

Mercedes-Benz Engines

5-259

1962-72 MERCEDES-BENZ 6 CYLINDER

| GENERAL SPECIFICATIONS | | | | | | | | | | |
|--|-------------------------|----------------------|-----------------------------------|----------------------------------|----------------------------------|-------------------------|----------------------|----------------|----------------------|----------------------|
| Year | Displ. | | Carburetor | HP at RPM | Torque (Ft. Lbs. at RPM) | Compr. Ratio | Bore | | Stroke | |
| | cu. ins. | cc | | | | | in. | mm | in. | mm |
| 1962-65 220 B 220 SB 220 SEB | 133.9 133.9 133.9 | 2195 2195 2195 | 2x1-Bbl. 2x2-Bbl. Fuel Inj. | 105@5000 124@5200 134@5000 | 133@3300 139@3700 152@4100 | 8.7-1 8.7-1 8.7-1 | 3.15 3.15 3.15 | 80 80 80 | 2.86 2.86 2.86 | 72.8 72.8 72.8 |
| 1963-67 230 SL | 140.7 | 2306 | Fuel Inj. | 170@5600 | 160@4500 | 9.3-1 | 3.23 | 82 | 2.86 | 72.8 |
| 1965-67 230S | 140.7 | 2306 | 2x2-Bbl. | 135@5600 | 145@4200 | 9.0-1 | 3.23 | 82 | 2.86 | 72.8 |
| 1965-68 230 | 140.7 | 2306 | 2x1-Bbl.⓪ | 118@5400 | 137@3800 | 9.0-1 | 3.23 | 82 | 2.86 | 72.8 |
| 1967-72 230/8 | 139.8 | 2292 | 2x2-Bbl. | 135@5600 | 145@3800 | 9.0-1② | 3.22 | 81.75 | 2.86 | 72.8 |
| 1965-67 250 SE 250 SL | 152.3 152.3 | 2496 2496 | Fuel Inj. Fuel Inj. | 170@5600 170@5600 | 174@4500 174@4500 | 9.3-1 9.5-1 | 3.23 3.23 | 82 82 | 3.10 3.10 | 78.8 78.8 |
| 1965-69 250 S | 152.3 | 2496 | 2x2-Bbl. | 146@5600 | 157@4200 | 9.0-1 | 3.23 | 82 | 3.10 | 78.8 |
| 1967-72 250/8 | 152.3 | 2496 | 2x2-Bbl. | 146@5600 | 161@3800 | 9.0-1② | 3.23 | 82 | 3.10 | 78.8 |
| 1968-71 250 E/8, 250 CE | 152.3 | 2496 | Fuel Inj. | 170@5600 | 170@4650 | 9.5-1 | 3.23 | 82 | 3.10 | 78.8 |
| 1970-72 250, 250C | 169.5 | 2778 | 2x2-Bbl. | 157@5400 | 181@3800 | 9.0-1 | 3.40 | 86.5 | 3.10 | 78.8 |
| 1967-72 280 S/8 280 SE/8 | 169.5 169.5 | 2778 2778 | 2x2-Bbl. Fuel Inj. | 157@5400 180@5750 | 181@3800 193@4500 | 9.0-1② 9.5-1③ | 3.40 3.40 | 86.5 86.5 | 3.10 3.10 | 78.8 78.8 |
| 1967-71 280 SL/8 | 169.5 | 2778 | Fuel Inj. | 195@5900 | 195@4700 | 9.5-1 | 3.40 | 86.5 | 3.10 | 78.8 |
| 1970-71 280 SEL | 169.5 | 2778 | Fuel Inj. | 180@5750 | 193@4500 | 9.5-1 | 3.40 | 86.5 | 3.10 | 78.8 |
| 1962-65 300 SE (Type 1) | 182.8 | 2996 | Fuel Inj. | 185@5200 | 205@4000 | 8.7-1 | 3.35 | 85 | 3.46 | 88 |
| 1962-67 300 SE (Type 2) | 182.8 | 2996 | Fuel Inj. | 195@5500 | 203@4100 | 8.8-1 | 3.35 | 85 | 3.46 | 88 |
| 1965-67 300 SEB | 182.8 | 2996 | Fuel Inj. | 195@5500 | 203@4100 | 8.8-1 | 3.35 | 85 | 3.46 | 88 |
| 1966-70 300 SEL | 182.8 | 2996 | Fuel Inj. | 195@5500 | 203@4100 | 8.8-1 | 3.35 | 85 | 3.46 | 88 |
| 1967-71 300 SEL/8 | 169.5 | 2778 | Fuel Inj. | 195@5900 | 195@4700 | 9.5-1 | 3.40 | 86.5 | 3.10 | 78.8 |

① — 135 HP @ 5600 RPM, 145 ft. lbs. of torque at 4200 RPM with two Zenith INAT 2-bbl. carburetors.

② — 8.7-1 in 1972.

③ — 9.2-1 in 1972.

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)

ENGINE IDENTIFICATION

First six digits of engine identification number, located on tag on engine crankcase or stamped in crankcase, identify engine as follows:

| Model | CID | Code |
|------------------------|------------|--------------|
| 220 B..... | 133.9..... | 180.940 |
| 220 SB..... | 133.9..... | 180.941 |
| 220 SEB..... | 133.9..... | 180.982 |
| 230 SL..... | 140.7..... | 127.981 |
| 230 S..... | 140.7..... | 180.947 |
| 230..... | 140.7..... | 180.945, 949 |
| 230/8..... | 139.8..... | 180.954 |
| 250 SE..... | 152.3..... | 129.980 |
| 250 SL..... | 152.3..... | 129.982 |
| 250 S..... | 152.3..... | 108.920 |
| 250/8..... | 152.3..... | 114.920 |
| 250 E/8, 250 CE..... | 152.3..... | 114.980 |
| 250, 250 C..... | 169.5..... | 130.923 |
| 280 S/8..... | 169.5..... | 130.920 |
| 280 SE/8..... | 169.5..... | 130.980 |
| 280 SL/8, 280 SEL..... | 169.5..... | 130.980, 983 |
| 300 SEL/8..... | 169.5..... | 130.981 |
| 300 SE..... | 182.8..... | 189.984, 986 |
| 300 SEB..... | 182.8..... | 189.989 |
| 300 SEL..... | 182.8..... | 189.988 |

ENGINE REMOVAL

Removal - 1) Remove hood and battery ground cable. Drain cooling system. Disconnect radiator, heater hoses and automatic transmission cooling lines if fitted. Install dummy plugs on transmission lines. Remove radiator guard and radiator.

2) Remove fan and air cleaners. On engines with three groove crankshaft pulley, remove heater line. Remove engine vibration damper. Disconnect fuel lines and vacuum hose to power brake.

3) On models with power steering and level control, disconnect air and oil lines, plugging connections with dummy plugs. Disconnect oil pressure line.

4) On models with air conditioning, disconnect hoses from compressor.

CAUTION - Observe safety precautions when removing compressor lines, as lines are under pressure.

5) Disconnect all electrical leads and plug connectors. Remove choke cable from carburetor. Remove cap and rotor from distributor. Disconnect tele-thermometer using suitable wrench (SW14).

6) Disconnect gearshift linkage. Place window washer bag aside and drain power steering reservoir. Disconnect exhaust pipe from manifold. Remove high pressure and return hoses from power steering pump and plug connections.

NOTE - On some models it may be necessary to loosen steering idler arm, center tie rod and steering shock absorber and move downward.

7) Disconnect fuel filter line and speedometer cable. Remove engine shock absorber from support. On manual transmission models, remove clutch slave cylinder from clutch housing. Unscrew exhaust bracket at transmission and press bracket downward.

8) Disconnect oil cooler lines at transmission and plug. Attach suitable lifting sling to engine and lightly tension sling.

9) Mark position of rear engine support in relation to chassis, remove support from rubber mount and chassis. Disconnect brake cable from brake lever and remove from cable guide at front axle support, then remove support.

10) Remove engine support with rubber mount from transmission case rear cover. Disconnect speedometer drive. Mark position of bearing bracket for propeller shaft intermediate bearing on chassis panel. Remove two attaching screws and washers.

11) Disconnect propeller shaft together with shaft plate at transmission end and push to rear. Remove screws from right and left front engine mounts. Carefully lift engine and tilt to a 45° angle. Lift engine and transmission out of vehicle.

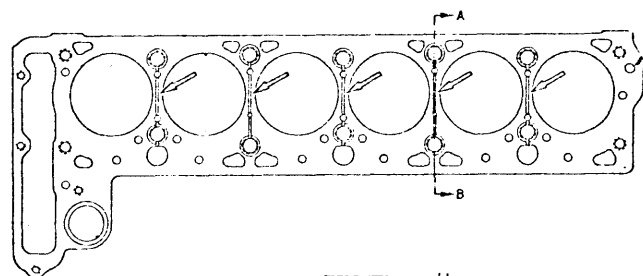
Installation - 1) Lower engine and transmission into vehicle at a 45° angle until transmission is behind front axle carrier. Place a jack under transmission and lower engine down onto front engine mounts. While lowering engine insert engine damper into bracket on crossmember.

2) To install remaining components, reverse removal procedures. Fill cooling system, check oil level in engine and transmission. Fill and bleed hydraulic systems. Reconnect air conditioning and charge system. Start engine and check all systems for leaks.

CYLINDER HEAD REMOVAL

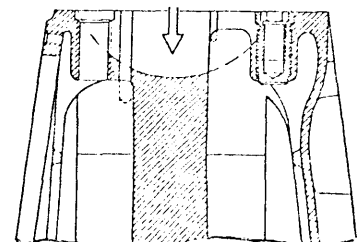
On 230/8 models with M180 engines, cylinder head gasket No. 180 016 40 20 is used for standard to second repair size. Maximum combustion chamber diameter is 3.267". For cylinder diameters above 3.267", use head gasket 180 016 41 20.

On 280 SL/8 models as of engine numbers 12-010809 and 10-006149 and on, crankcases were modified by machining deeper cooling grooves between cylinders (see illustration). Head gasket No. 130 016 30 20 must be used.



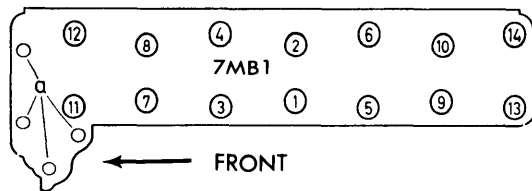
Section A-B

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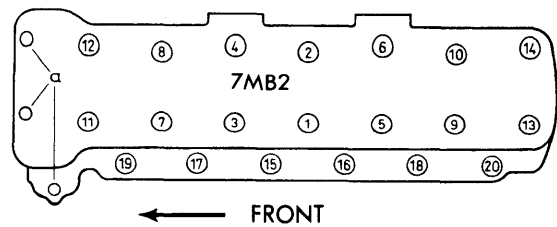


IMPROVED COMBUSTION CHAMBER COOLING

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)



CYLINDER HEAD TIGHTENING SEQUENCE
(ALL 220, 230, 250 & 280 MODELS)



CYLINDER HEAD TIGHTENING SEQUENCE
(ALL 300 MODELS)

| VALVES | | | | | | |
|--|------------------------------|------------|--------------|--------------------------|--------------------------|----------------|
| Engine & Valve | Head Diam. | Face Angle | Seat Angle | Seat Width | Stem Diameter | Stem Clearance |
| 1962-69 220 B, 220 SB, 220 SEB, 230 SL Int. Exh. | 1.539-1.547" 1.375-1.387" | 45° 45° | 45°+ 45°+ | .049-.078" .049-.078" | .352-.353" .390-.391" | .002" .003" |
| 230 S, 230/8, 280 S/8, 280 SL/8, 250 SE/8, 300 SEL/8, 250 SE, 250 SL, 250 S, 250/8, 250/8C, 250 E/8 Int. Exh. | 1.618-1.625" 1.454-1.466" | 45° 45° | 45°+ 45°+ | .049-.078" .049-.078" | .352-.353" .430-.431" | .002" .003" |
| 230 Int. Exh. | 1.618-1.625" 1.454-1.466" | 45° 45° | 45°+ 45°+ | .049-.078" .049-.078" | .352-.353" .390-.391" | .002" .003" |
| 300 SE, 300 SEB, 300 SEL Int. Exh. | 1.933-1.940" 1.649-1.657" | 45° 45° | 45°+ 45°+ | .059-.078" .059-.078" | .352-.353" .469-.470" | .002" .003" |
| 1970-72 230, 250, 280 S, 280 SE, 280 SEL, 280 SL, 300 SEL Int. Exh. | 1.618-1.625" 1.454-1.466" | 45° 45° | 45°+ 45°+ | .049-.078" .049-.078" | .352-.353" .430-.431" | .002" .003" |

VALVE ARRANGEMENT

All Models — E-I-I-E-E-I-I-E-E-I-I-E (front to rear).

VALVE GUIDE SERVICING

1) Clean valve guide and remove all hard carbon. Using a suitable go and no-go gauge, measure valve guide clearance. Drift out old guide using a suitable drift. Check bore in cylinder head and ream to oversize if necessary.

2) Heat cylinder head to 176-194°F in water and chill valve guide. Coat guide bore in head with tallow. Drive valve guide in until lock ring is seated against cylinder head. Allow cylinder head to cool and check guide fit in head.

Replacement Valve Guides (In.)

| Application | Intake O.D. | Exhaust O.D. |
|------------------------------------|------------------|---------------|
| ① 1962-68 230, 230 S, 250 S, 250 E | | |
| Std. Green..... | .5514-.5516..... | .5908-.5910 |
| Std. | .5516-.5519..... | .5910-.5912 |
| Std. Brown | .5519-.5521..... | .5912-.5915 |
| Interm. Grey/Green..... | .5521-.5524..... | .5915-.5917 |
| Interm. Grey..... | .5524-.5526..... | .5917-.5920 |
| Interm. Grey/Brown | .5526-.5528..... | .5920-.5922 |
| 1st O.S. Red | .5593-.5600..... | ② .5986-.5990 |
| 2nd O.S. White | .5672-.5679..... | ③ .6066-.6068 |

① — Interference fit in cylinder head of .00027".

② — On 230 models 1962-66, .5986-.5994".

③ — On 230 models 1962-66, .6065-.6072".

Mercedes-Benz Engines

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)

Replacement Valve Guides (In.)

| Application | Intake O.D. | Exhaust O.D. |
|--|-------------|--------------|
| ① 1962-68 220 B, 220 SB, 230 SL, 220 SEB | | |
| Std. Green..... | .5514-.5516 | .5514-.5516 |
| Std. | .5516-.5519 | .5516-.5519 |
| Std. Brown | .5519-.5521 | .5519-.5521 |
| Interm. Grey/Green..... | .5521-.5524 | .5521-.5524 |
| Interm. Grey | .5524-.5526 | .5525-.5526 |
| Interm. Grey/Brown | .5526-.5528 | .5526-.5528 |
| 1st O.S. Red | .5593-.5600 | .5593-.5600 |
| 2nd O.S. White | .5672-.5679 | .5672-.5679 |

① — Interference fit in cylinder head of .00027".

Replacement Valve Guides (In.)

| Application | Intake O.D. | Exhaust O.D. |
|--------------------------|-------------|--------------|
| ① 1962-70 300 SE | | |
| Std. Green..... | .5514-.5516 | .6695-.6698 |
| Std. | .5516-.5519 | .6698-.6700 |
| Std. Brown | .5519-.5521 | .6700-.6702 |
| Interm. Grey/Green..... | .5521-.5524 | .6702-.6705 |
| Interm. Grey | .5524-.5526 | .6705-.6707 |
| Interm. Grey/Brown | .5526-.5528 | .6707-.6709 |
| 1st O.S. Red | .5593-.5600 | .6774-.6777 |
| 2nd O.S. White | .5672-.5679 | .6853-.6856 |

① — Interference fit in cylinder head of .00027".

Replacement Valve Guides (In.)

| Application | Intake O.D. | Exhaust O.D. |
|----------------------------|-------------|--------------|
| ① 1962-68 300 SEB, 300 SEL | | |
| Std. Green..... | .5514-.5516 | .6301-.6304 |
| Std. | .5516-.5519 | .6304-.6306 |
| Std. Brown | .5519-.5521 | .6306-.6309 |
| Interm. Grey/Green..... | .5521-.5524 | .6309-.6311 |
| Interm. Grey | .5524-.5526 | .6311-.6313 |
| Interm. Grey/Brown | .5526-.5528 | .6313-.6315 |
| 1st O.S. Red | .5593-.5600 | .6380-.6383 |
| 2nd O.S. White | .5672-.5679 | .6459-.6462 |

① — Interference fit in cylinder head of .00027".

Replacement Valve Guides (In.)

| Application | Intake O.D. | Exhaust O.D. |
|---|-------------|--------------|
| ① 1969-72 230, 230 S, 230/8, 250 S, 250 SE, 250/8, 250 CE/8, 280 SE/8, 280 S/8, 280 SE/8, 300 SEL | | |
| Std. Green..... | .5516-.5520 | .5910-.5913 |
| Std. Brown | .5520-.5523 | .5913-.5917 |
| 1st O.S. Grey/Green | .5523-.5527 | .5917-.5920 |
| 2nd O.S. Grey/Brown | .5527-.5530 | .5920-.5924 |
| 3rd O.S. Red | .5595-.5602 | .5988-.5996 |
| 4th O.S. White | .5674-.5681 | .6067-.6074 |

① — Interference fit in cylinder head of .00047".

Replacement Valve Guides (In.)

| Application | Intake O.D. | Exhaust O.D. |
|---------------------------|-------------|--------------|
| ① 1969-72 230 SL | | |
| Std. Green..... | .5516-.5520 | .5514-.5518 |
| Std. Brown | .5520-.5523 | .5518-.5521 |
| 1st O.S. Grey/Green | .5523-.5527 | .5521-.5525 |
| 2nd O.S. Grey/Brown | .5527-.5530 | .5525-.5528 |
| 3rd O.S. Red | .5595-.5602 | .5593-.5600 |
| 4th O.S. White | .5674-.5681 | .5672-.5679 |

① Interference fit in cylinder head of .00027".

Replacement Valve Guides (In.)

| Application | Intake O.D. | Exhaust O.D. |
|----------------------------|-------------|--------------|
| ① 1969-72 300 SEB, 300 SEL | | |
| Std. Green..... | .5516-.5520 | .6303-.6307 |
| Std. Brown | .5520-.5523 | .6307-.6311 |
| 1st O.S. Grey/Green | .5523-.5527 | .6311-.6314 |
| 2nd O.S. Grey/Brown | .5527-.5530 | .6314-.6318 |
| 3rd O.S. Red | .5595-.5602 | .6382-.6389 |
| 4th O.S. White | .5674-.5681 | .6461-.6468 |

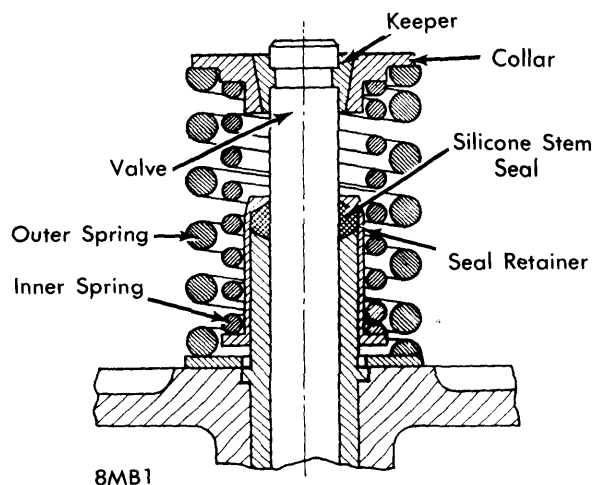
① — Interference fit in cylinder head of .00047"

VALVE STEM OIL SEALS

Removal — 1) Remove camshaft cover. Remove rocker arm. See *Rocker Arm Assembly*. Remove spark plug and insert suitable valve retaining tool or rotate engine until both valves are closed and supply compressed air to spark plug hole to hold valves closed, preventing valves from falling into cylinder.

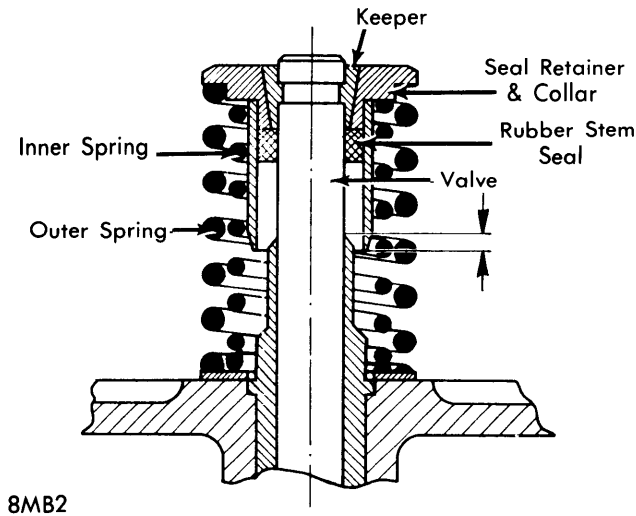
2) Compress valve springs, using suitable tool (112 589 08 61 00). Remove valve keepers, collar, springs and valve stem seal.

Installation — 1) Slide a suitable plastic sleeve over valve stem. Install valve stem oil seal. Install seals on valve stem as shown in illustration.

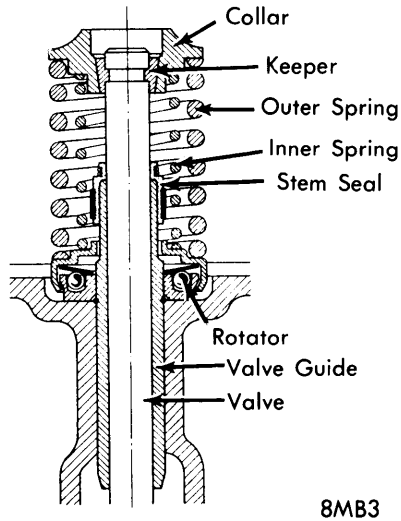


INTAKE VALVE ASSEMBLY (300 SE)

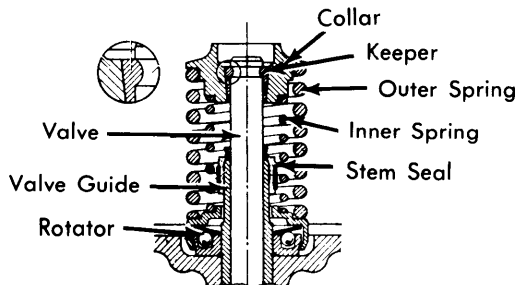
1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)



EXHAUST VALVE ASSEMBLY (300 SE)

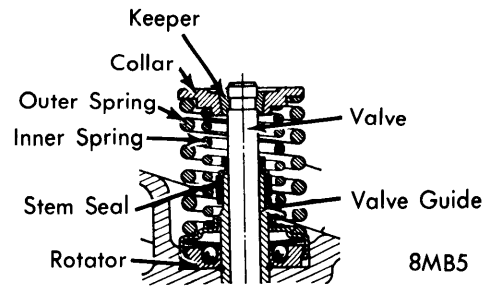


VALVE ASSEMBLY (230 SL)

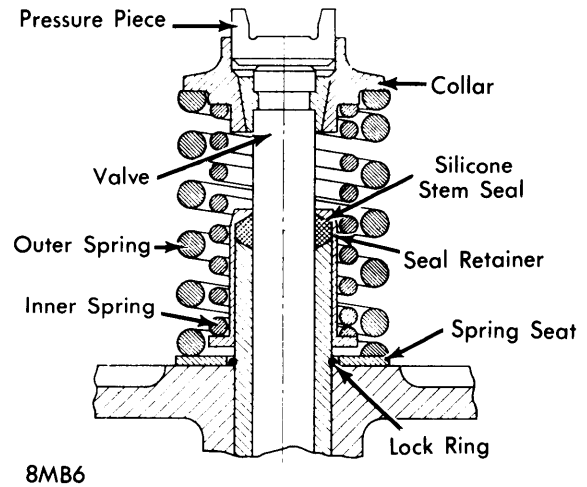


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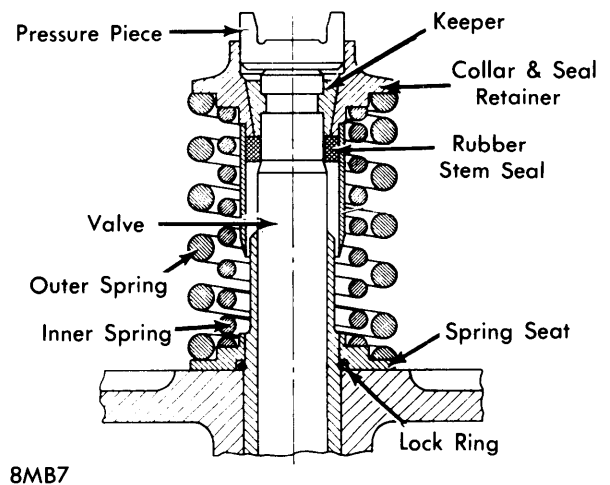
VALVE ASSEMBLY (230, 230 S, 250 SE, 250 SL)



VALVE ASSEMBLY (300 SEB & 300 SEL)



INTAKE VALVE ASSEMBLY (220 B, 220 SB, 220 SEB)



EXHAUST VALVE ASSEMBLY (220 B, 220 SB, 220 SEB)

2) Install springs, collars and keepers, using suitable spring compressor. Install rocker arm and check tappet clearance. Replace camshaft cover and tighten attaching nuts.

Mercedes-Benz Engines

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)

| VALVE SPRINGS | | | |
|---|-------------|-----------------|----------------|
| Engine | Free Length | PRESSURE (LBS.) | |
| | | Valve Closed | Valve Open |
| 1962-69 220 B, 220 SB, 220 SEB | | | |
| Inner | 1.673" | 19-22@1.346" | 40-46@1.011" |
| Outer | 1.988" | 51-58@1.511" | 102-117@1.177" |
| 230 SL | | | |
| Inner | 1.594" | 19-25@1.240" | 43-49@.846" |
| Outer | 2.047" | 58-66@1.574" | 124-140@1.181" |
| 230, 230 S, 250, 250 SE, 250 SL | | | |
| Inner | 1.771" | 28-33@1.220" | 50-55@.826" |
| Outer | 2.047" | 58-66@1.574" | 124-140@1.181" |
| 300 SE/c, 300 SEB, 300 SEL | | | |
| Inner | 2.244" | 29-32@1.751" | 63-69@1.397" |
| Outer | 2.539" | 75-83@2.015" | 160-178@1.661" |
| 220/8, 250/8 | | | |
| Inner | 1.771" | 28-33@1.220" | 50-55@.826" |
| Outer | 1.854" | 58-66@1.574" | 152-170@1.181" |
| 230/8 | | | |
| Inner | 1.771" | 28-33@1.220" | 50-55@.826" |
| Outer | 2.086" | 58-66@1.574" | 130-143@1.181" |
| 280 S/8, 280 SE/8 | | | |
| Inner | 1.771" | 28-55@1.220" | 50-55@.826" |
| Outer | 2.047" | 79@1.574" | 149-168@1.181" |
| 280 SL/8, 300 SEL/8, 280 E/8, 250/8 | | | |
| ⊙ Inner | 1.771" | 25-27@1.299" | 50-56@.846" |
| Outer | 2.009" | 73-79@1.653" | 183-200@1.200" |
| 1970-72 250, 280 S, 280 SE, 280 SL, 280 SEL, 300 SEL | | | |
| Inner | 1.771" | 25-27@1.299" | 50-55@.846" |
| Outer | 1.949" | 65-71@1.653" | 185-203@1.200" |
| 230 | | | |
| Inner | 1.771" | 28-33@1.220" | 50-55@.826" |
| Outer | 1.988" | 53-59@1.575" | 130-143@1.181" |

⊙ — With camshaft code number one.

VALVE SPRING REMOVAL

With head and rocker arms removed, compress valve springs with suitable tool (112 589 08 61 00). Remove valve keepers, collar and springs. To install, reverse removal procedures.

ROCKER ARM ASSEMBLY

Removal — 1) Press out spring clamp from notch at top of rocker arm and push spring clamp outward over ball cup of rocker arm.

2) Using suitable tool (111 589 01 61), press down on valve spring collar to relieve pressure on rocker arm. Lift rocker arm off of ball pin and remove.

NOTE — Before installation check sliding surfaces and ball cup of rocker arm for wear or damage. Damaged rocker arms must be replaced.

Installation — 1) Install suitable tool (111 589 01 61) to camshaft and valve spring collar and push valve downward until rocker arm can be placed on ball pin head.

2) Position rocker arm, push spring clamp over ball cup of rocker arm until it engages in notch of rocker arm. Check and adjust tappet clearance.

VALVE CLEARANCE ADJUSTMENT

NOTE — Adjust tappets with engine cold. On 220, 230, 250 and 280 models, measure tappet clearance between rocker arm and base circle of camshaft. On 300 models, measure between valve and adjusting screw.

1) Remove air vent line and camshaft cover. Remove control shaft and carburetor air scoop where fitted.

NOTE — On 300 SE engines tappet clearance is always adjusted at ignition TDC, in firing number order.

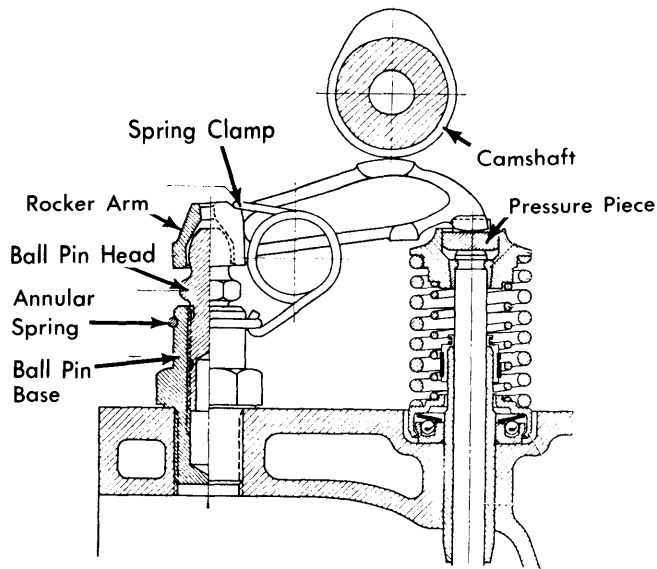
2) Rotate engine until rocker arm and camshaft base circle are facing each other. Insert feeler gauge and measure clearance, .003" (intake) and .008" (exhaust).

NOTE — Always rotate engine by crankshaft, never by camshaft sprocket.

3) Adjust tappet clearance either by turning ball pin or rocker arm adjusting screw, depending on engine type. Ball pin turning torque must be at least 11 ft. lbs. Replace ball pin or ball pin base if required torque is not achieved.

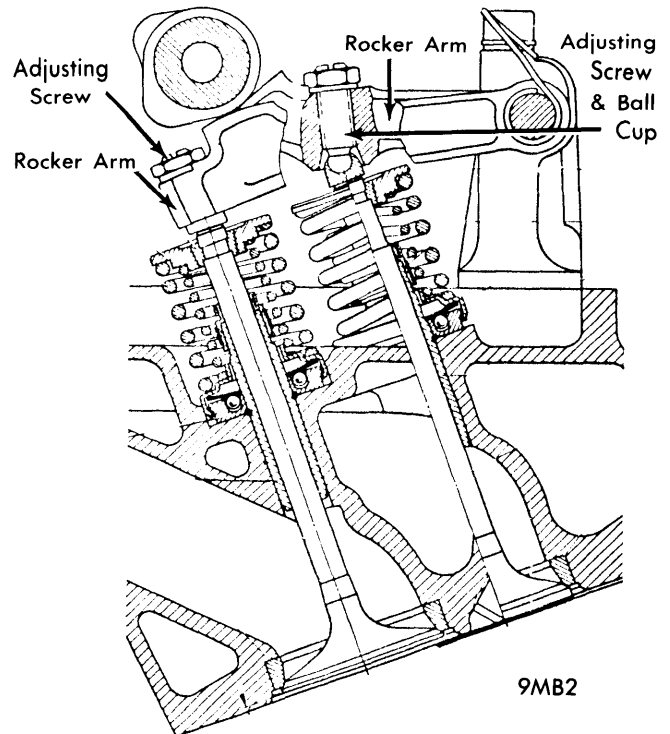
4) If ball pin cannot be adjusted to give proper clearance a different pressure piece may be installed. There are standard .177" and undersizes .137" and .098" available. To replace a pressure piece, rocker arm must be removed.

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)



9MB1

VALVE TRAIN ASSEMBLY



9MB2

VALVE TRAIN ASSEMBLY

| PISTONS, PINS, RINGS | | | | | | |
|------------------------------|------------------------|-------------------|--------------|---------|------------|----------------|
| Engine | PISTONS ① Clearance | PINS | | RINGS ② | | |
| | | Piston Fit | Rod Fit | Rings | End Gap | Side Clearance |
| 1962-66 M127, M180 | .001" | -.0002 to +.0001" | .0004-.0009" | No. 1 | .021-.027" | .003-.004" |
| | | | | No. 2 | .018-.023" | .0015-.003" |
| | | | | No. 3 | .012-.018" | .0015-.003" |
| | | | | No. 4 | .012-.018" | .0015-.003" |
| M108, M129 | .001" | -.0002 to +.0001" | .0004-.0009" | No. 1 | .021-.027" | .002-.003" |
| | | | | No. 2 | .018-.023" | .0015-.003" |
| | | | | No. 3 | .012-.018" | .0015-.003" |
| M189 | .001" | -.0002 to +.0001" | .0004-.0009" | No. 1 | .021-.027" | .002-.003" |
| | | | | No. 2 | .018-.023" | .0015-.003" |
| | | | | No. 3 | .012-.018" | .0015-.003" |
| | | | | No. 4 | .012-.018" | .0015-.003" |
| 1972 M114 | .001" | -.0002 to +.0001" | .0004-.0009" | No. 1 | .012-.018" | .002-.003" |
| | | | | No. 2 | .012-.018" | .0008-.002" |
| | | | | No. 3 | .010-.016" | .0004-.001" |
| M130 | .001" | -.0002 to +.0001" | .0004-.0009" | No. 1 | .012-.018" | |
| | | | | No. 2 | .012-.018" | .0015-.003" |
| | | | | No. 3 | .012-.016" | .0015-.003" |
| M180 | .001" | -.0002 to +.0001" | .0004-.0009" | No. 1 | .012-.018" | |
| | | | | No. 2 | .012-.018" | .0015-.003" |
| | | | | No. 3 | .012-.016" | .0015-.003" |

① — Maximum weight difference is four grams.

② — Subtract .006-.008" from end gap clearance for molybdenum filled rings.

Mercedes-Benz Engines

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)

FITTING PISTONS

1) Measure pistons and cylinder diameters to determine if pistons or cylinder diameters are worn. On 300 models, cylinder liners cannot be bored to oversize, but must be replaced with a new liner.

2) Heat cylinder block in forced circulation oven to a minimum of 302°F and a maximum of 338°F. Using a suitable tool, drive liner out top of cylinder block. Allow crankcase to cool and measure bores to determine if oversize sleeves are necessary.

3) Before installing cylinder liners, pressure test oil passage at 89 psi and water jacket at 30 psi and check for leaks. Place cylinder liners one, three and five together and two, four and six together as they differ in compression chamber recesses.

4) Heat cylinder block to 302-338°F and slide liners into their proper bores. Allow cylinder block to cool. Mill cylinder liner until it protrudes .057-.061" above cylinder block parting surface. Match-grind valve recesses to match cylinder block. Hone cylinder to proper piston fit. The following sizes of pistons are available:

Replacement Pistons (In.)

Application **①Piston Dia.**
1962-66 220 B, 220 SB, 220 SEB

| | |
|-------------------|---------------|
| Standard..... | 3.1480-3.1488 |
| Intermediate..... | 3.1578-3.1586 |
| 1st O.S. | 3.1677-3.1684 |
| 2nd O.S. | 3.1873-3.1881 |
| 3rd O.S. | 3.2070-3.2078 |

1962-70 230, 230 S, 230 SL, 250 S, 250 SE

| | |
|-------------------|---------------|
| Standard..... | 3.2271-3.2279 |
| Intermediate..... | 3.2370-3.2377 |
| 1st O.S. | 3.2468-3.2476 |
| 2nd O.S. | 3.2665-3.2673 |

Replacement Pistons (In.)

Application **①Piston Dia.**

1962-70 300 SE, 300 SEB, 300 SEL

| | |
|---------------|---------------|
| Standard..... | 3.3452-3.3460 |
|---------------|---------------|

1969-70 230/8, (Type 1), 250/8, 250 E/8

| | |
|-------------------|---------------|
| Standard② | 3.2275-3.2283 |
| Intermediate..... | 3.2373-3.2381 |
| 1st O.S.② | 3.2472-3.2480 |
| 2nd O.S.② | 3.2669-3.2677 |

1969-70 230/8 (Type 2)

| | |
|-------------------|---------------|
| Standard③ | 3.2177-3.2184 |
| Intermediate..... | 3.2275-3.2283 |
| 1st O.S. | 3.2273-3.2381 |
| 2nd O.S.③ | 3.2472-3.2480 |
| 3rd O.S.③ | 3.2669-3.2677 |

1969-70 280 S/8, 280 SE/8, 280 SL/8, 300 SEL/8

| | |
|-------------------|---------------|
| Standard④ | 3.4047-3.4055 |
| Intermediate..... | 3.4145-3.4153 |
| 1st O.S.④ | 3.4244-3.4251 |
| 2nd O.S.④ | 3.4440-3.4448 |

- ① — Weight difference of pistons is four grams maximum.
- ② — 1971-72 M114 and M180 (Type 1) engines.
- ③ — 1971-72 M180 (Type 2) engines.
- ④ — 1971-72 M130 engines.

CONNECTING ROD ASSEMBLY

From 1968 onward, connecting rod bolts are stretch bolts. Measure smallest diameter of stretch bolt with a pair of sharp edge calipers. Replace bolt if a minimum diameter of .307" has been reached. Install connecting rod cap and torque nuts to 36 ft. lbs. Further tighten an additional 100° of wrench rotation. Use a stiff handle wrench for final tightening.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

| Engine | MAIN BEARINGS | | | CONNECTING ROD BEARINGS | | |
|--|----------------|--------------|--------------------|-------------------------|------------|------------|
| | Journal Diam. | Clearance | Crankshaft Endplay | Journal Diam. | Clearance | Sideplay |
| 230, 230 S 230 SL, 230/8, 250 S, 250 SE, 250 SL, 250/8, 250 E/8, 250 S/8, 280 SE/8, 280 SL/8, 300 SEL/8, 280 SEL | 2.3604-2.3608" | .0017-.0025" | .004-.007" | 1.8879-1.8883" | .001-.002" | .004-.010" |
| 300 SE/c, 300 SEB, 300 SEL | 2.3602-2.3610" | .001-.002" | .004-.009" | 2.0452-2.0460" | .002-.003" | .004-.010" |

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)

MAIN BEARING SERVICE

Inspect main and connecting rod journals for wear or damage. Maximum wear limit is .00078". Regrind crankshaft and install new undersize bearings if necessary.

Crankshaft Journal Diameters (In.)

| Application | Main Bearing | Rod Bearing |
|------------------------------|---------------|---------------|
| 1966-72 220, 230, 250 & 280s | | |
| Standard..... | 2.3604-2.3608 | 1.8879-1.8883 |
| 1st U.S. | 2.3505-2.3509 | 1.8781-1.8785 |
| 2nd U.S. | 2.3407-2.3411 | 1.8683-1.8686 |
| 3rd U.S. | 2.3309-2.3312 | 1.8584-1.8588 |
| 4th U.S. | 2.3210-2.3214 | 1.8486-1.8490 |

1966-72 300s

| | | |
|---------------|---------------|---------------|
| Standard..... | 2.3602-2.3610 | 2.0452-2.0460 |
| 1st U.S. | 2.3503-2.3511 | 2.0354-2.0362 |
| 2nd U.S. | 2.3405-2.3413 | 2.0255-2.0263 |
| 3rd U.S. | 2.3307-2.3314 | 2.0157-2.0165 |
| 4th U.S. | 2.3208-2.3216 | 2.0059-2.0066 |

REAR MAIN BEARING OIL SEAL SERVICE

Removal — 1) Remove engine and transmission. See *Engine Removal*. Drain engine oil. Separate transmission and clutch from engine. Remove regulating shaft with bearing bracket. Disconnect crankcase breather from camshaft cover and water heat sensor on injection pump.

2) Remove camshaft cover. Mark camshaft chain and sprocket and remove camshaft sprocket. Turn engine over and remove oil pan. Loosen flywheel or drive plate. Remove oil pump, main and connecting rod caps. Mark bearing caps for proper reassembly.

3) Check diameter of connecting stretch bolts. Mark crankshaft sprocket and chain for reassembly. Raise crankshaft slightly and lift out forward, while holding chain clear of crankshaft. Pull out old seal and clean seal grooves.

Installation — 1) Force new seal into groove with a lightly oiled hammer handle. Cut seal halves so that they protrude .023" above parting surfaces of oil pan and crankcase. Clean all bearing points, crankshaft journals and lightly coat with oil.

2) Install crankshaft, using care not to damage front oil seal. Replace main and connecting rod bearings caps, torque to specifications. Install oil pump and oil pan, using suitable sealing compound.

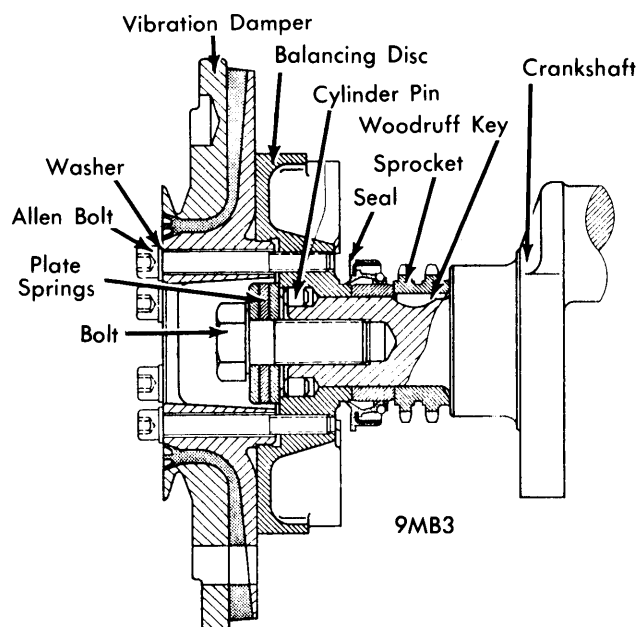
3) Check seat of rear seal. Rotate crankshaft and check for tightness, so that no pressure marks will be produced. To install remaining components, reverse removal procedures.

ENGINE FRONT OIL SEAL

Removal — 1) Remove radiator, fan and drive belts. Remove pulley on water pump. Remove power steering pump and mounting bracket after draining hydraulic fluid reservoir. Remove vibration damper/balancing disc along with pulleys, using suitable puller.

2) Force out seal with a pair of screwdrivers. Use care not to damage crankshaft bearing pin, receiver or spacer ring. Deburr edge of seal bore and smooth with emery paper. Lightly oil lip seal. Install seal, using suitable tool (111 589 17 61 00).

Installation — 1) Install balancing disc and vibration damper using suitable tool (186 589 07 61 00) and sleeve (C35). Tighten center bolt while holding crankshaft (see illustration).



VIBRATION DAMPER

NOTE — When positioning balancing disc, note position of locating holes for cylinder pins. One hole is slightly off-set. A wrong assembly will result in TDC mark being 180° from real TDC.

2) Install plate springs with crown faces toward screw head. To install remaining components, reverse removal procedures.

NOTE — The original seal (blue) has been replaced with a silicone seal (white/yellow). Because of possible installation damage when installing white/yellow seal, while in vehicle, a new seal (black) is used only for in vehicle repairs.

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)

| CAMSHAFT | | |
|--|----------------|-------------|
| Engine | Journal Diam. | Clearance ① |
| 230, 230 S, 230 SL, 230/8, 250 S, 250 SE, 250 SL, 250/8, 280 S/8, 230 SE/8, 280 SL/8, 300 SEL/8 | | |
| 1st | 1.3763-1.3769" | |
| 2nd & 3rd | 1.8881-1.8887" | .001-.002" |
| 4th | 1.9275-1.9281" | |
| ② 250/8, 250E/8, 280 SL/8, 300 SEL/8 | | |
| 1st | 1.3763-1.3769" | |
| 2nd & 3rd | 1.9668-1.9675" | .001-.002" |
| 4th | 2.0062-2.0068" | |
| 300 SE/c, 300 SEB, 300 SEL | | |
| 1st | 1.3763-1.3769" | |
| 2nd & 3rd | 1.9275-1.9281" | .001-.002" |
| 4th | 1.9668-1.9675" | |

① — End play is .002-.005".

② — With camshaft code number one or two.

CAMSHAFT REMOVAL

Removal — 1) Remove battery and spark plugs. Drain cooling system. Remove camshaft cover. Remove rocker arms and set aside in proper order for reassembly. See *Rocker Arm Assembly*.

2) Rotate engine by crankshaft until number one piston is at TDC with pointer on vibration damper aligned with TDC mark. Mark on camshaft must be aligned with mark on front camshaft bearing support.

NOTE — Do not rotate engine by camshaft sprocket nut. Use crankshaft to rotate engine.

3) Remove nut attaching camshaft sprocket. Wire camshaft sprocket to chain so they will not become separated. Remove sprocket from camshaft. Chain tensioner need not be removed. Unscrew Allen bolts and remove camshaft with bearing supports.

Installation — 1) Inspect camshaft and bearings, replace as necessary. Slide bearing supports on camshaft. Install bearing supports and camshaft on cylinder head and tighten to specifications. Check that camshaft turns freely.

3) Install rocker arms and camshaft cover brackets. Adjust tappet clearance and check camshaft timing. Install remaining components in reverse of removal procedures.

2) Install compensating washer, spacer and disc spring on camshaft. Press chain tensioner downward and install sprocket. Install camshaft nut after checking that timing is correct.

| VALVE TIMING | | | | |
|---|-------------|--------------|-------------|--------------|
| Engine ① | INTAKE | | EXHAUST | |
| | Open (BTDC) | Close (ABDC) | Open (BBDC) | Close (ATDC) |
| 1962-69 220 B, 220 SB, 220 SEB | 10° | 46° | 44° | 12° |
| 230 SL | 10° | 58° | 51° | 23° |
| 230 S, 230, 250 SE, 250 SL, 250 S | 11° | 53° | 47° | 21° |
| 230/8 | 11° | 47° | 48° | 16° |
| ② 280 S/8, 280 SE/8, 250/8 | 11° | 47° | 48° | 16° |
| 300 SE (Type 1) | 7° | 47° | 49.5° | 11.5° |
| 300 SE (Type 2), 300 SEB, 300 SEL | 18° | 56° | 53° | 15° |
| ② 280 SL/8, 300 SEL/8 | 12° | 56° | 53° | 21° |
| 250 E/8 | 16° | 46° | 53° | 15° |
| 1970-72 250, 280 SE, 280 SEL, 300 SEL, 280 SL | 16° | 46° | 53° | 15° |
| 230/8, 280 S | 11° | 47° | 48° | 16° |

① — With tappet clearance zero and valve lift .016".

② — With exhaust emission equipment, 16°, 46°, 53°, 15°.

TIMING CHAIN REPLACEMENT

Removal — 1) Remove camshaft cover and spark plugs. Remove regulating shaft between venturi control unit and injection pump. Remove chain tensioner.

2) Brake endless chain and attach new chain with a master link. Install master link spring lock facing direction of rotation. Use care not to drop chain down into engine.

Installation — 1) Slowly turn engine in direction of rotation, drawing new chain over sprockets and pulling old chain from engine. Connect ends of new chain with master link facing inward toward camshaft and spring lock facing direction of rotation (see illustration).

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)

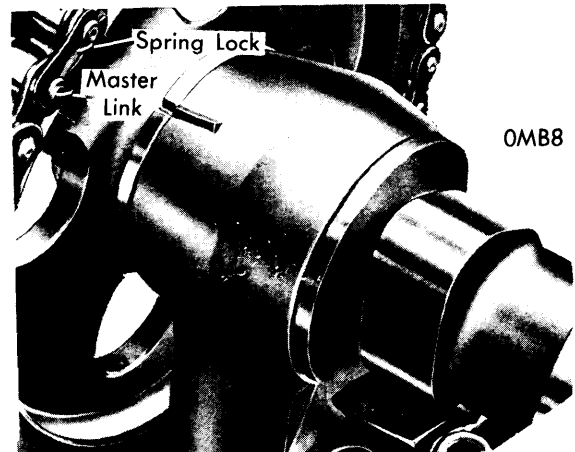
2) Install "O" ring behind chain tensioner. Install chain tensioner without oil and tighten attaching nuts. Fill oil pocket in cylinder head with engine oil. Using suitable venting lever (187 589 02 63 00), push tensioner sprocket bearing against stop. Move sprocket back slowly, keeping oil pocket filled. Repeat until no more air bubbles appear.

3) Check crankshaft in relation to camshaft to find if valve timing is correct. See *Valve Timing*. Install camshaft covers and spark plugs.

VALVE TIMING

Rotate crankshaft until number one piston is at TDC. Camshaft timing mark must align with mark on front bearing support (see illustration).

NOTE — Rotate engine by crankshaft, never use camshaft sprocket nut.



CAMSHAFT TIMING MARK & MASTER LINK

ENGINE OILING

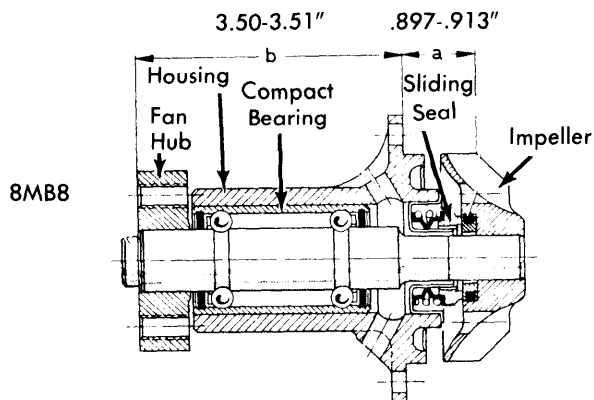
Crankcase Capacity — 6.5 qts. approx. with oil filter.

Normal Oil Pressure — 71 psi.

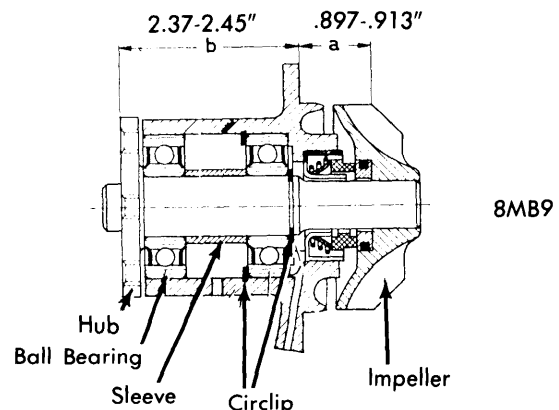
Oil Filter — Replace 6,000 miles.

Pressure Regulator Valve — Non-adjustable.

ENGINE COOLING



WATER PUMP



WATER PUMP (WITH A/C)

Cooling System Capacity (Approx.)

| Model | Qts. |
|--|------|
| 230 (1962-69)..... | 14.8 |
| 300 SE, 300 SEB, 300 SEL (1966-69)..... | 17.8 |
| 250 S, 250 SE (1966-69)..... | 12 |
| 250 SL, 280 SL/8, 280 SL (1969-71)..... | 13 |
| 230, 280 SE, 280 SEL, 300 SEL, 300 SEL/8, 280 SE/8, 230 SL, 280 S, 280 S/8 (1971)..... | 11 |
| 250 (1972)..... | 10.5 |

Thermostat — Opens at 172-176°F (std.), 186-190°F (winter).

Mercedes-Benz Engines

1962-72 MERCEDES-BENZ 6 CYLINDER (Cont.)

TIGHTENING SPECIFICATIONS

| Application | Ft. Lbs. |
|--|----------|
| Cylinder Head ① | |
| Camshaft Cover..... | 7 |
| Camshaft Bearing Supports (exc. 300s)..... | 18 |
| (300s)..... | 29 |
| Rocker Arm Mounts..... | 58 |
| Rocker Arm Bearing Brackets (300s)..... | 27 |
| Connecting Rod Bolts ② (exc. 300s & 230 SL)..... | 43 |
| (300s & 230 SL)..... | 27 |
| Main Bearing Caps (exc. 300s)..... | 58 |
| (300s)..... | 36 |
| Crankshaft Nut (exc. 300s)..... | 159 |
| (300s)..... | 217 |
| Vibration Damper Screws..... | 25 |
| Intermediate Flange..... | 36 |
| Oil Pan..... | 8 |

① — On all models except 300s, tighten in four stages 29, 43, 58 and 65 ft. lbs. On 300 models, tighten in four stages, (screw 1-14) 29, 50, 72 and 80 ft. lbs. and (screws 15-20) 14, 29, 36 and 43 ft. lbs. Warm-up engine and retorque all bolts. Run vehicle 13 miles repeat tightening sequence. Apply graphite oil to all bolts and washers before installation.

② — See *Connecting Rod Assembly* in this article.