Air vent line             |

4. Detach fuel line (4) on both carburetors and on fuel feed pump while supporting pipe union (Fig. 01-4/20). Then loosen clamp which holds fuel line to cylinder head and remove line.
5. Then loosen strut (4) which supports the carburetor system at top of air suction tube (refer to Fig. 01-4/6).
6. Unscrew fuel leak-off pipe (3) on Tee-piece (refer to Fig. 01-4/6).
7. Pull fuel overflow line (3) out of connecting hose to front pipe connection (Fig. 01-4/20).
8. With engine installed drain part of the cooling water, be careful of additives.
9. Loosen water hose from radiator to cooling water thermostat (5) and water return pipe (1) on connecting hose to distributor pipe (Fig. 01-4/20).
10. Unscrew air vent line (7) on water pump and on cylinder head.
11. Unhook accelerator linkage and unscrew exhaust pipe on exhaust manifold.
12. Remove distributor with distributor bearing (refer to Job No. 01-4, Section F). If the distributor bearing is the first version, that is a bearing without fixing eye, there is no need for removal.
13. Unscrew thermostat for cooling water telethermometer from cylinder head and take capillary tube from clamp on ignition cable conduit.
14. Unscrew water pipe bend for heating pipe union on cylinder head.
15. For further disassembly proceed as for Model 190.

**Installation:**

16. Following the installation of the cylinder head, which is done vice-versa, set ignition (refer to Job No. 01-3, Section E).
17. Warm up engine and tighten cylinder head screws (refer to Section III, (Para i).

**Note:** On model 190 SL with the new, further modified valve controls (Fig. 01-4/20 a) the valve stem seal and the removal of the rocker arms differ as described below. Rocker arms for inlet and outlet valves are of similar design.

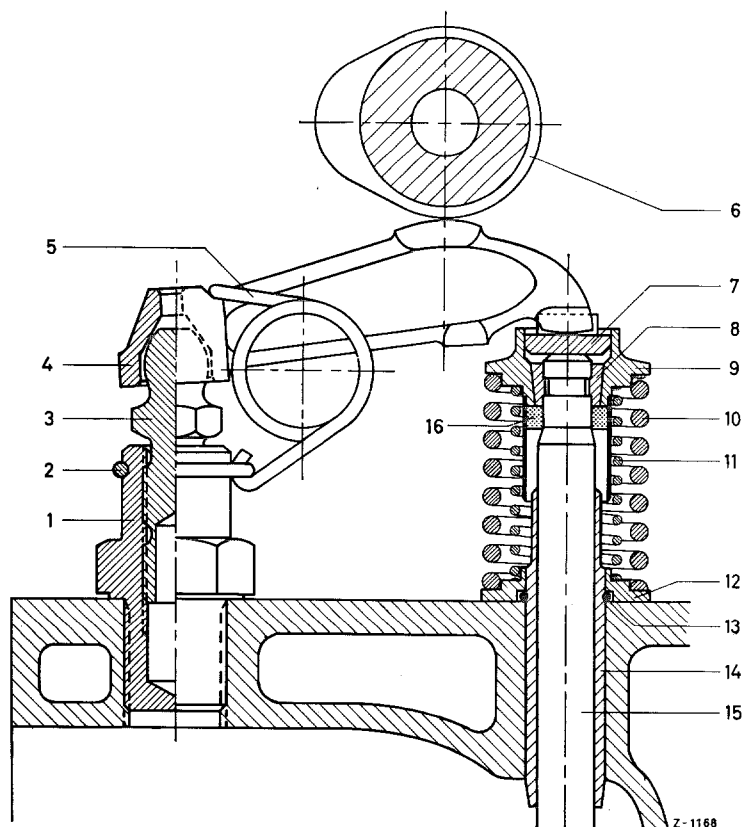


Fig. 01-4/20 a

**New, further modified valve controls types 180 c and 190 SL**

- 1 Ball pin socket
- 2 Annular spring
- 3 Ball pin top
- 4 Rocker arm
- 5 Tension spring
- 6 Camshaft
- 7 Thrust plate
- 8 Valve cone section
- 9 Valve plate with sealing ring holder
- 10 Outer valve spring
- 11 Inner valve spring
- 12 Thrust plate
- 13 Snap ring
- 14 Valve guide
- 15 Valve
- 16 Sealing ring

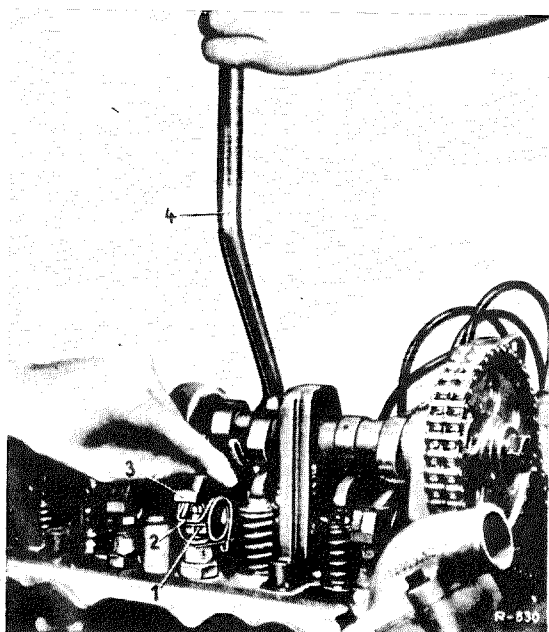


Fig. 01-4/20 b

- 1 Ball pin top
- 2 Tension spring
- 3 Rocker arm
- 4 Disassembly and assembly tool 1115890161

**Disassembly of Rocker Arm:**

1. Push tension spring (2) out of notch at top of rocker arm (3) and slide spring over ball

socket of rocker arm outwards (refer to Fig. 01-4/20 b).

2. Apply disassembly and assembly tool (4) 111 589 01 61 to camshaft and valve spring plate and force valve downward to relieve rocker arm (3) (Fig. 01-4/20 b).
3. Lift rocker arm (3) from ball pin top (1) and remove (Fig. 01-4/20 b).

**Note:** Prior to installation check slide surfaces and ball socket of rocker arm. Damaged rocker arms should be replaced.

**Installation of Rocker Arms:**

4. Apply disassembly and assembly tool 111 589 01 61 to camshaft and to valve spring plate and press valve downward to the point where the rocker arm with its ball socket can be inserted into the ball pin top.
5. Insert rocker arm.
6. Push tension spring across ball socket of rocker arm toward the front until it snaps into the notch of the rocker arm.
7. Check or adjust valve clearance (refer to Job No. 00-3).

## Valve Stem Sealing

A sealing ring holder (3) in the shape of a bell enveloping the valve guide is soldered to the valve spring plate (5) at the exhaust valve (8). The rubber sealing ring (4) is inserted into sealing ring holder from below (Fig. 01-4/20 d).

Valve stem sealing at inlet valve (8) is effected by a sealing ring holder (3) by means of a Silicon sealing ring (4). The sealing ring holder is pushed over the valve guide and held in place by the inner valve spring (10) (Fig. 01-4/20 c).

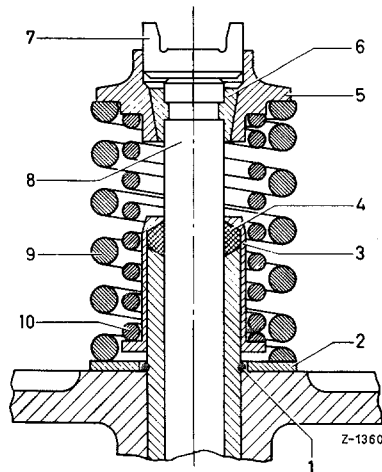


Fig. 01-4/20 c

### Inlet Valve

- |                           |                       |
|---------------------------|-----------------------|
| 1 Lock washer             | 6 Valve cone section  |
| 2 Washer for valve spring | 7 Thrust plate        |
| 3 Sealing ring holder     | 8 Inlet valve         |
| 4 Silicon sealing ring    | 9 Outer valve spring  |
| 5 Valve spring plate      | 10 Inner valve spring |

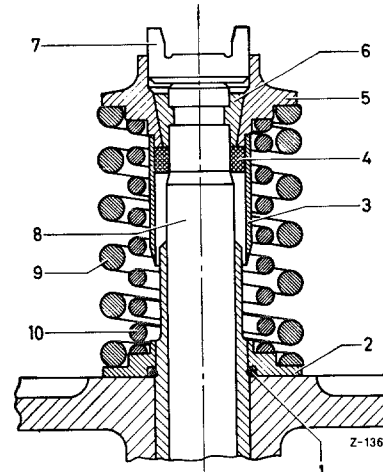


Fig. 01-4/20 d

### Exhaust Valve

- |                       |                       |
|-----------------------|-----------------------|
| 1 Lock washer         | 6 Valve cone section  |
| 2 Thrust ring         | 7 Thrust plate        |
| 3 Sealing ring holder | 8 Exhaust valve       |
| 4 Sealing ring        | 9 Outer valve spring  |
| 5 Valve spring plate  | 10 Inner valve spring |

During assembly the following points should be observed

- Valves should have no burr at the groove for the valve cone sections to eliminate any possibility of damage when the sealing rings are attached.
- Don't forget washer (2) or thrust ring (2) for spring support (Fig. 01-4/20 c and 01-4/20 d).
- The sealing ring holder (3) at the inlet valve (8) should slide easily over valve guide, but without play (Fig. 01-4/20 c).
- The sealing ring holder at the exhaust valve should not cover the valve guide more than 2.5 to 3 mm when the valve is closed.
- Valve cone section should bear only at top and bottom of stem next to the groove, but not on bottom of groove.
- The gap between the two valve cone sections should be of similar size on both sides when assembled.
- During assembly be sure that sealing ring holder (3) does not touch valve spring (10) (Fig. 01-4/20 d).

## II. Removal and Installation of Cylinder Head of Model 220 SE

Also refer to Section III.

### Removal:

- Remove air filter. For this purpose loosen vent line to cylinder head, supplementary air line (2), connection to venturi control

unit and fixing screw on supporting rod (19) (refer to Fig. 01-4/11 a). Then remove air filter **in upward direction**, since the inlet air thermostat (13) projects into the air filter.

2. Disconnect the vacuum line to the distributor at the venturi control unit, detach the pull rod and the return spring at the throttle valve lever and unscrew the venturi control unit.
3. If the engine is installed in the car, drain off part of the cooling water and collect additives if present.
4. Remove the supplementary-air line, the injection pipes from the injection pump to the fuel distributor fittings, and the cooling water lines for the cooling water thermostat.
5. Further removal procedures are the same as for Model 190.
7. Attach the venturi control unit and the return spring holder to the intake pipe; do not omit the sealing ring (O-ring). Attach the vacuum line to the distributor and attach the pull rod and the return spring to the throttle valve lever.
8. **Check the adjustment of the control linkage** (see Workshop Manual Passenger Car Models starting August 1959, Job No. 00-16).
9. Install the air filter, fasten it, and connect all lines. When installing the air filter, take care to ensure that the rubber grommet is properly seated in the filter bottom and is not pushed into the filter housing.
10. Top up the cooling water.

#### Installation:

6. Installation of the cylinder head is the reverse of the removal procedure. After installation attach all pipes and lines.
11. Set the ignition (see Job No. 01-3, Section E).
12. Warm up the engine and retighten the cylinder head screws (see Section III, para i).

### III. Procedure Differences for the Individual Models Concerning Removal and Installation of Cylinder Head, Valves, Camshaft, Chain Tensioner, Tension Sprocket, and Rocker Arms

#### a) Cylinder Head

##### 1. Compression Ratio

**When the cylinder head is replaced, pay attention to the stamped or cast-in compression ratio.**

In order to exclude confusion between the cylinder heads for the different compression ratios, the compression ratio of the engine has been cast into the left side of the cylinder head above the threaded union for the water pipe connection (Fig. 01-4/21).

On previous cars the compression ratio was stamped into the left rear part of the machined surface (Fig. 01-4/21).

In order to increase engine performance and torque, the compression ratio was increased on Models 219 and 220 S from  $\epsilon = 7.6 : 1$  to  $\epsilon = 8.7 : 1$ .

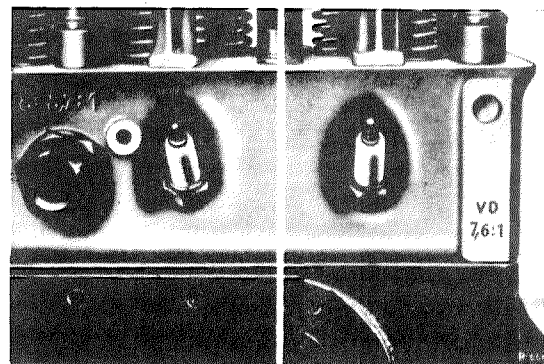


Fig. 01-4/21

Compression ratio on cylinder head

Cast-in on recent cars

Previously stamped

On Model 190 SL the compression ratio was also increased from  $\epsilon = 8.5 : 1$  to  $\epsilon = 8.8 : 1$ . When cylinder heads are replaced on Models 220 a, 219, and 220 S, replacement cylinder heads are only supplied for a

compression ratio  $\epsilon = 8.7 : 1$ , even if the engine was originally supplied with a cylinder head for a compression ratio  $\epsilon = 7.6 : 1$ . We recommend, however, that when the higher compression cylinder head is installed, particularly in cars which are normally driven at high speeds, that the exhaust valves are replaced by sodium-filled exhaust valves as installed originally on Model 220 S and installed as a standard part on Model 219 with a compression ratio  $\epsilon = 8.7 : 1$ .

In the same way replacement cylinder heads for Model 180 a are only supplied with a compression ratio  $\epsilon = 7.0 : 1$  and for Model 190 SL with a compression ratio  $\epsilon = 8.8 : 1$ .

If pinking occurs during acceleration in the lower speed range when lower octane-number fuel is used in the case of Model 180 a with a compression ratio  $\epsilon = 7.0 : 1$ , distributor VJU R 4 BR 28 should be installed. This distributor has a retarded centrifugal governor advance. When distributor VJU R 4 BR 28 is being installed, the ignition should at the same time be retarded to  $4^\circ$  BTDC, since otherwise ignition would be too early in the upper speed range. For countries using fuel of a lower octane rating, Models 220 a, 219, and 220 S have occasionally been supplied with a compression ratio of  $\epsilon = 6.8 : 1$ .

The correct compression ratio for countries above 2000 meters altitude is  $\epsilon = 7.5 : 1$  for Models 180 a and 180 b.

## 2. Cylinder Head Gasket and Water Distributor

The water distributor, which on Models 180 a, 190 SL, 220 a, 219, and 220 S was previously stamped into the crankcase, has for some months now been pressed into the cylinder head. This alteration makes it necessary to use a different cylinder head gasket.

On Models 180 b, 219, and 220 S with a compression ratio of  $\epsilon = 8.7 : 1$  and on Model 220 SE the water distributor was pressed into the cylinder head on all cars.

**Note:** All replacement cylinder heads are supplied with a pressed-in water distributor system. If such replacement cylinder heads are used on engines on which the water distributor is located in the crankcase, the water distributor in the crankcase must be

removed and the correct gasket type must be installed.

### Four-cylinder engines

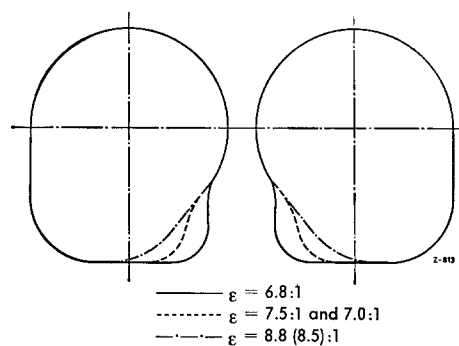


Fig. 01-4/22

### Six-cylinder engines

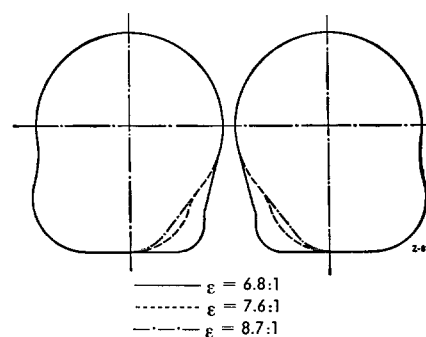


Fig. 01-4/23

**It follows that different gaskets must be used for engines with water distributors in the cylinder head as for engines with water distributors in the crankcase.**

Before installing the cylinder head gasket, check

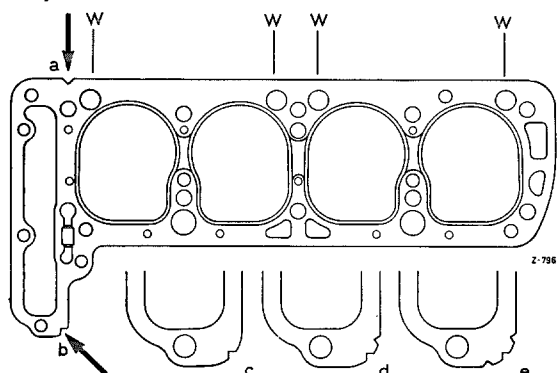
- the location of the water distributors,
- the compression ratio of the engine.

The easiest way of checking this is to put the cylinder head gasket on the cylinder head and to check whether the shape of the combustion chamber in the cylinder head and in the gasket correspond (Figs. 01-4/22 and 01-4/23).

Together with the introduction of the higher compression ratio ( $\epsilon = 8.7 : 1$ ) on Models 219 and 220 S the cylinder head gasket was increased from 1.5 mm to 2 mm (unpressed). On the other hand, the crankcase was made 0.5 mm lower at the separating surface in accordance with the thicker gasket.

On recent cars of Models 220 a, 219, and 220 S of a compression ratio of  $6.8 : 1$  these 2 mm cylinder head gaskets and the lower crankcases have been installed as standard parts.

Be sure that no thin seal of 1.5 mm thickness is placed into engine having the lower crankcase, because in unfavorable cases the piston may then touch the inlet valve.



For better distinction of cylinder head gaskets – also when installed – the gaskets for the engines with water distributors are marked with notches on the cylinder head, which were first at the front right part, but are now at the left front part (see arrows in Fig. 01–4/24).

Fig. 01–4/24

#### Marking of Cylinder Head Gasket in a 4-Cylinder Engine

- a = 1st version of notch marks
- b = 2nd version of notch marks
- c = 1 notch as identification mark
- d = 2 notches as identification mark
- e = 3 notches as identification mark
- W = Water holes right

The table below shows the various cylinder head gaskets including the various notch marks.

#### Cylinder Head Gaskets

| Model  | Compression Ratio             | Part.-No. of Cylinder Head Gaskets for Engines with Water Distributors in      |   | Notch Mark |
|--|-------------------------------|--|---|------------|
|  |                               | Cylinder Crankcase   | Cylinder Head   |            |
| 180 a<br>(190 after SA 10250)                                  | 6.8 : 1                       | 121 016 10 20 (Diring)   | 121 016 19 20 (Goetze)<br>121 016 22 20 (Diring)  | —          |
| 180 a, 180 b, 180 c,<br>(190, 190 b acc.<br>to SA 10250)       | 7.0 : 1                       | The water distributors are<br>pressed into cylinder head<br>from the beginning | 121 016 25 20 (Goetze) <sup>2)</sup><br>121 016 24 20 (Diring) <sup>2)</sup>  | —          |
| 190, (180 a, 180 b<br>acc. to SA 10331)                        | 7.5 : 1                       | 121 016 09 20 (Diring)   | 121 016 25 20 (Goetze) <sup>2)</sup><br>121 016 24 20 (Diring) <sup>2)</sup>  | —          |
| 190 b, 190 c,<br>190 SL  | 8.5 : 1<br>8.7 : 1<br>8.8 : 1 | 121 016 08 20 (Diring)   | 121 016 26 20 (Goetze) <sup>2)</sup><br>121 016 23 20 (Diring) <sup>2)</sup>  | —          |
| 220 a and 219<br>acc. to SA 10037<br>220 S acc.<br>to SA 10187 | 6.8 : 1                       | 180 016 15 20  | 180 016 28 20 (Diring) <sup>2)</sup>  | —          |
| 220 a<br>219, 220 S  | 7.6 : 1                       | 180 016 16 20 (Diring)<br>optional<br>180 016 17 20 (Goetze)                   | In the event of a replacement for Models 220 a, 219, 220 S, only one cyl. head at a compr. ratio of $\epsilon = 8.7:1$ will be supplied | —          |
| 220 a, 219<br>220 S  | 8.7 : 1                       | The water distributors are<br>pressed into cylinder head<br>from beginning     | 180 016 27 20 (Diring) <sup>2)</sup><br>180 016 29 20 (Goetze) <sup>2)</sup>  | —          |
| 220 SE   | 8.7 : 1                       |  | 127 016 08 20 (Diring) <sup>2)</sup>  | —          |

<sup>1)</sup> Only for cylinder head gaskets of engine with water distributors in cylinder head.

<sup>2)</sup> With copper-lined water holes.

## b) Valve Guides with Valve Stem Sealing Systems

Valves stem sealing for Models 180 a, 180 b, 190 b, 190 SL, 220 a, 219 and 220 S at inlet and exhaust valves is according to Fig. 01-4/26 or 01-4/27. However, on Model 220 SE the inlet valve is sealed acc. to Fig. 01-4/25 by means of a silicone ring, and the exhaust valve acc. to Fig. 01-4/27.

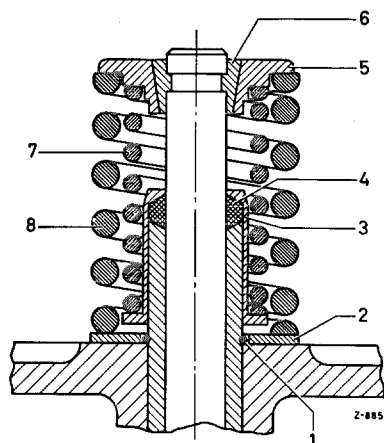


Fig. 01-4/25

### Inlet Valve Stem Sealing for Model 220 SE

- |                         |                         |
|-------------------------|-------------------------|
| 1 Snap ring             | 5 Valve spring retainer |
| 2 Washer                | 6 Valve cone half       |
| 3 Sealing ring retainer | 7 Inner valve spring    |
| 4 Sealing ring          | 8 Outer valve spring    |

When installing the thrust collars which serve to hold the valve guides and as a support for the valve springs, attention should be paid to the type of valve guides used. Formerly, only shouldered valve guides were used (Fig. 01-4/26).

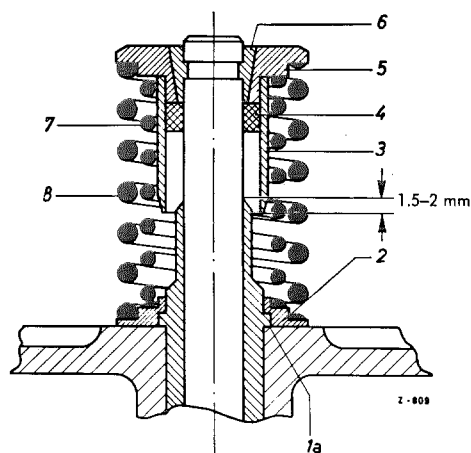


Fig. 01-4/26

### 1st Version

- |                            |                         |
|----------------------------|-------------------------|
| 1a Shoulder on valve guide | 5 Valve spring retainer |
| 2 Thrust collar            | 6 Valve cone half       |
| 3 Sealing ring retainer    | 7 Inner valve spring    |
| 4 Sealing ring             | 8 Outer valve spring    |

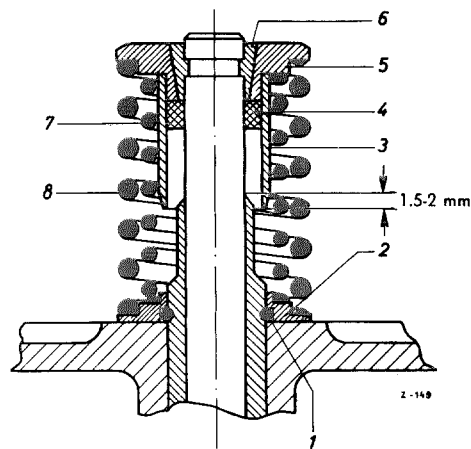


Fig. 01-4/27

### 2nd Version

- |                         |                         |
|-------------------------|-------------------------|
| 1 Snap ring             | 5 Valve spring retainer |
| 2 Thrust collar         | 6 Valve cone half       |
| 3 Sealing ring retainer | 7 Inner valve spring    |
| 4 Sealing ring          | 8 Outer valve spring    |

Now we are using only valve guides with snap ring (Fig. 01-4/27).

For shouldered valve guides only thrust collars, part No. 121 053 01 62 with the dimension  $a = 2.2 + 0.2$  mm may be used, and for valve guides with snap ring only thrust collars, part No. 121 053 02 62, with the dimensions  $a = 1.1 + 0.2$  mm (Fig. 01-4/28).

**In exceptional cases valve guides with snap ring may also use thrust collars of a dimension  $a = 2.2 + 0.2$  mm, but in no case vice-versa.**

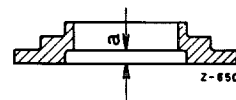


Fig. 01-4/28

$a = 2.2 + 0.2$  mm for shouldered valve guides  
 $a = 1.1 + 0.2$  mm for valve guides with snap ring

**Note:** More recently valve shaft sealing on Models 190 SL, 190 c and 180 c is from the beginning as shown in Fig. 01-4/20 c and 01-4/20 d.

## c) Valves

The following engines are provided with sodium-filled exhaust valves as standard parts:

|        |                           |                        |
|--------|---------------------------|------------------------|
| 180 b  | as from engine end        |                        |
|        | No. 029 282               | Part No. 121 053 15 05 |
| 180 c  | as from 1st engine        | Part No. 121 053 15 05 |
| 190 b  | as from engine end        |                        |
|        | No. 027 409               | Part No. 121 053 15 05 |
| 190 SL | as from compression 8.8:1 | Part No. 121 053 15 05 |
| 219    | as from compression 8.7:1 | Part No. 180 053 11 05 |
| 220 S  | as from 1st engine        | Part No. 180 053 11 05 |
| 220 SE | as from 1st engine        | Part No. 180 053 11 05 |
| 220 SE | Cabriolet A and Coupe A   |                        |
|        | as from 1st engine        | Part No. 180 053 15 05 |



In no case may normal exhaust valves be installed in these engines, since this may lead to burning of the valves.

During subsequent installation of a high-compression cylinder head ( $\epsilon = 8.7:1$ ) on Models 220 a and 219 the use of sodium-cooled exhaust valves is recommended.

The use of sodium-cooled exhaust valves for these models is a must, if a camshaft with the code No. 33 has been used (also refer to Section d).

On Models 180 a and 180 b sodium-cooled exhaust valves may be used in the event of repairs up to engine end No. 029 282.

To prevent confusion, the part No. punched into valve stem end should be observed.

**Note: When scrapping sodium-cooled exhaust valves observe safety regulations!**

**Because of a danger of explosion sodium-cooled valves may not be melted down without first removing the sodium charge. It is similarly dangerous to forge tools such as punches, screw drivers, chisels, etc. from sodium-cooled valves without previously removing the sodium charge.**

Be careful when removing the sodium from valves, because sodium reacts extremely strongly and explosive when in contact with water and aqueous solutions, while in addition the developing inflammable hydrogen gas may start fires.

For removal and installation of valves the valve mounting bridge 180 589 05 63 should be used for 6-cylinder engines, and valve mounting bridge 121 589 01 63 for 4-cylinder engines.

#### d) Camshaft

The valve timing has been changed for engines of Models 190 SL, 220 a, 219 and 220 S (also refer to Job No. 01-3, Section L). To distinguish between the various camshafts they are marked at their rear end face with a number (Fig. 01-4/31).

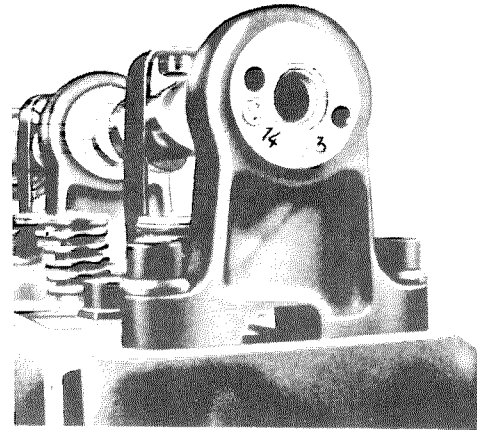


Fig. 01-4/31

#### Code Numbers of Camshafts

| Model                      | Engine End No.                        | Code No. |
|----------------------------|---------------------------------------|----------|
| 180 a, 180 b<br>190, 190 b | —                                     | 11       |
| 180 c, 190 c               | —                                     | 42       |
| 190 SL                     | up to 55 00183                        | 14       |
|                            | from 55 00184                         | 15       |
| 190 SL                     | from further modified<br>valve timing | 44       |
| 220 a                      | up to 55 04778                        | 14       |
|                            | from 55 04779                         | 14/1     |
| 219                        | up to 75 04347                        | 14/1     |
| 220 S                      | up to 75 09083                        |          |
| 219                        | from N 75 04348<br>Z 75 00002         | 33       |
| 220 S                      | from N 75 09084<br>Z 75 00003         |          |
| 220 SE                     | —                                     | 50       |

N = Engine with standard clutch.

Z = Engine with hydraulic automatic clutch.

On Model 190 SL the two camshafts having the code numbers of 14 and 15 may not be mixed up. Because of the longer stroke of the inlet valve the camshaft with Code No. 15 may be used only in combination with the cylinder head now used. If the new camshaft (with the Code No. 15) is nevertheless used with an old cylinder head, the supporting surface on the cylinder head for the thrust collars of the valve springs have to be milled down another Millimeter, because otherwise the valve springs may be crushed when the valve block is fully open (Fig. 01-4/32).

For Models 220 a, 219 and 220 S (also at a compression of  $\epsilon = 7.6:1$ ) only spare camshafts having the Code No. 33 will be supplied.

However, this camshaft may only be used in combination with sodium-cooled exhaust valves.

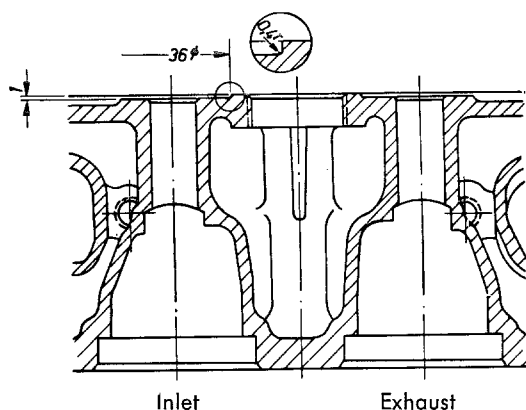


Fig. 01-4/32

### e) Chain Tensioner

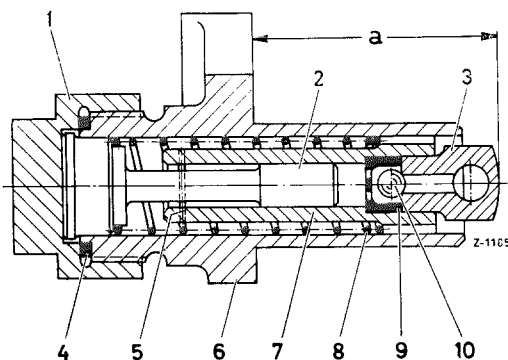


Fig. 01-4/33 a

1st Version

- |                |                           |
|----------------|---------------------------|
| 1 Cover cap    | 6 Chain tensioner housing |
| 2 Pressure pin | 7 Pressure sleeve         |
| 3 Head         | 8 Pressure spring         |
| 4 Sealing ring | 9 Ball retainer           |
| 5 Dowel pin    | 10 Steel ball             |

A self bleeding chain tensioner has been installed (Fig. 01-4/33b). This chain tensioner may be used instead of first version acc. to Fig. 01-4/33 a for subsequent installation, also for Model 220 a. Models 180 b, 190 b, 190 SL and 220 SE have the 2<sup>nd</sup> and 3<sup>rd</sup> version. Installation and removal is similar to model 190. However, it is emphasized once again that the two fixing nuts should be tightened uniformly and carefully. A new seal should also be used.

Following installation check, whether chain tensioner operates accurately without jamming, because otherwise the chain may run noisy.

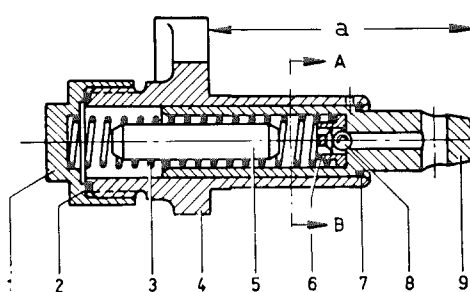
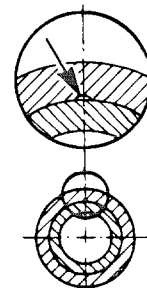


Fig. 01-4/33 b

2nd Version

- |                   |                 |                |
|-------------------|-----------------|----------------|
| 1 Cap nut         | 4 Housing       | 7 Snap ring    |
| 2 Sealing ring    | 5 Pin           | 8 Ball         |
| 3 Pressure spring | 6 Ball retainer | 9 Pressure pin |



Section A-B

Z-769

| Model                                | Part No.                               | Dimension "a"<br>with removed<br>chain tensioner |  |
|--------------------------------------|--|--|--|
| 1st Version                          |  |  |  |
| 180 a<br>190<br>190 SL               | 121 050 03 11                          | 58   |  |
| 220 a<br>219<br>220 S                | 180 050 03 11                          | 52   |  |
| 2nd Version                          |  |  |  |
| 180 a, 180 b<br>190, 190 b<br>190 SL | 621 050 00 11                          | 58   |  |
| 219<br>220 S<br>220 SE               | 180 050 05 11                          | 52   |  |
| 3rd Version <sup>1)</sup>            |  |  |  |
| Model                                | Installed as<br>from engine<br>end No. | Part No.   | Dimension "a"<br>with removed<br>chain tensioner |
| 180 b                                | 017 323                                | 121 050 04 11                                    | 58   |
| 190 b                                | 015 336                                |  |  |
| 190 SL                               | 018 423                                |  |  |
| 220 SE<br>Ca<br>and CpA              | 001 059<br>000 240                     | 180 050 06 11                                    | 52   |
| 4th Version <sup>2)</sup>            |  |  |  |
| 180 c                                | 000 031                                | 121 050 05 11                                    | 58   |
| 190 c                                | 000 341                                |  |  |
| 190 SL                               | 000 007                                |  |  |

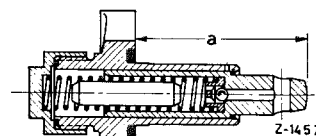


Fig. 01-4/33 c

3rd Version

Z-1457

<sup>1)</sup> The chain tensioner of 3rd design is in its functions similar to the 2nd version. The chain tensioner housing is however provided with an annular groove and a rubber ring is inserted between chain tensioner and cylinder crankcase; the up to now used gasket is therefore omitted (flange gasket).

<sup>2)</sup> The chain tensioner of 4th version (for 4-cyl. engine with improved valve timing) is distinguished from the 3rd version by its stronger pressure spring. This chain tensioner is marked by a red dot on the cap nut.

## f) Tension Sprocket Bearing

If a new tension sprocket bearing is installed in Model 190 SL first measure the height "H" of the web of the oil case (Fig. 01-4/33c). The height of the web was changed from 28 mm to 32 mm and later to 36 mm in order to prevent air from being sucked up by the chain tensioner. On various engines this web was subsequently increased in height by adding a rubber gasket.

In order to prevent the tension sprocket bearing from fouling the web, old tension sprocket bearings with the Part No. 180 050 04 10 or 121 050 01 10 must not be installed in engines with a higher web and in engines modified as shown in Fig. 01-4/33 c. The new tension sprocket bearings with the Part No. 121 050 09 10 (Fig. 01-4/33 c) can be used in any engine.

The subsequent increase of the web height is described in detail in Workshop Manual Model 190 (see Job No. 05-5, Section F).

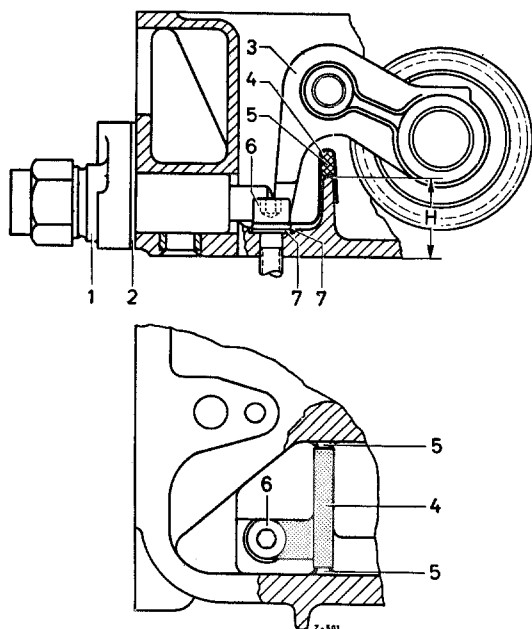


Fig. 01-4/33 c

- 1 Chain tensioner
- 2 Gasket
- 3 Tension Sprocket Bearing 121 050 09 10
- 4 Insert Plate 121 016 00 41
- 5 Rubber Gasket 121 987 00 46
- 6 Hexagon socket screw M 8 × 22 DIN 912-8 G
- 7 Washer 8.4 DIN 433

## g) Chain Guides

On Model 220 SE the arrangement has been modified by adding a guide sprocket in the cylinder head; as a consequence, the chain guide is now fastened to a bracket screwed to the cylinder head. (Fig. 01-4/34).

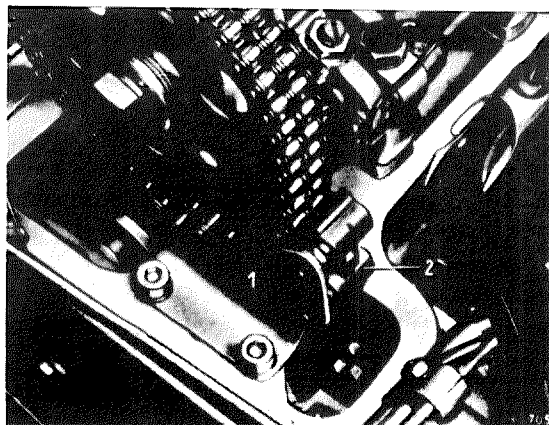


Fig. 01-4/34

- 1 Bracket
- 2 Chain guide

## h) Rocker Arm Blocks and Rocker Arms

On earlier models sheet-metal spring clamps were used to secure the rocker arms (Fig. 01-4/35).

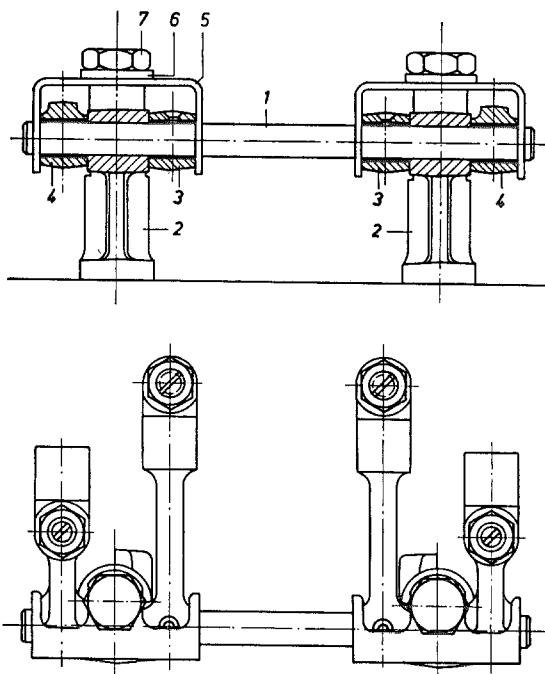


Fig. 01-4/35

- 1 Rocker arm shaft
- 2 Rocker arm block
- 3 Rocker arm for inlet valve
- 4 Rocker arm for exhaust valve
- 5 Spring clamp
- 6 Washer
- 7 Stretch screw

These sheet-metal clamps have now been replaced by spring clamps of spring steel wire (Fig. 01-4/36). At the same time, the

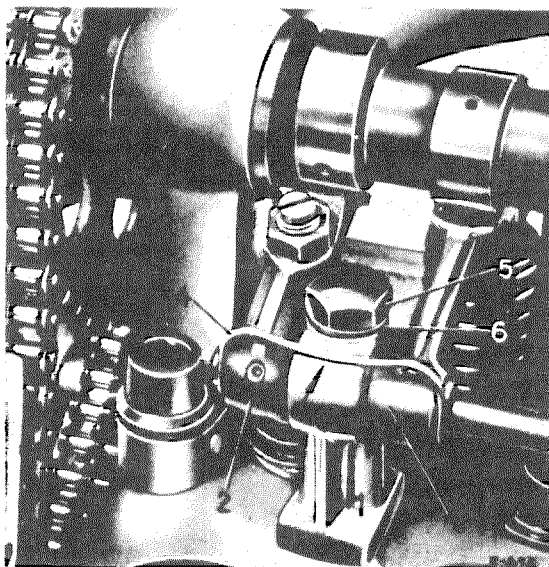


Fig. 01-4/36

- |                                |                 |
|--------------------------------|-----------------|
| 1 Rocker arm block             | 4 Spring clamp  |
| 2 Rocker arm for exhaust valve | 5 Stretch screw |
| 3 Rocker arm for inlet valve   | 6 Washer        |

rocker arm blocks were provided with a notch in which the clamp springs engage (Figs. 01-4/36 and 01-4/37).

When repairs are being carried out, it is advisable to replace the sheet-metal spring clamps by spring clamps of spring steel wire with the Part No. 180 055 00 93. If the old rocker arm blocks are not being replaced, they must be provided with a notch to secure the spring clamp as shown in Fig. 01-4/37. The notch must correspond exactly to the dimensions given above in order to ensure that the clamp is tensioned sufficiently and engages securely.

**Note:** On Models 220 S and 220 SE the length of the rocker arm shafts is 153 mm for the 1<sup>st</sup> version and 159 mm for the 2<sup>nd</sup> version. The projecting ends of the 2<sup>nd</sup> version shafts prevent the spring clamps from jumping off the rocker arm shafts at high engine speeds. If complaints are received, the 1<sup>st</sup> version can without any modification be replaced by the 2<sup>nd</sup> version (Part No. 180 055 08 05) on Models 219, 220 S, and 220 SE.

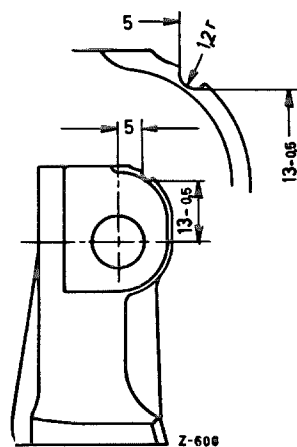


Fig. 01-4/37

#### i) Tightening of Cylinder Head Screws

The cylinder head screws must be tightened in stages and in the sequence shown in Figs. 01-4/38 and 01-4/39.

|   |       |
|---|-------|
| 1 <sup>st</sup> tightening                    | 4 mkg |
| 2 <sup>nd</sup> tightening                    | 6 mkg |
| 3 <sup>rd</sup> tightening                    | 8 mkg |
| 4 <sup>th</sup> tightening (check tightening) | 8 mkg |
| 5 <sup>th</sup> tightening                    |       |
| with engine hot                               | 9 mkg |

#### Tightening Sequence for 4-Cylinder Engines

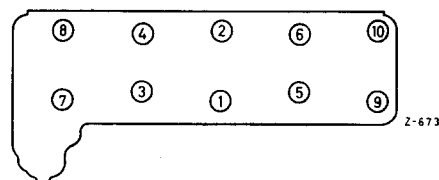


Fig. 01-4/38

#### Tightening Sequence for 6-Cylinder Engines

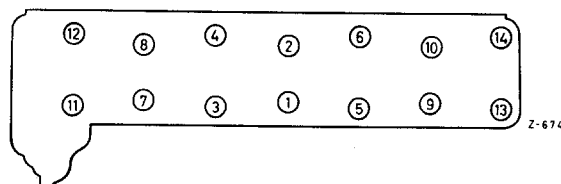


Fig. 01-4/39

The four hexagon socket screws M 8 at the front of the cylinder head should be tightened by hand.

**After tightening the cylinder head screws check whether the camshaft can be turned easily by hand.**

**For the final tightening of the cylinder head screws on the warm engine proceed as follows:**

Warm up the engine under slight load until the cooling water temperature reaches 80° C. Run the engine for another 5 minutes at this cooling water temperature and then tighten the cylinder head screws to **9 mkg** in the sequence indicated above.

After a road test or after a mileage of no more than 20 km check the tightening torque of the cylinder head screws (9 mkg.) Do not force the engine during the road test.

After the road test also check all unions for leakage and all screws for tightness and, if necessary, retighten.

Finally check the tappet clearance once more with the **engine cold**.

After the car has run a further 500 km carry out a third check on the tightening torque of the cylinder head screws with the engine at normal running temperature; the tightening torque must be **9 mkg**.

## **D. Removal and Installation of Generator and Starter**

a) **Removal and Installation of Generator, see Job No. 15-11.**

b) **Removal and Installation of Starter, see Job No. 15-0.**

## **E. Removal and Installation of Water Pump with Fan**

Repair procedures see Job No. 20-5.

On Models 180 a, 180 b, 190 SL, 220 a, 219, 220 S, and 220 SE, with the exception of the pump on Model 190 SL, the removal and installation procedures are the same as for Model 190.

The usual by-pass line (8) (Fig. 01-4/40) is not installed in Model 190 SL, since the line heating the intake pipe also serves as a by-pass line. The threaded union (10) in the water pump housing has been replaced by a screw plug (Fig. 01-4/41). Furthermore, the hub pressed onto the water pump shaft and to which the pulley and the fan are fixed has four threaded bores, whereas on all other models pulley and fan are fastened with only three screws.

The water pumps of Models 180 a, 180 b, 190, 220 a, 219, 220 S, and 220 SE with the same capacity are interchangeable, whereas the pulleys vary in size (see table).

### **Pulley for Water Pumps**

| Model                          | 180 a, 180 b, 190, 190 b,<br>220 S | 190 SL | 220 a, 219,<br>220 SE |
|--------------------------------|------------------------------------|--------|-----------------------|
| External diameter<br>of pulley | 138                                | 125    | 149                   |