Description of the 1600 S-90 Engine

General

The 1600 S-90 engine (intern 616/7) is a further development of the 1600 S engine. The following description is principally concerned with the new developments.

Crankcase

The crankcase is a light alloy three piece casting consisting of two crankcase halves and a timing case cover. The three sections are machined as a unit and must be replaced as such. It is possible to replace the timing case cover separately.

In order to prevent the split steel shell bearing inserts from turning in the crankcase, index grooves have been cut into the bearing bores (dowel pins in the 1600 S engine).

Two dowel sleeves have been installed in the crankcase at main bearing No. 2 in order to secure the two crankcase sections.

Crankshaft and Connecting Rods

The four connecting rods run on steel shell split insert bearings on the crankshaft.

The connecting rods have bronze piston pin bushings.

The crankshaft, which is supported on three steel shell split insert bearings and one sleeve type light alloy bearing, is mild-nitrated on all bearing surfaces (1600 S engine has 4 light alloy main bearings). Main bearing No. 4 may be replaced by removing the timing case cover and therefore does not require that the crankcase be disassembled. Main bearing No. 1 acts as crankshaft thrust bearing. The flywheel (1600 S-90 engine 6.5 kg = 14.4 lb.; 1600 S engine 8.7 kg = 19.2 lb.) with integral starter ring gear is fastened to the crankshaft by a central gland nut and eight dowel pins. Crankshaft main bearing journals 1, 2 and 3 are 55 mm in diameter (1600 S engine 50 mm). The timing and distributor pinions are secured to the crankshaft by a woodruff key. The V-belt pulley is also secured by a woodruff key and is bolted to the end of the crankshaft. The crankshaft is sealed by an oil seal at the flywheel end and at the pulley end by an oil seal and oil slinger ring.

Pistons

The light alloy pistons of the 1600 S-90 engine have 4 rings; the bottom ring being an oil control ring (1600 S engine, 3 rings). The piston pins are fully floating and are secured by lock rings in the pistons.

Cylinders

The cylinders of the 1600 S-90 engine are cast light alloy with flame sprayed carbon steel bore surfaces which have extremely good wear characteristics. (1600 S engine has light alloy cylinders with hard chromed bore surfaces.) For better heat transfer to the cooling air the finned cylinders are blackened.

Cylinder Heads

Each pair of cylinders carries a common, heavily finned, blackened, cylinder head of cast light alloy with shrunk in valve seats and guides. The spark plug sockets have Heli-Coil thread inserts. The valves are overhead in a "V". The diameter of the intake valve has been increased 2 mm over the size of the 1600 S engine valve. No gasket is employed for the cylinder to cylinder head joint. A ball check valve has been installed in the rocker box cover vents to prevent oil loss while traveling in curves.

Timing Gear

The camshaft is supported at three places directly in the crankcase without bearing inserts or bushings. The camshaft is driven by a cast, light alloy, helical, timing gear. The valves are operated from the camshaft through flat tappets, light alloy pushrods, and rocker arms. Each cam operates alternately a valve in each of two opposed cylinders. The exhaust valves are coated with high grade chrome-nickel steel.

Cooling System

The engine is cooled by blower circulated air. The blower is mounted on an extension of the generator shaft and is driven from the crankshaft by a V-belt. The blower draws air through an opening in the fan housing and forces it over the cooling fins on the cylinders and cylinder heads. The cooling air is guided by guides and duct plates to the lower air channel from which it either escapes to the atmosphere or is used as heating for the passenger compartment. The lower air channel has double outlet flaps (1600 S engine has only one) which, together with the inlet funnel on the fan housing, increase the air flow by 10 %.

V-Belt

The high grade small cross-section V-belt has blue markings and writing on its circumference in contrast to the ones used on the other models which are yellow.

Centrifugal Valve

In order to insure a constant oil supply from the sump even while the car is traveling in a high speed curve, a centrifugally actuated valve has been installed at the oil intake between the strainer and magnetic filter.

Longitudinal Section View of 1600 S-90 Engine

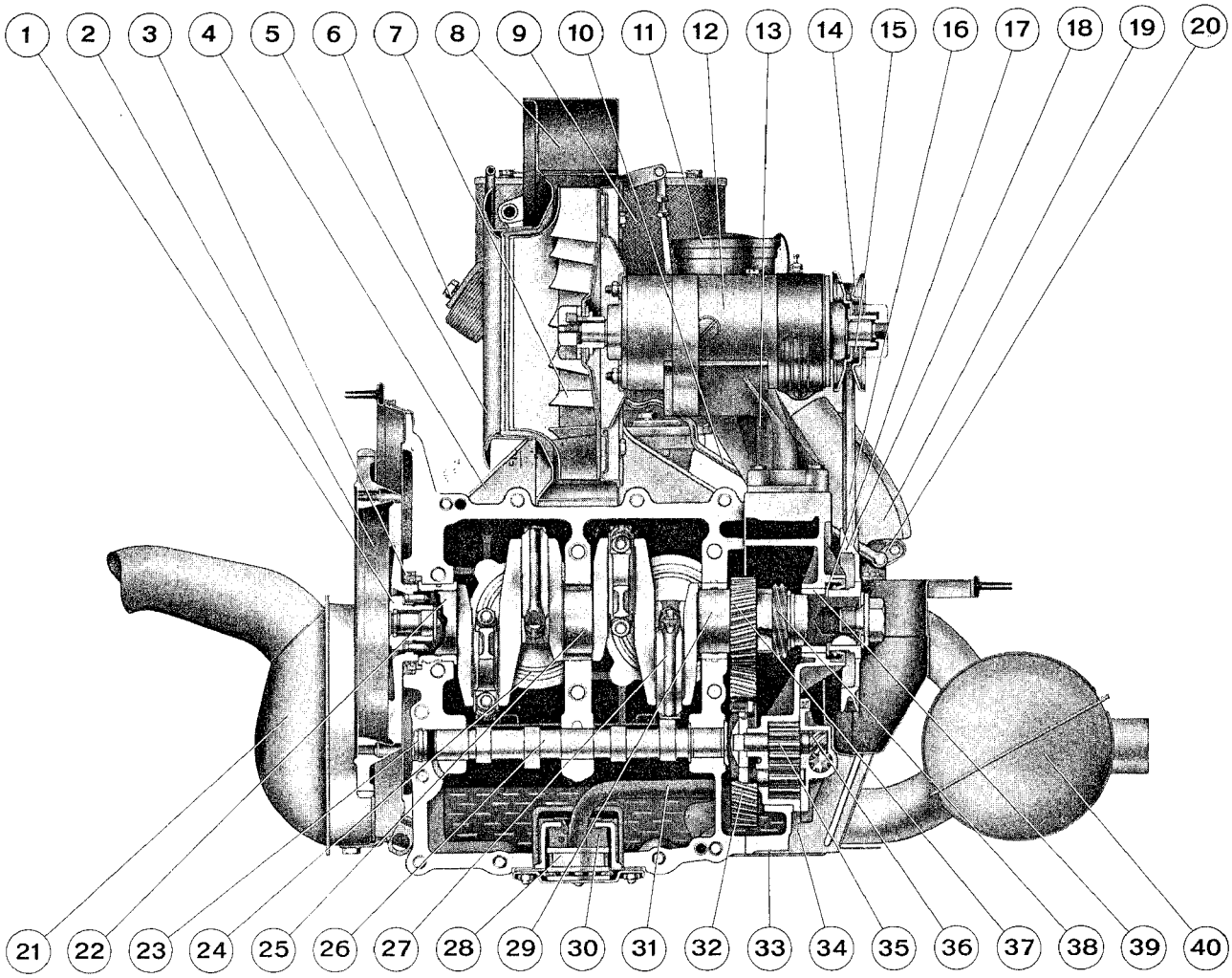

Fig. 1

① Gland nut
② Flywheel
③ Oil seal
④ Air guide plate
⑤ Cooling air inlet funnel
⑥ Engine compartment heater thermostat
⑦ Blower impeller
⑧ Fan housing
⑨ Metal mesh air filter
⑩ Engine compartment heater control rod
⑪ Oil filler cap
⑫ Generator
⑬ Generator bracket
⑭ Generator V-belt pulley
⑮ V-belt tension adjusting spacers
⑯ V-belt
⑰ Oil slinger washer
⑱ Crankshaft V-belt pulley
⑲ Duct for engine compartment heater
⑳ Engine compartment heater control lever
㉑ Heater junction box (heat exchanger)
㉒ Main bearing journal No. 1
㉓ Camshaft end plug
㉔ Piston and cylinder
㉕ Main bearing journal No. 2
㉖ Camshaft
㉗ Connecting rod bearing cap
㉘ Magnetic oil filter
㉙ Main bearing journal No. 3
㉚ Centrifugal valve
㉛ Oil suction pipe
㉜ Camshaft itming gear
㉝ Timing case cover
㉞ Lower air guide
㉟ Gear oil pump
㊱ Tachometer drive pinion
㊲ Timing pinion
㊳ Distributor drive gear
㊴ Main bearing No. 4
㊵ Muffler

Main Bearings

General

Main bearings 1, 2, and 3 are split, steel shell, insert bearings with bearing No. 1 (flywheel side) the crankshaft thrust bearing. These steel shell bearings are so called tri-metal bearings which consist of a steel shell, and a lead bronze base, a very thin layer of nickel, and the white metal bearing surface (0.02 to 0.025 mm thick). Besides the bearing layers a fine coat of lead alloy covers the entire insert to act as corrosion inhibitor, break-in surface, and an aid in sliding the insert into the bearing seat.

Bearing inserts are supplied to the repair shops ready to be installed. They are available in one crankshaft undersize and one crankcase seat oversize.

The crankshaft main bearings should always be replaced in complete sets.

The crankshaft must be sent to the factory to be reground on either the main or connecting rod journals. Lapping the bearing surfaces will damage the mild-nitrated surface and would result in rapid crankshaft wear. Therefore all crankshaft reworking must be done by the factory.

Removing and Installing Main Bearings

Removal

1. Disassemble crankcase.
2. Remove crankshaft.
3. Remove bearing inserts from the crankcase halves, and inspect whether white metal surface is reusable. If the lead bronze layer is visible a complete set of new main bearings should be installed.

Inspection

1. Clean crankcase and bearing seats thoroughly.
2. Assemble empty crankcase and tighten cap nuts to 4 mkg (29 ft. lb.) torque.
3. Using VW 247 gauge ring measure the bearing bores in the crankcase (for dimensions see SE 15).

Installation

Note

The bearing seats have an index recess into which the insert index fits in order to prevent the bearing from rotating in the crankcase.

1. Thoroughly clean the crankcase halves and insure that bearings, bearing seats, and oil passages are clean.

2. Install bearing insert at index first; then press firmly into place (Fig. 2).

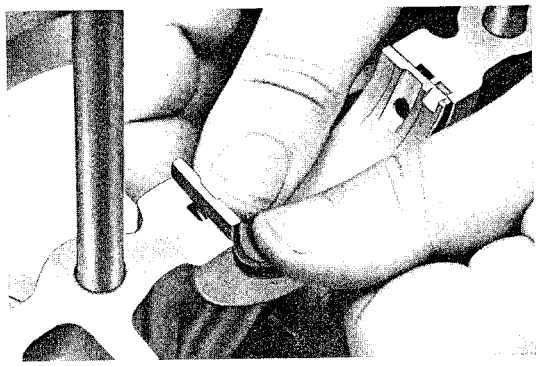

Fig. 2

3. Lay the crankshaft on the well oiled bearings observing the fit of the thrust faces at bearing No. 1. Apply a uniform thin coat of sealing compound to the crankcase joint allowing no compound to enter the bearing surfaces or into the oil passages. Install right crankcase half and tighten cap nuts to the prescribed torque.

4. Turn crankshaft and check free rotation.

Adjusting End Play

General

The end play (new installation) for the 1600 S-90 engine is 0.10 to 0.18 mm. To achive the correct clearance, five sizes of thrust washers are available.

Size A = 2.80 mm

Size B = 2.85 mm

Size C = 2.90 mm

Size D = 2.95 mm

Size E = 3.00 mm

The thrust washers are marked with a letter indicating the size group.

1. Install bearing inserts into both crankcase halves.

2. Install the crankshaft in the well oiled bearings.

3. Place the thrust washer on the end of the installed crankshaft.

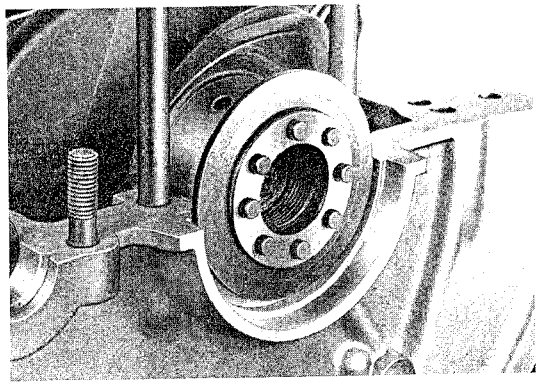

Fig. 3

4. Install the right crankcase half and tighten the cap nuts to the prescribed torque.

5. Install a soft iron gasket on the crankshaft and bolt the flywheel to crankshaft with 45 to 50 mkg (326 to 363 ft. lb.) torque.

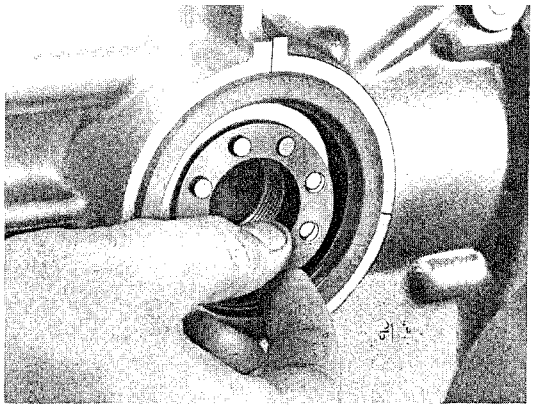

Fig. 4

6. Attach special tool P 17 and dial gauge to the crankcase flange so that the feeler of the dial gauge contacts the rim of the flywheel and travels parallel to the crankshaft.

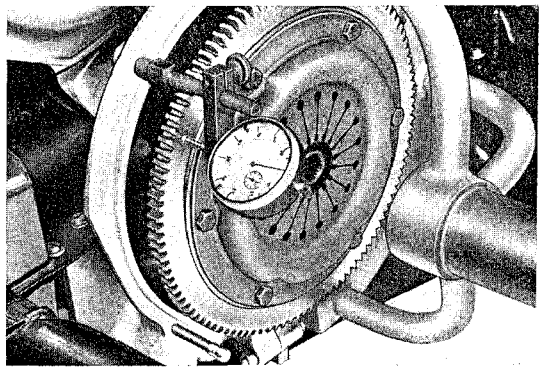

Fig. 5

7. Measure end play by moving the crankshaft axially in both directions. Correct the end play by installing a thinner or thicker thrust washer as required.

Removing and Installing Valves

Inspecting Valve Springs

A 5% deviation from the listed pressures is permissible in the case of used springs.
It is desirable that the valve springs of the 1600 S-90 engine have a pressure of at least 94 kg (208 lb.) at a compressed length of 30.15 mm.
These valve springs have been installed in all 356 B engines for some time and replace those mentioned in the basic manual having a free length of 47 mm. Only valve springs of the same type and free length should be installed in one engine due to their different spring characteristics.

Testing Installed Length

Note

The intake and exhaust valve springs are of equal length. The difference in the installed length is obtained by the use of spacer washers. All the valve springs of the 1600 S-90 engine have an additional 1.5 mm steel washer to increase the spring pressure.

Important

The valve springs must not bear on the shims but must always seat on the steel washer. The springs will damage the shims if they are not protected by the steel washer.

Free length	49 mm	1.929 in.	
Cross-section dia.	4,5 mm	.177 in.	
Pressure at 41 mm, 1.614 in. Compressed length	35 kg + 2,5 kg – 1.0 kg	77.3 lb.	+ 5.5 lb. – 2.2 lb.
Pressure at 30.15 mm 1.187 in. Compressed length	93 kg + 7 kg – 3 kg	205.5 lb.	+ 20 lb. – 6.6 lb.

1. Install special tool P10 in the cylinder head together with the corresponding valve, spring retainer, and keepers.

Installed length for intake valve springs	**41.0 mm 1.614 in.**
Installed length for exhaust valve springs	**40.0 mm 1.575 in.**

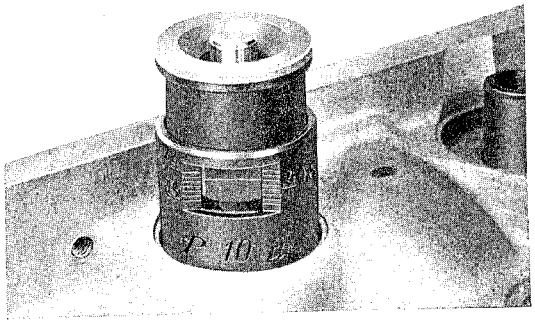

Fig. 6

2. Adjust with shims until the correct length is obtained.

3. Install valve springs so that the closely wound coils are nearest the cylinder head and rest on the steel washer (Fig. 7).

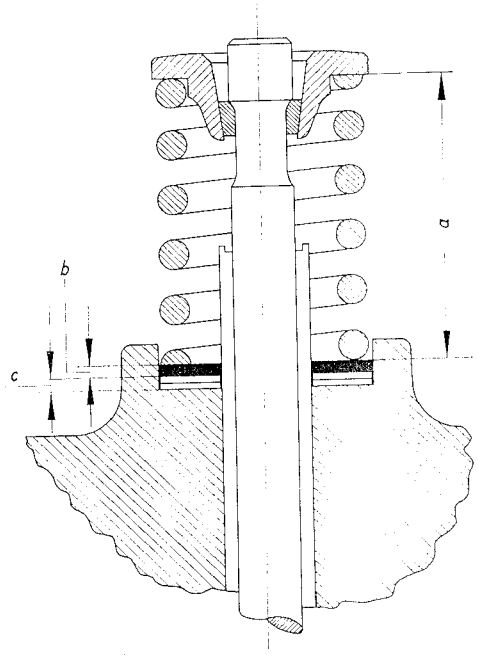

Fig. 7

a = Installed length
b = Steel washer
c = Shims

Lower Air Channel

In order to increase the flow of cooling air of the 1600 S-90 engine, a specially designed lower air channel having two outlet flaps and an intake funnel for the fan housing have been incorporated in the cooling system.

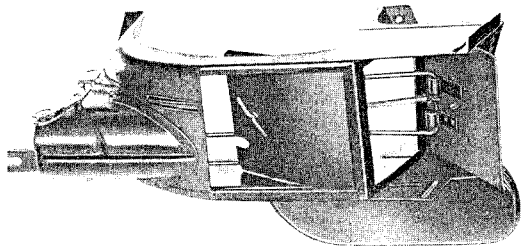

Fig. 8

Inspecting Cylinders

The 1600 S-90 engine is equipped with light alloy cylinders with ferral bore surfaces. The following size group table is valid for the 1600 S-90 engine only.

Size group divisions

Group	Cylinder Dia mm	Piston Dia. mm
A	82.460-82.465	82.430-82.435
B	82.465-82.470	82.435-82.440
C	82.470-82.475	82.440-82.445
D	82.475-82.480	82.445-82.450
E	82.480-82.485	82.450-82.455
F	82.485-82.490	82.455-82.460
G	82.490-82.495	82.460-82.465
H	82.495-82.500	82.465-82.470
I	82.500-82.505	82.470-82.475
K	82.505-82.510	82.475-82.480

Matching cylinder and piston pairs are marked with the same letter. The cylinders are marked at the base while the pistons are marked on the face.

Only cylinders and pistons of the same size group are to be matched.

Matching cylinder and piston pairs are marked with the same letter. The cylinders are marked at the base while the pistons are marked on the crown. Only cylinders and pistons of the same size group are to be matched. Cylinders must be measured using an inside micrometer and gauge ring P 13 c.

Cylinder measurement should be taken approximately 30 mm (13/16 in.) from the bottom of the bore.

Piston cylinder clearance, new, should be from 0.025 to 0.035 mm (.00098 to .00138 in.). The wear limit is 0.1 mm (.00394 in.).

Cylinders approaching the wear limit should be replaced together with their pistons by new pairs of the same size group. Within one engine it is permissible to have a size group difference of not more than four, i. e. A and D sizes may be used, but not A and E.

Note

Cylinder heights between the base and the cylinder head mounting surface are available in four height groups.

Only cylinders of the same height group may be installed under a common cylinder head. The height group is marked on the cylinder base in an equilateral taringle next to the size group with a 5, 6, 7, or 8.

Installing Piston Rings

When installing piston rings observe the "TOP" marking. The top marking as well as the inside bevel on the compression rings must be up or toward the piston crown. The first compression ring is made of a specially hard alloy and is distinguishable by the marking "E 120" next to the word "TOP". This ring must not be installed in the other grooves (Fig. 9).

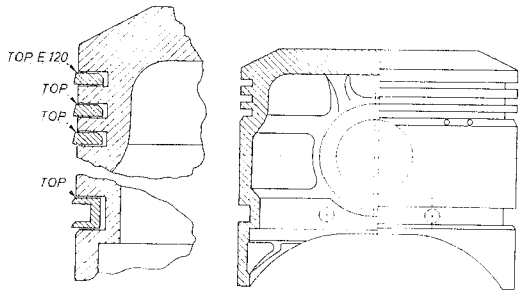

Fig. 9

Measuring Points and Markings of Pistons

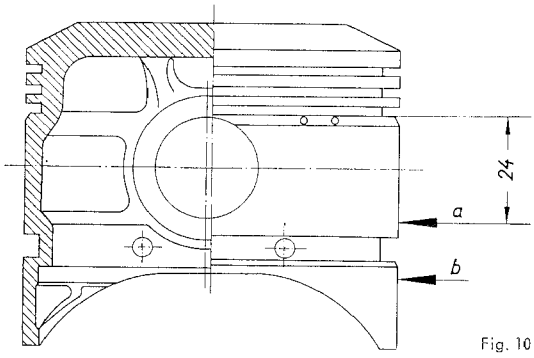

Fig. 10

1600 S-90 Engine

Nominal piston diameter 82.5 mm

Characteristic features:

Broad bevel around high piston crown.

Three compression rings above the piston pin and one oil control ring below the piston pin.

Nominal diameter measuring point at arrows "a" and "b".

For piston dimension see page SE 9.

Missing Supplement page SE11

9. Rotate the crankshaft pully one half revolution (exactly 180°) counter clockwise and adjust the valves of cylinder II.

10. Procede likewise for the remaining cylinders.

11. Clean the rocker box covers with solvent and inspect the cork gasket. Replace the gasket if required.

12. Test the free movement of the ball check valve and correct deficiencies.

13. Install rocker box covers.

14. Start engine and check for oil leaks.

Adjusting Ignition Timing

General

The ignition point is 3° before TDC or approx. 3.6 mm (9/64 in.) at the rim of the crankshaft pulley measured in the direction of rotation (marked with a pencil). This mark is then aligned with the mark on the crankcase with the distributor rotor pointing toward the notch in the distributor housing.

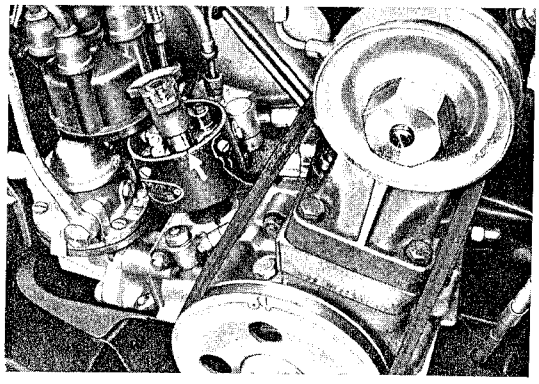

Fig. 13

Adjusting

1. Remove the distributor cover and bring the engine and distributor to the timing mark for cylinder I (3° BTDC or 3.6 mm, 9/64 in. at pulley rim).
2. Loosen clamping bolt at distributor base.
3. Connect one lead of a 6 V test lamp to terminal one on the distributor housing and the other to ground.
4. Switch on ignition.
5. Rotate distributor clockwise until the breaker contacts close (lamp goes out), then rotate counter clockwise until the test lamp lights and hold at the exact position.
6. Tighten clamp.
7. Install distributor cap.

Note

The ignition timing of all four cylinders is correct if the test lamp lights exactly when the pencil mark, 3° or 3.6 mm (9/64 in.) before TDC comes in line with the crankcase mark while the crankshaft is slowly rotated clockwise.

Centrifugal Valve

General

The centrifugal valve insures that the oil suction pipe, and therefore the lubrication system, receves oil even while traveling in fast curves.

Operation

Two valves, which are attached to the ends of a common sliding stem, open alternately to either side. In a curve the sliding valves move toward the outside of the curve just as the oil in the sump does. The closed valve prevents air from entering the suction pipe while the open valve remains submerged in oil.

Removal

1. Remove 10 nuts securing the sump plate.
2. Remove sump cover with magnetic filter.
3. Remove gaskets, centrifugal valve assembly, and oil strainer
4. Clean all parts using solvent.

Installation

The installation is accomplished in the reverse order of removal observing the following points:

1. The oil suction pipe must seat firmly in the crankcase.
2. Clean the crankcase seating surface removing old gasket material.
3. Use three new gaskets.
4. The centrifugal valve must move freely and seat properly in the housing.
5. The strainer must fit easely in the grooves of the centrifugal valve body.
6. Install centrifugal valve assembly with oil strainer so that the sliding valve is offset to the rear (to the muffler).
7. Install sump plate with the magnetic filter and new gasket.
8. Tighten 10 nuts uniformly.

Section view of oil strainer with magnetic oil filter and centrifugal valve

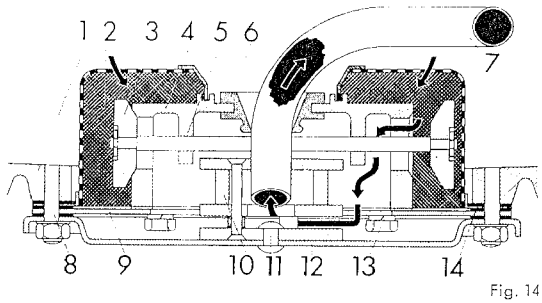

Fig. 14

① Crankcase
② Oil strainer
③ Valve
④ Centrifugal valve housing
⑤ Common valve stem
⑥ Oil suction pipe gromet
⑦ Oil suction pipe
⑧ Stud
⑨ Base plate
⑩ Magnetic oil filter
⑪ Magnetic filter retaining rivet in sump plate
⑫ Oil sump plate
⑬ Cap screw for fastening valve housing to base plate
⑭ Gasket

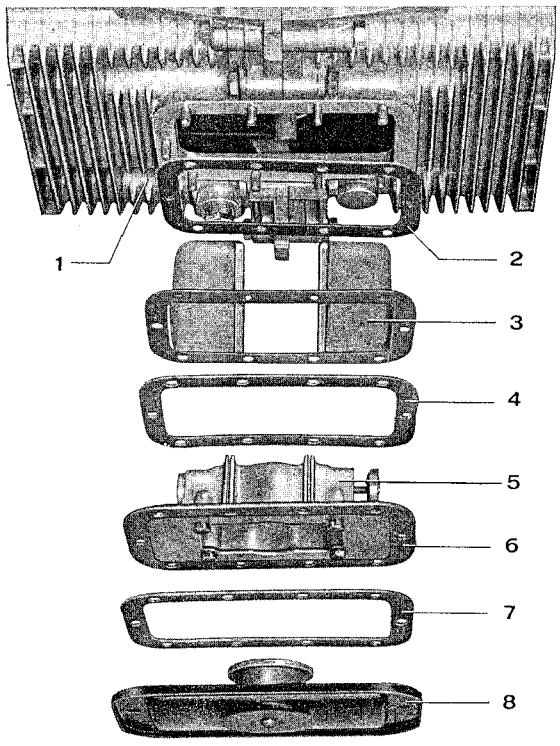

Fig. 15

① Crankcase
② Gasket
③ Oil strainer
④ Gasket
⑤ Housing with centrifugal valve
⑥ Base plate
⑦ Gasket
⑧ Oil sump plate with magnetic filter

Ball Check Valve in Rocker Box Covers

A ball check valve has been installed in the rocker box covers to prevent oil loss through the breather hole while traveling in fast curves. The check valve should be cleaned with solvent and inspected for proper operation when the valve clearance is adjusted. Disassemble and clean the valve if necessary.

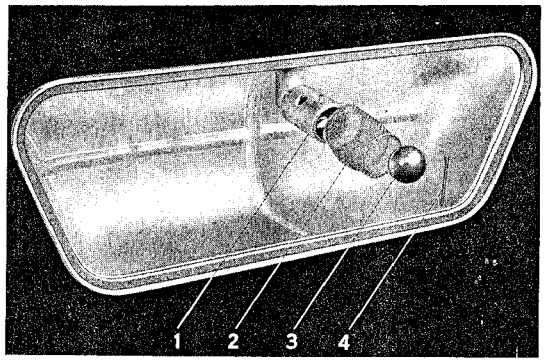

Fig. 16

① Valve housing
② Screen
③ Ball
④ Cotter key

Crankshaft and Main Bearing Dimensions for 1600 S-90 Engines

Main Bearings

Item	Type		Bearings 1, 2 and 3 mm
Journal	standard	diameter	54.990 - 54.971
Bearing	int. dia. standard ext. dia. standard	wall thickness	2.615 - 2.603
Crankcase bore	standard	diameter	60.24 ± 0.005
Journal	standard	diameter	54.990 - 54.971
Bearing	int. dia. standard ext. dia. oversize	wall thickness	2.740 - 2.728
Crankcase bore	for oversize bearing	diameter	60.49 ± 0.005
Journal	1. undersize	diameter	54.740 - 54.721
Bearing	int. dia. undersize ext. dia. standard	wall thickness	2.740 - 2.728
Crankcase bore	standard	diameter	60.24 ± 0.005
Journal	1. undersize	diameter	54.740 - 54.721
Bearing	int. dia. undersize ext. dia. oversize	wall thickness	2.865 - 2.853
Crankcase bore	for oversize bearing	diameter	60.49 ± 0.005
Journal	2. undersize	diameter	54.490 - 54.471
Bearing	int. dia. undersize ext. dia. standard	wall thickness	2.865 - 2.853
Crankcase bore	standard	diameter	64.24 ± 0.005
Journal	2. undersize	diameter	54.490 - 54.471
Bearing	int. dia. undersize ext. dia. oversize	wall thickness	2.990 - 2.978
Crankcase bore	for oversize bearing	diameter	60.49 ± 0.005

Second Edition of this Page, April 1963

Crankshaft and Main Bearing Dimensions for 1600 S-90 Engines

Main Bearings

Item	Type		Bearings 1, 2 and 3 mm
Journal	3. undersize	diameter	54.240 - 54.221
Bearing	int. dia. undersize ext. dia. standard	wall thickness	2.990 - 2.978
Crankcase bore	standard	diameter	60.24 ± 0.005
Journal	3. undersize	diameter	54.240 - 54.221
Bearing	int. dia. undersize ext. dia. oversize	wall thickness	3.115 - 3.103
Crankcase bore	for oversize bearing	diameter	60.49 ± 0.005

Crankshaft journal and insert dimensions for main bearing No. 4 as well as crankshaft journal and insert dimensions for connecting rod bearing are the same as for 1600 and 1600 S engines.

Crankshafts for 1600 S-90 engines can only be regrinded at the factory and/or obtained through the exchange service, as these crankshafts demand a special treatment of material.

Undersize bearings are available as spare parts. When ordering note whether the crankcase bores are standard or oversize.

Measuring point for wall thickness of bearing inserts.

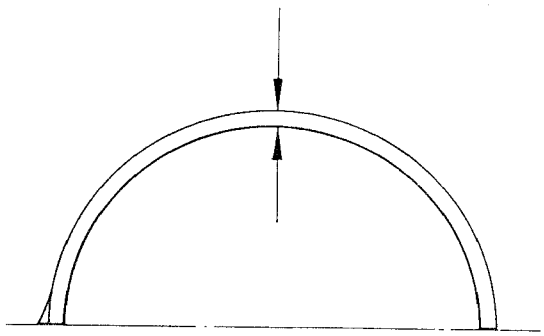

Fig. 17

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Torque Values.

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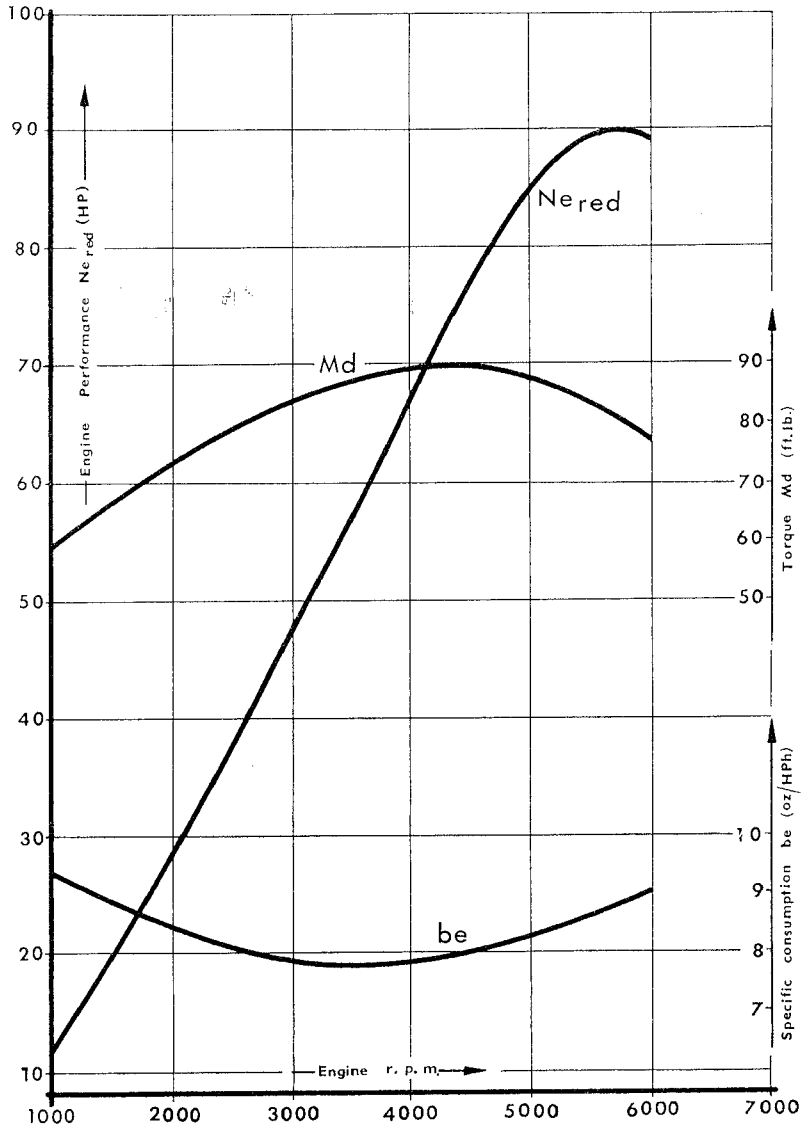
Performance and Fuel Consumption 1600 S-90 Engine (DIN HP)



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Tolerance and Wear Limits

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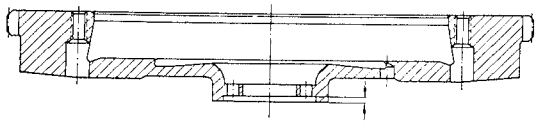
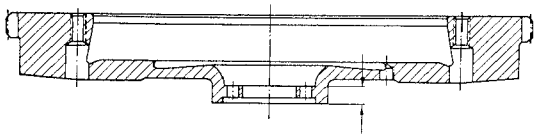
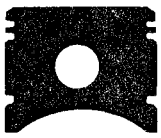
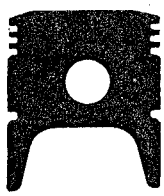
Measuring Point	Tolerance (new) mm	Wear Limit mm	
7. Flywheel Depth of flywheel recess	2.10 – 2.15	–	
8. Oil seal bearing surface width	8.250 – 9.250	–	
9. Valve springs Free length Installed length exhaust intake	49.00 41.00 40.00		See Fig. 7 Page SE 8

TYPE 1600 S ENGINE

(Reference 616 / 12)

The type 1600 S engine (Ref. No. 616/2) has been modified to a certain extent and will be referred to as No. 616/12. The modifications apply to engines commencing with Engine Serial No. 700 001.

The following charts show the extent of changes made.

616/2 Engine	Characteristic	616/12 Engine	Characteristic
Light alloy cylinders	See text	Cast iron cylinders	See text
Piston with 2 compression rings and 1 oil control ring.		Pistons with 3 identical compression rings and 1 oil control ring.	
Fan housing with screened air intake.	See text	Fan housing with air funnel without screen. *	See text
Fuel line.		Contoured fuel line for installation with fan housing with air funnel. *	See text
Light - alloy pushrods.		Pushrods combined of light - alloy and steel.	

* This modification also applies to the engine type 1600

616/2 Engine	Characteristic	616 / 12 Engine	Characteristic
Oil cooler without air baffles between cooling tubes.	See text	Oil cooler with reinforced base plate and air baffles between cooling tubes.	See text
Right and left bell - crank support brackets welded to fan housing.	See text	Left bell-crank support welded to air blower housing, right support of spring steel, bolted to fan housing. *	See text
Valve clearance: Inlet 0.15 mm (.006 in.) Exhaust 0.10 mm (.004 in.)		Valve clearance: Inlet 0.10 mm (.004 in.) Exhaust 0.15 mm (.006 in.)	
Cooling air outlet duct with one gate.	See text	Cooling air outlet duct with two gates.	See text
Rocker box cover without ball valve.	See text	Rocker box cover with ball valve.	See text

* This modification also applies to Type 1600 and 1600 S - 90 engines

Missing Supplement page SE25
Cylinders and Pistons Specifications for 616/12 Engine

you can email a copy to 356@miplace.com if you have.

TIMING GEAR BACKLASH

Engine Types 1600, 1600 S, and 1600 S-90

Installation tolerance (new) for backlash between the timing gear and crankshaft gear has been changed to 0.015 - 0.025 mm (.0006 to .0010 in.). This tolerance must be maintained when repairing any engine with the 3-piece crankcase.

CONNECTING ROD BEARING INSERTS

The Type

1600	engines - beginning with engine No. P-606 801
1600 S	engines - beginning with engine No. P-700 001
1600 S-90	engines - beginning with engine No. P-804 001

will be equipped with modified connecting rod bearing inserts. The spare part number for this new type has not been changed. The modified connecting rod bearing inserts are not readily reconizable.

The main feature of this modification is that the bearing inserts are by 0.02 to 0.035 mm thinner for a length of 7 mm, starting from the mating surfaces of both bearing inserts (see Fig. 2).

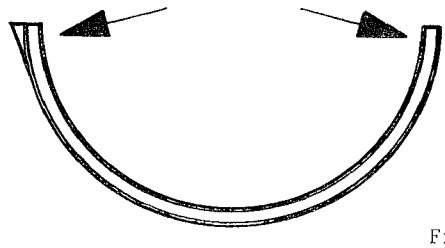


Fig. 2

It is important to make sure that only the modified bearing inserts are used for the Type 1600 S-90 engines.

C L U T C H

Commencing with Engine-Nr. 804 001 , the 1600-S 90 engines(Ref. Nr. 616 / 7) will be equipped with the A-12 HAEUSSERMANN clutch. The following table indicates the extent of changes made.

A-10 Clutch	Characteristic	A-12 Clutch	Characteristic
Clutch disc facing outside diameter 179 - 181 mm	See text	Clutch disc facing outside diameter 199-201 mm	See text
Clutch disc facing inside diameter 124 - 125 mm	See text	Clutch disc facing inside diameter 130 - 131 mm	See text
Clutch disc facing thick - ness without load, 9.1 - 9.5 mm	See text	Clutch disc facing thick - ness without load, 9.7 - 10.1 mm	See text
Clutch disc facing thick - ness underload, 8.2 - 8.6mm Wear tolerance 7.5 mm	See text	Clutch disc facing thick - ness under load, 9.0 - 9.4 mm, Wear tolerance 8.0 mm.	See text
Disc spring Code Nr. 692	See text	Disc spring Code - Nr. 692 / 3 A	See text

The description and outline of service operations presented in the basic volume of the 356 B Service Manual remains same with the exception that changed specifications must be noted.

In this connection we again wish to stress the following:

Permature clutch slippage may often be attributed not to mechanical wear but to abnormal dragg in the pivot points of the disc spring.

When encountering clutch slippage, or when access to clutch is gained as a result of a service operation, the following work should be performed:

1. Check if pivot points of disc spring are well lubricated with grease containing molybdenum-sulphide additives. If the points are not sufficiently lubricated, disassemble clutch and thoroughly clean it.

2. Grease all pivot points of clutch disc spring (See Fig. 1).

3. Assemble clutch. Check tolerances and correct deficiencies, if noted (refer to service operation 60-MO, Group M, basic volume of 356 B Service Manual).

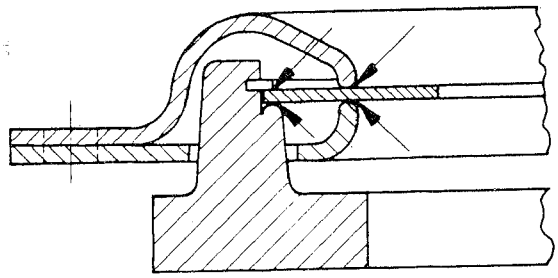


Fig. 1

Heating System Type 356 B/ T 6, Acceptance Code No. S 50

(This heating system is being manufactured on account of a legal regulation for Western Germany)

Description of the 356 B/ T 6 Heating System

The entire fresh air supply enters through slots in the engine compartment lid (1), being drawn in by the cooling air blower. Part of the fresh air flow, required for heating of the passenger compartment, is diverted from the cooling air blower (2) into a separate duct (3).

The fresh air (outside air) flows from the supply duct through the two heat exchangers (4) at the engine. The heat exchangers consist of closed sheetmetal jackets which enclose the exhaust pipes (5). All detachable and welded joints of the exhaust system (6) have been excluded from the confines of the heat exchanger jackets.

The heating air flows from both heat exchangers through connecting hoses (7), air gates (8), guide ducts (9), and silencers included within the longitudinal chassis support members, to outlets which are arranged in pairs.

Warm air outlets are provided as follows:
For defrosting windshield (11) and the rear window (12) by way of defroster nozzles.
For the forward leg area (pedal area) by way of sliding gates (13) located alongside the longitudinal chassis supports next to both seats.

The air gates (8) are so designed as to permit a continuous flow of air through the heat exchangers (over the exhaust pipes) regardless whether the heat is turned on or off.

Additionally, cold outside air may be let in through the ventilating system (14) in front of the windshield, independently of the car's heating system.

The heater is controlled by a turning knob located in front of the gearshift lever.

By turning the knob counter-clockwise, the heater is turned on; it is turned off by turning the knob clockwise. When the knob is turned, control flaps in the air gates (8) are actuated by way of cables. Should the control cable break, the hot air flow automatically shuts off and, simultaneously, the safety outlet opens up.

Sliding gates (13) are provided for the forward leg room and are located on the right and left inboard sides of the longitudinal support members next to the front seats. Part of the inflowing warm air, namely that flowing to the leg area, may thus be regulated or completely shut off.

When the sliding gate is pushed forward, the air outlet for the leg area is shut off.

When the sliding gate is closed, the entire warm air supply enters the passenger compartment through the defroster nozzles (11 and 12).

Additional ventilation is possible through the ventilating system (14) which is controlled by means of control levers mounted on the dashboard.

Caution!

To ensure proper cooling of engine, a certain amount of backpressure must exist within the heating system, which is achieved -with the engine installed -through the existence of heating ducts and air gates.

Therefore, when running performance tests on engines which are dismounted from the car, it is absolutely essential to create a backpressure within the heating system.

Proper backpressure may be maintained on dismounted engines by installing an air flow restrictor cap on the hot air discharge ducts of the heat exchangers; the caps are fastened to the heat exchangers by hose clamps.

Reference Fig. 1 for specifications for local manufacture of restrictor caps.

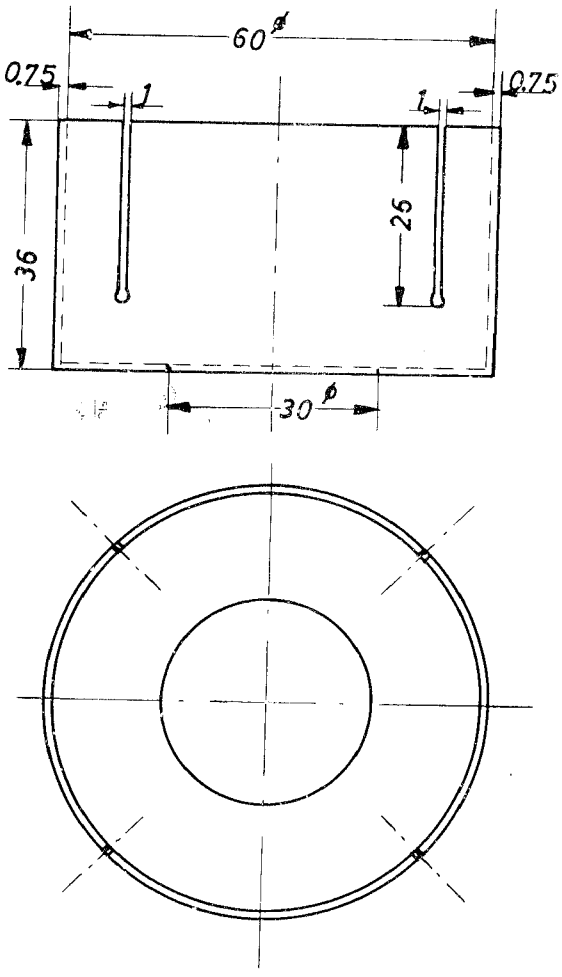


Fig. 1

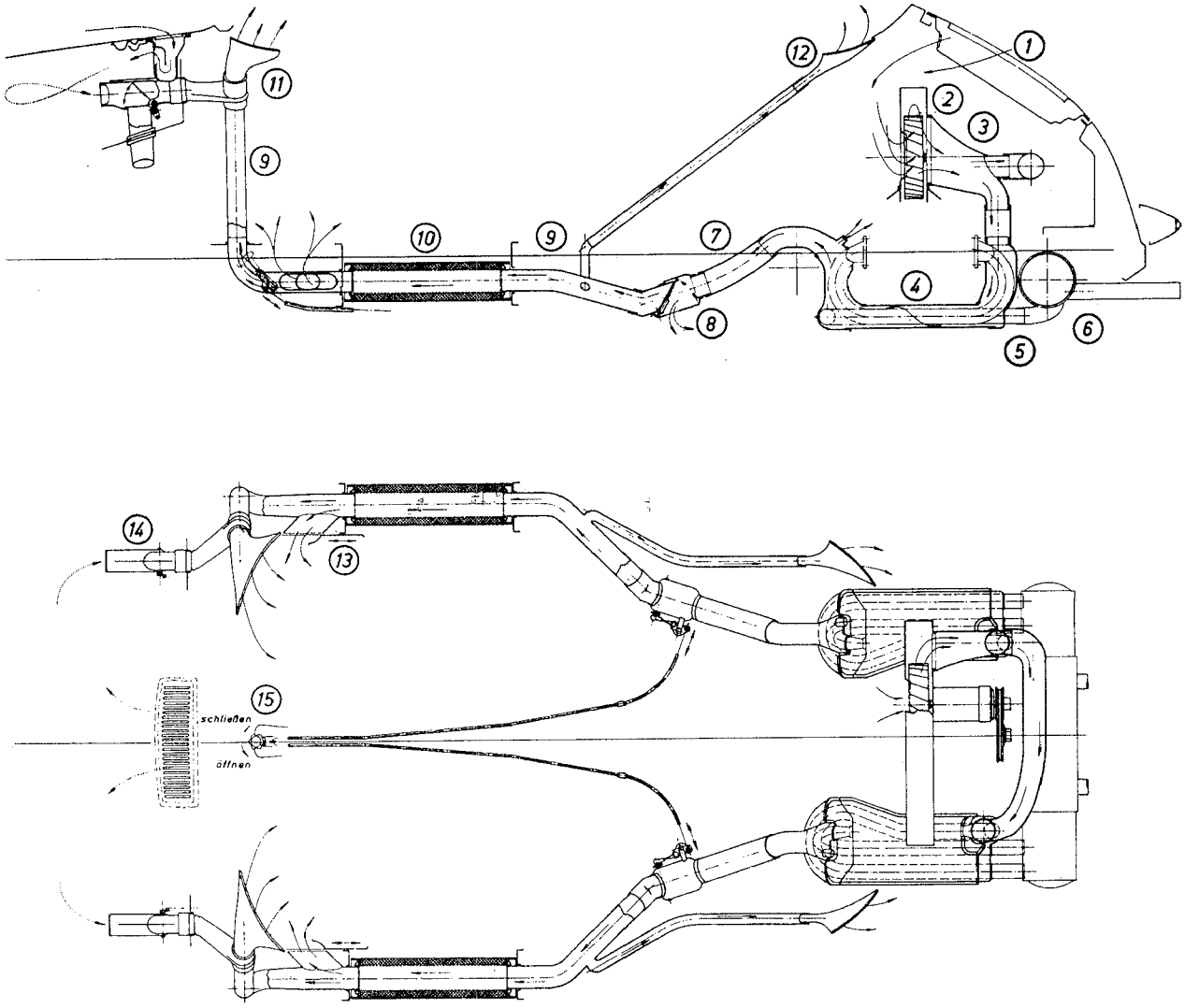


Fig. 2

Schematic View of Type 356 B/ T 6 Heating System

1 Engine compartment lid
2 Cooling air blower
3 Connecting duct
4 Heat exchangers
5 Exhaust pipes
6 Exhaust muffler
7 Connecting hoses
8 Air gates
9 Duct tubes
10 Silencers
11 Defroster nozzles, windshield
12 Defroster nozzles, rear window
13 Sliding gate, leg room
14 Ventilating system
15 Turning knob

Removing and Installing Engine

Note: As a result of the introduction of the 356 B/T 6 heating system, certain changes ensued in the engine removal and installation procedures.

Removal

1. Jack up car or place it on stand.
2. Disconnect battery terminal cables.
3. Shut off fuel valve.
4. Raise engine compartment lid.
5. Disconnect heater air hose in engine compartment.

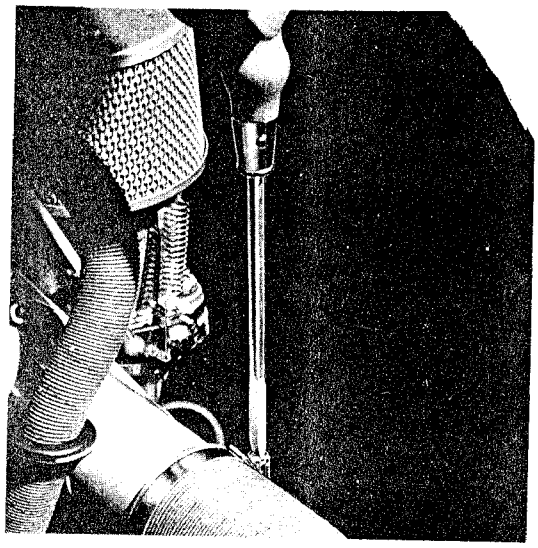


Fig. 3

6. Detach connecting duct from air blower housing (ref. page SE 37).
7. Remove fuel pump shield.

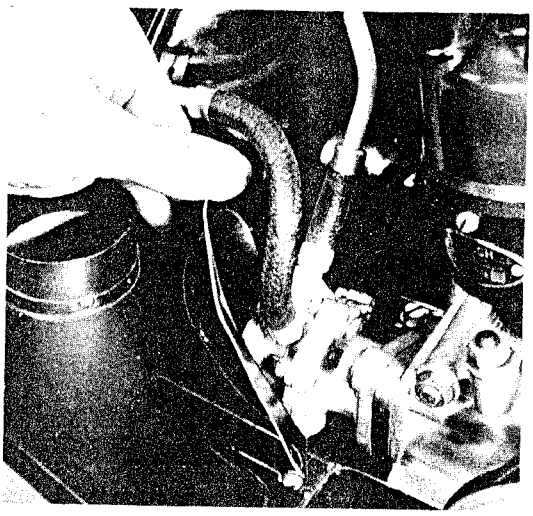


Fig. 4

8. Remove retaining screws from rear engine cover plate and pull it up diagonally.

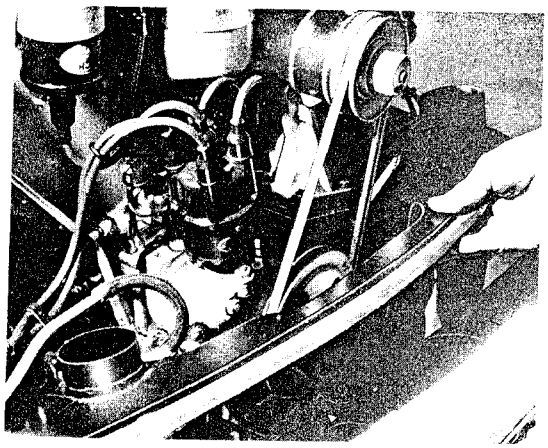


Fig. 5

9. Pull out cable connecting oil temperature sender (black/green).
10. Disconnect (black) lead from ignition coil (Terminal 15).
11. Disconnect (green) lead from oil pressure sender.
12. Disconnect generator leads D- (yellow/white), DF (black), and D+ (red).
13. Detach ball joint throttle linkage and pull it out downward.

Fig. 6

14. Loosen both heater flex hoses from engine.
15. Loosen tail pipe clamp screws at muffler and remove tail pipes.
16. Disconnect fuel line by sliding hose off tubing.
17. Detach tachometer drive.
18. Remove two engine mounting nuts from lower mounting studs.
19. Place dolly or engine jack under engine.
20. Hold two upper engine mounting bolts and have assistant remove the nuts.
21. When using a dolly: lower the car until engine comes to rest on dolly.
    When using an engine jack: raise jack until engine rests on its platform.
22. Move engine away from the gearbox until mainshaft clears the clutch plate.
23. Lower the engine and pull it out to the rear.

Installation

The engine is installed in reversed order of the above, following instructions outlined on page E 6, Section 1 EN; however, points 11 and 12 should be disregarded.

Removing and installing muffler

Removal

1. Loosen exhaust pipe clamps at muffler and remove tail pipe extensions.
2. Loosen clamp bolts.

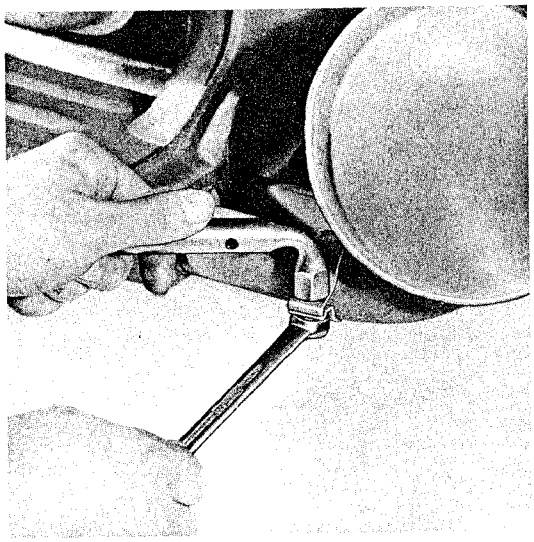


Bild 7

3. Loosen and remove both muffler clamps.

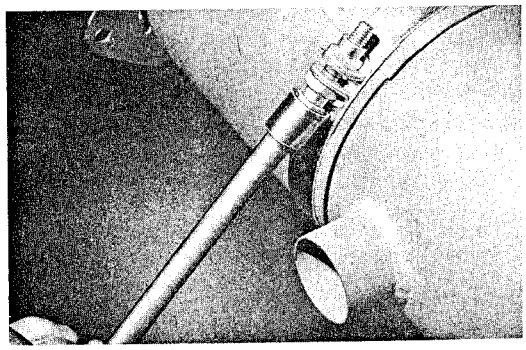


Fig. 8

4. Remove muffler by gently tapping with a rubber mallet on exhaust pipe joints.

Installation

Installation is accomplished in reversed order of the above, noting the following points:

1. Prior to installation, carefully inspect the muffler and exhaust pipes for damage or leaks.
2. Straighten dented or bent pipes, replace if necessary. Leaks in the exhaust pipes could allow exhaust gasses to enter the engine compartment and, with heater turned on, into the car's interior.
3. Once the engine is installed, the muffler or exhaust pipes should not touch the body.

Removal (engine dismounted from car)

1. Loosen carburetor heating hose clamps at heat exchangers and pull the hose off.

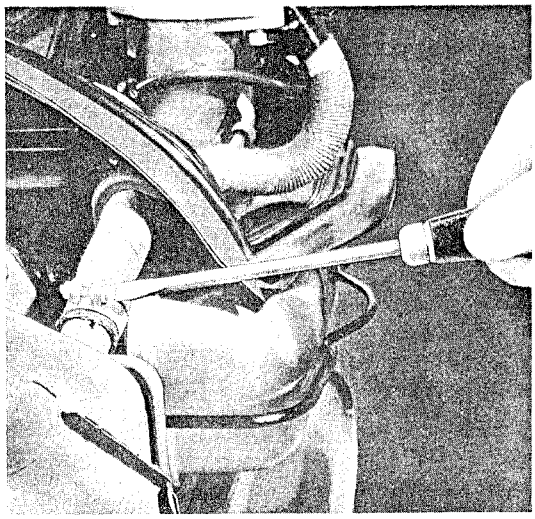


Fig. 9

2. Detach forward engine cover plate

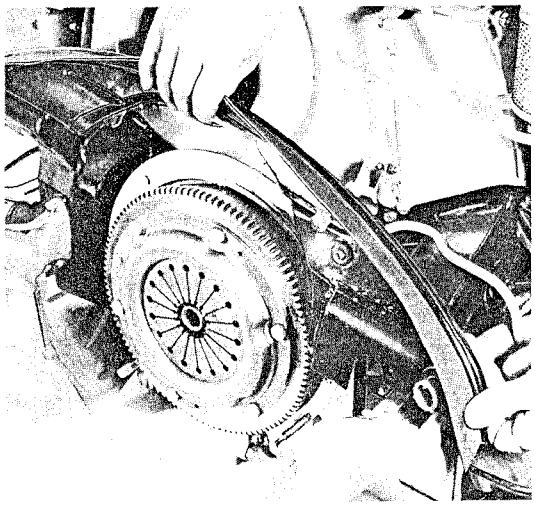


Fig. 10

3. Remove attaching bolt on front part of heat exchanger.

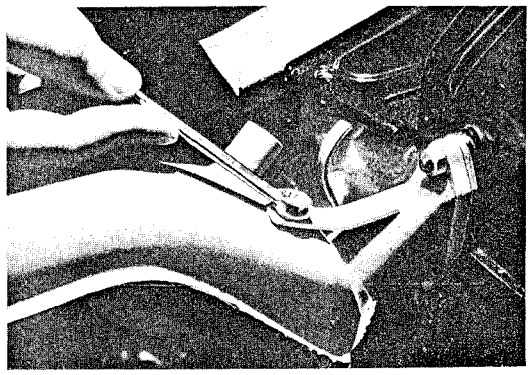


Fig. 11

4. Remove front and rear exhaust flange retaining nuts.

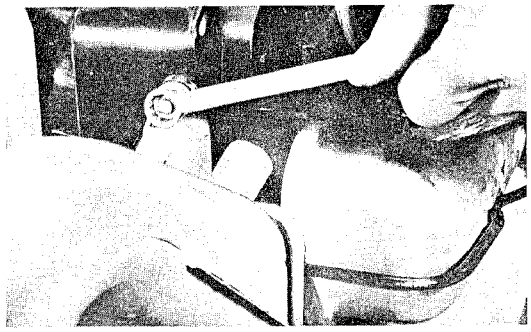


Fig. 12

5. Remove lower air guides.

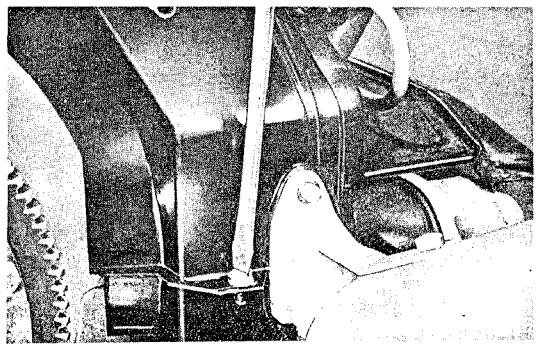


Fig. 13

6. Pull front and rear exhaust pipes away so that flanges clear the studs, remove heat exchanger assembly by moving it downward.

Note:
In the early versions, where the front part of the heat exchangers is screwed on, it is necessary to first detach it when disassembling or assembling the unit in order to gain clearance necessary for pulling the exhaust pipes off the studs.

Installation

The installation is accomplished in reversed order of the above, observing the following points:

1. Inspect heat exchangers and exhaust pipes for leaks or damage.
2. Flange sealing surfaces must be straight and clean; warped flanges should be straightened.
3. Use new gaskets.
4. Slip edge of lower air guides between the first fins of cylinder head.

Removing and installing air blower connecting duct

Note:

The air blower housing utilized with 356 B/T 6 heating system differs from earlier models, but only inasmuch as it has an air outlet for the heating system. For assembly or disassembly, follow instructions outlined in Section 4 EN, Basic Volume, 356 B Workshop Manual.

1. Detach heating hose from connecting stack.

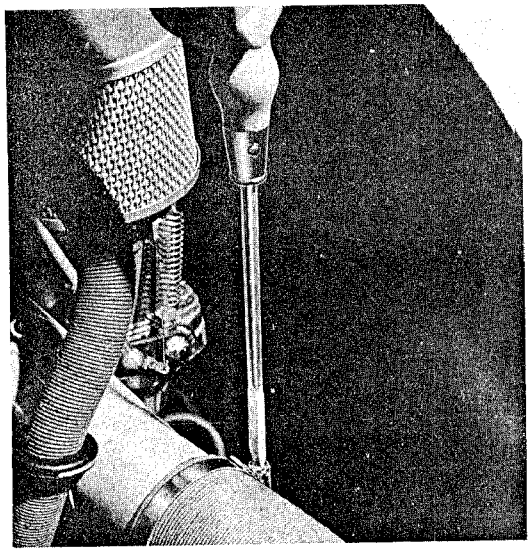


Fig. 14

2. Withdraw breather hose, with grommet, from bracket at the connecting duct and remove duct by moving it up diagonally.

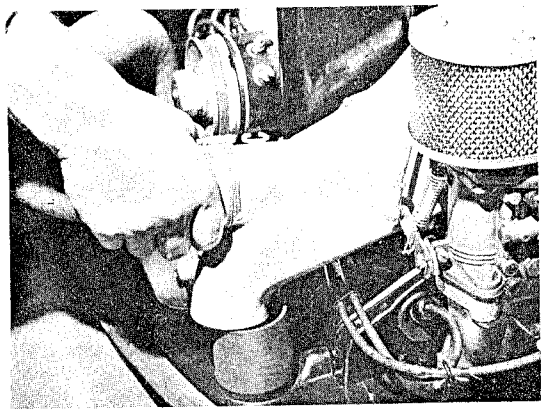


Fig. 15

Installation

1. Check position of counter nut on stud which secures the connecting duct. The position of the hext nut should be so as to ensure proper alignment of the duct with the air blower housing and, also, exclude the possibility of misalignment when tightened.

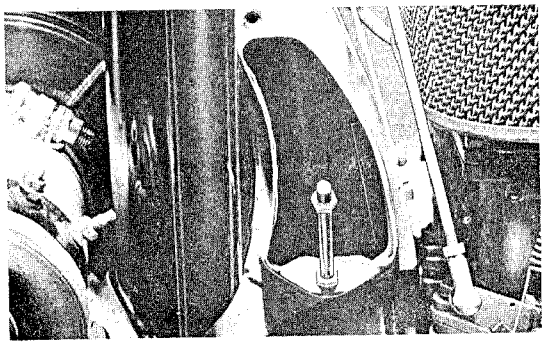


Fig. 16

2. Inspect heating and breather hoses for leaks or damage.

Removing and installing 356 B/T 6 heater cables

General

The heater cables need not be removed, except when replacement is contemplated.

Removal

1. Detach cable ends from connecting levers at air gate assemblies.
2. Remove floor tunnel cover.
3. Mark original position of shift lever base to simplify reassembly.

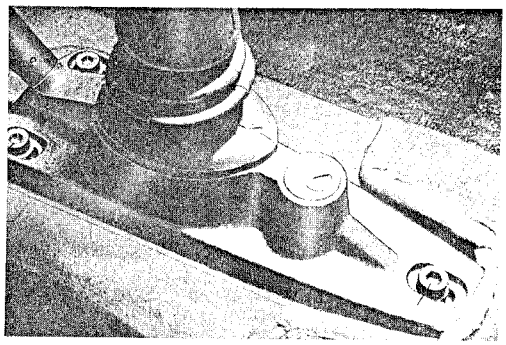


Fig. 17

4. Remove the three retaining bolts from shift lever base.
5. Lay shift lever base on its side.
6. Remove lock ring from heater spindle with a small screwdriver, turn spindle now until spindle nut is removed.

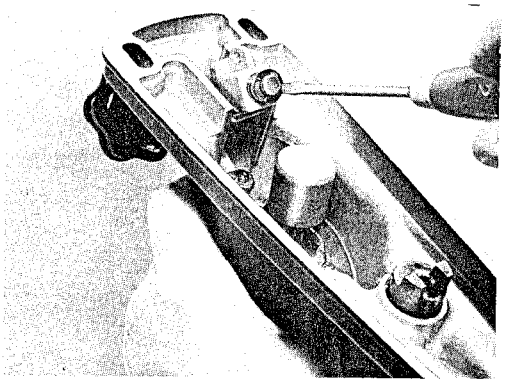


Fig. 18

7. Pull out heater cables.

Installation

1. Thread one end of heater cable through eye in spindle nut and pull cable through to the bend.
2. Insert both ends of cable into conduit tubes; make certain that cables do not cross.
3. Install spindle nut on heater control spindle with cable eye pointing to the front of car.

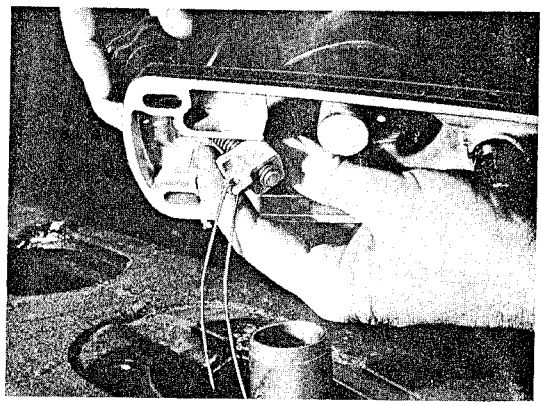


Fig. 19

4. Install lock ring on control spindle.

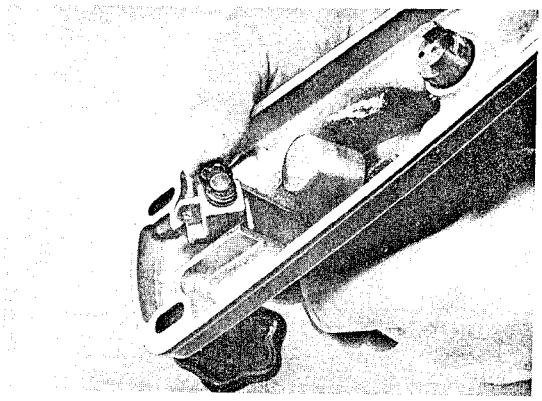


Fig. 20

5. Install gearshift base and start the three Allen-head screws, do not tighten.

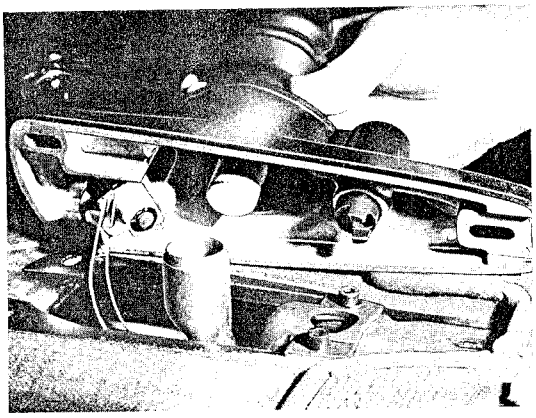


Fig. 21

6. Align gearshift base with markings, tighten screws.

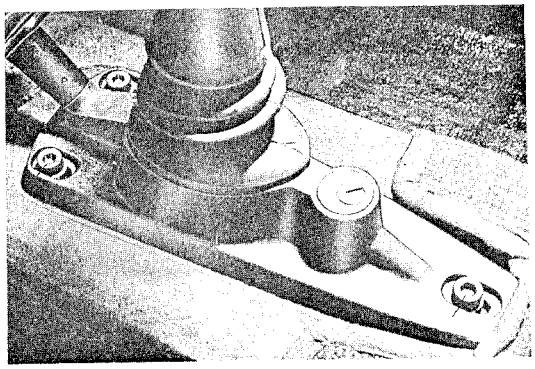


Fig. 22

7. Turn control knob to the lowest position of spindle nut, that is, until it rests against the lock ring.

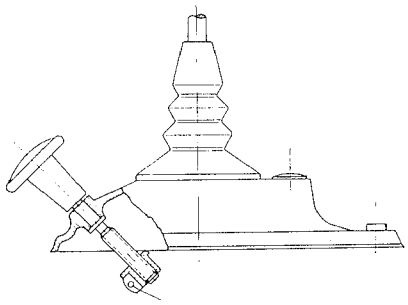
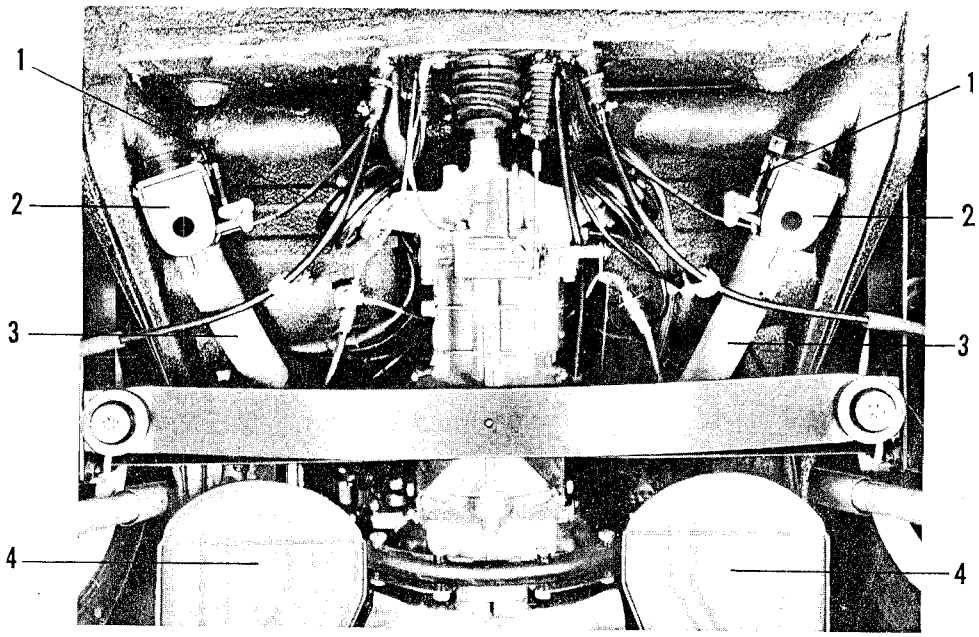


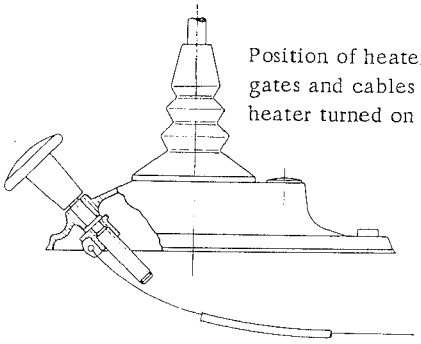
Fig. 23

8. Attach control cable ends to connecting levers at air gate assemblies. Make certain that the heater flaps work in unison, opening and closing fully.

Bottom View



1 Heater cable
2 Air gate assemblies
3 Heater hose
4 Heat exchanger



Position of heater control gates and cables with heater turned on

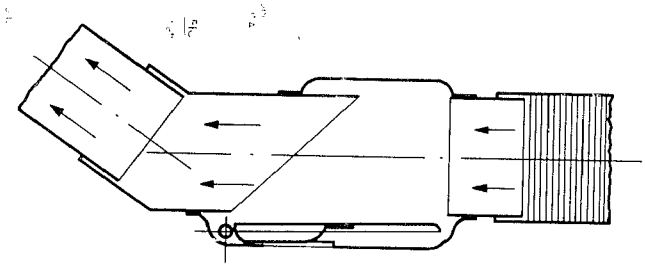
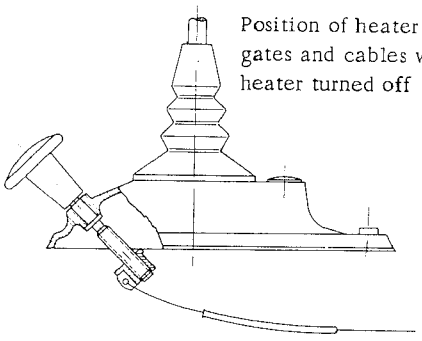


Fig. 25



Position of heater control gates and cables with heater turned off

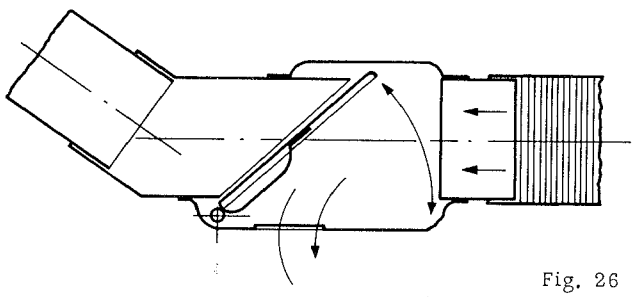


Fig. 26

Beginning with the following Chassis Serial Nos., a heater control lever is utilized in place of the control knob:

Coupe	126 001 or 215 001, respectively
Cabriolet	159 001

The lever is more convenient to use for setting the heater output; also, it is possible to visually check the setting position.

Removing and Installing Heater Control Cable

Removal

1. Detach cable ends from connecting levers at the air gate assemblies.
2. Remove floor tunnel cover.
3. Mark original position of shift lever base to ensure quick reassembly.
4. Remove the three retaining bolts from shift lever base.
5. Withdraw shift lever assembly.
6. Move heater control lever slightly away from the tunnel and pull out control cable.

Installation

Note:
It should be noted that there are two connecting holes in the control lever. Cars originally delivered in Germany and Sweden are equipped with the 356 B/T 6 heating system (page SE 31) which connects to the smaller hole in the control lever (Point 1, Fig. 1); in all other cars, the control cables are connected to the larger hole in the lever (Point 2, Fig. 1).

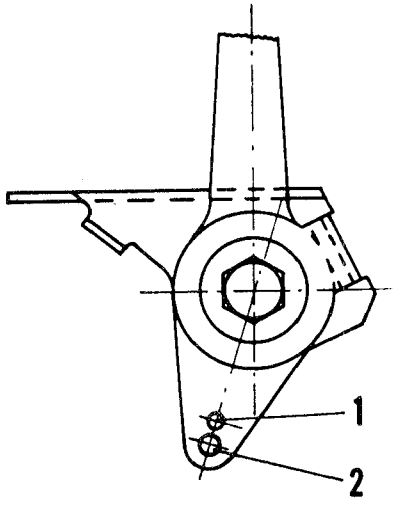


Fig. 1

1. Thread one end of control cable through the respective hole in the control lever and pull through to the bent end.

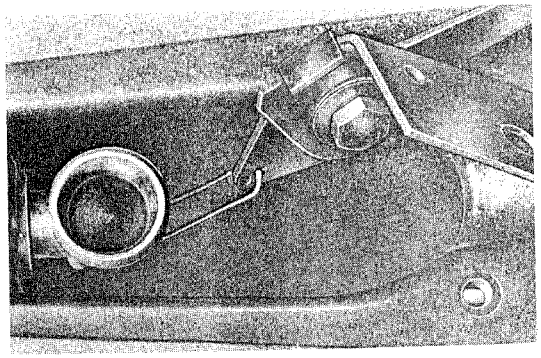


Fig. 2

2. Insert both ends of cable into conduit tubes; make certain that cables do not cross.
3. Mount shift lever assembly taking care that the guide dowel fits into the hole provided for aligning the lever bracket (Fig. 3).

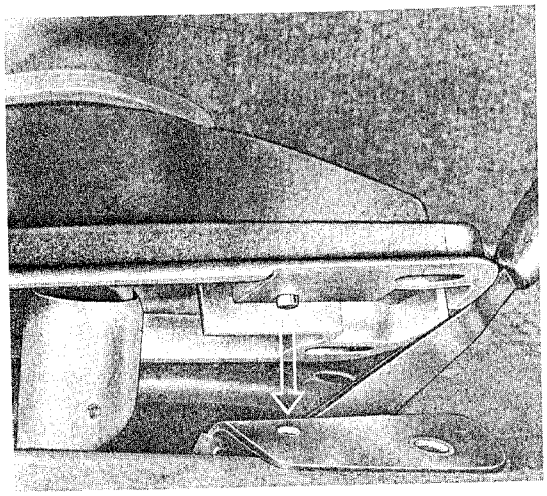


Fig. 3

4. Align gearshift lever assembly according to markings made during disassembly, and tighten Allen-head retaining bolts.
5. Move control lever forward to stop, into "closed" position.
6. Attach cable ends to connecting levers at the air gate assemblies. Make certain that the heater flaps work in unison, opening and closing fully.

Disassembling and Reassembling Control Lever Assembly

Disassembly

1. Hold head of hexagon bolt in a vise and remove self-locking nut.
2. Remove component parts one by one.

Reassembly

1. Hold head of hexagon bolt in a vise.
2. Install component parts as shown in Fig. 4.
3. Tighten self-locking nut to 0,5 mkg (3,6 lbs/ft), then turn back one complete turn (360°).
4. Adjust by testing friction of lever brake, which should be 10 ± 1 kg (22 lbs ± 2,2 lbs), measured with a spring scale attached to the lever, through the upper hole, at a 90° angle (Fig. 5).

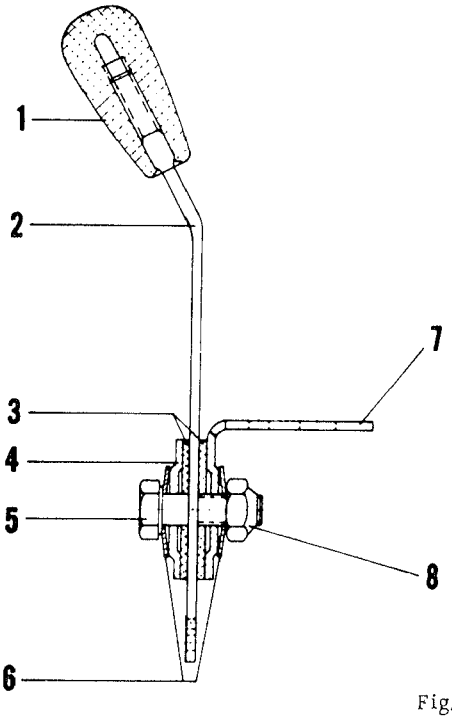


Fig. 4

1. Control lever grip
2. Control lever (left-hand drive cars)
3. Friction discs
4. Pressure disc
5. Hexagon bolt
6. Diaphragm spring
7. Supporting bracket
8. Self-locking nut

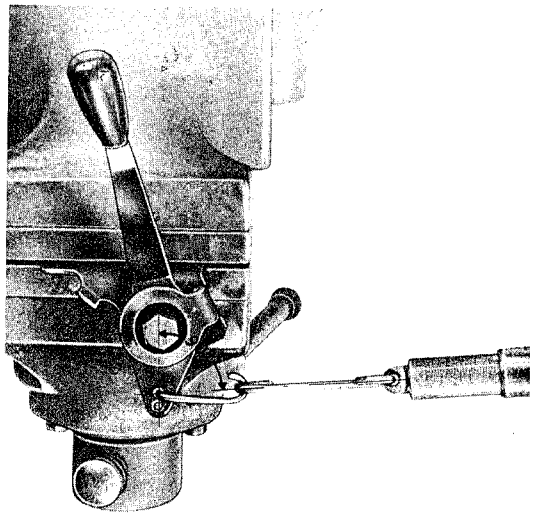


Fig. 5

Lever friction will increase when the hexagon nut is tightened, and decrease when the nut is loosened.

DESCRIPTION OF ENGINE TYPES 1600 C (616/15) and 1600 SC (616/16)

GENERAL

The 1600 C engine (Design No. 616/15) is an improved version of the 1600 S engine (616/12); the 1600 SC engine (616/16) is an improved version of the 1600 S-90 (616/7).
The following outline is for comparison with the 1600 S and 1600 S-90 engines. Minor modifications which are of insignificant nature are not included herein.

CRANKCASE

The cast light alloy crankcase consists of two halves and a timing gear cover. The three parts are machined to form one complete assembly; as such, they should not be replaced individually although it is possible to replace the timing gear cover alone.
To simplify stocking, identical crankcases are utilized for both engine types, i.e., the 1600 C and 1600 SC.
To ensure good seating of the split, steel-reinforced main bearing inserts, grooves have been machined into the crankcase bearing seats.

CRANKSHAFT AND CONNECTING RODS

The four connecting rods ride on plain-bearing crankshaft journals and are provided with exchangeable, steel--reinforced, tri-metal bearing inserts.
All connecting rods accomodate bronze bushings for the pistons pins.
The 1600 C and 1600 SC crankshafts are identical in dimensions, material, and fabrication features; the only difference in the 1600 SC crankshaft is that it has counter weights for better balance.
Both engines employ soft-nitrited crankshafts. The 1600 C and 1600 SC crankshafts ride in 4 main bearings. Bearing 1 and 4 are light-alloy sleeves, bearings 2 and 3 are split, steel-backed lead-bronze inserts. The diameter of main bearing journal is, in both engines, as follows: Bearing 1 = 50 mm diameter (1.969 in.), Bearings 2 and 3 = 55 mm (2.165 in.), and Bearing 4 = 40 mm (1.574 in.).

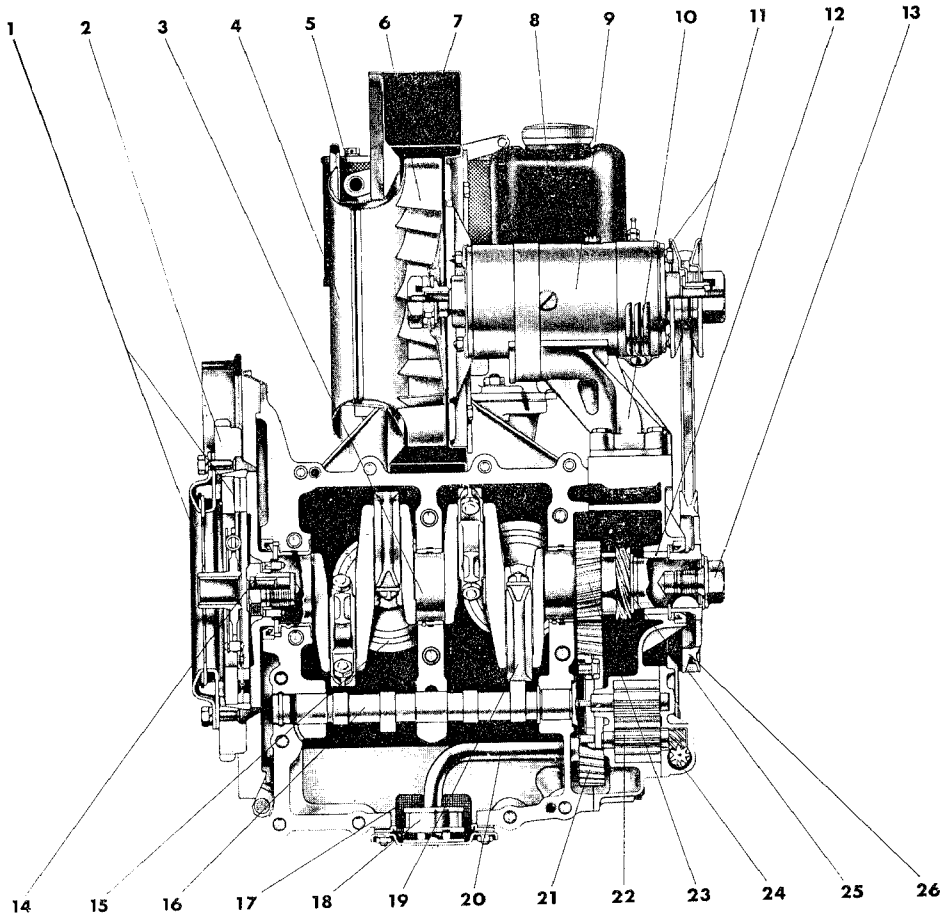


Fig. 1

1. Clutch
2. Flywheel
3. Main bearing journal, bearing # 2
4. Cooling air inlet
5. Air cleaner
6. Blower impeller
7. Blower housing
8. Oil filler
9. Generator
10. Generator support
11. Generator pulley halves
12. Main bearing sleeve, bearing # 4
13. Retaining bolt
14. Gland nut
15. Cylinder and piston
16. Camshaft
17. Oil screen
18. Magnetic oil filter
19. Connecting rod bearing cap
20. Oil suction tube
21. Timing gear
22. Oil pump
23. Camshaft drive gear
24. Tachometer drive pinion
25. Distributor drive pinion
26. Crankshaft pulley

CYLINDER HEAD

The intake and exhaust ports have been modified to improve cylinder breathing and volumetric efficiency. Also, the exhaust valve seats have been re-positioned by 1.5 mm (.06 in.) and the exhaust valve heads enlarged from 31 mm (1.22 in.) to 34 mm (1.34 in.); diameter of the intake valves is 38 mm (1.50 in.). The intake and exhaust valve stems have grooved valve keeper seats.

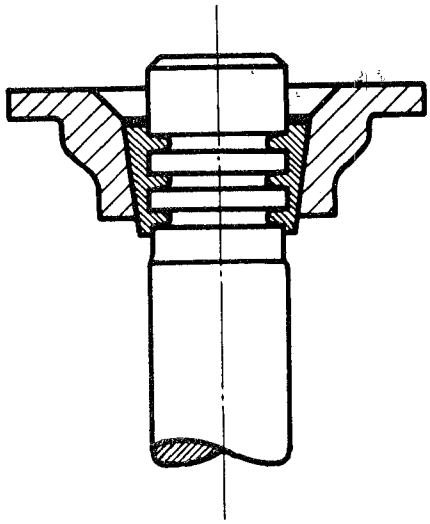


Fig. 2

The valve spring retainers have been strengthened and reshaped to accomodate the new valve keepers.

Installed length of valve springs remains unchanged.

Type 1600 C:	Intake	= 42.5 mm (1.66 in.)
	Exhaust	= 41.5 mm (1.63 in.)
Type 1600 SC:	Intake	= 41.0 mm (1.61 in.)
	Exhaust	= 40.0 mm (1.58 in.)

To keep oil losses at a minimum, the intake valves have been provided with sealing caps. When installing the sealing caps, it should be noted that first the valve is pushed into the valve guide and then the sealing cap pulled over the valve guide until the base of the cap comes to rest against the valve guide.

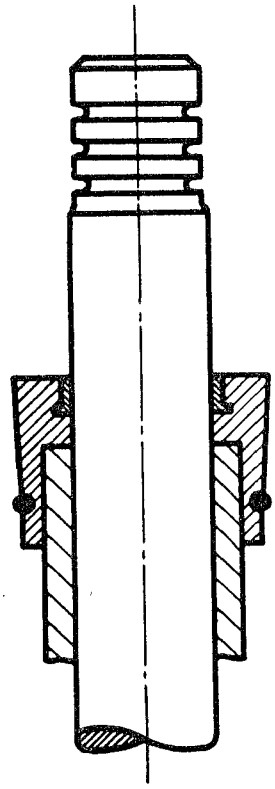


Fig. 3

RECONDITIONING or the EXCHANGE OF CYLINDER HEADS

Cylinder heads which become unserviceable due to defects or wear in the valve guides, valve seats, or spark plug seats, may be sent in to the factory for reconditioning. At time of manufacture, all cylinder heads are tested for combustion chamber displacement and the appropriate value in cubic centimeters is stamped into each unit.

It is essential that each engine is fitted with cylinder heads of like displacement; a difference of 1 cc (. 06 cu. in.) is permissible. If the cylinder heads are reconditioned locally, their cubic displacement must be established subsequent to the overhaul and the new values stamped in.

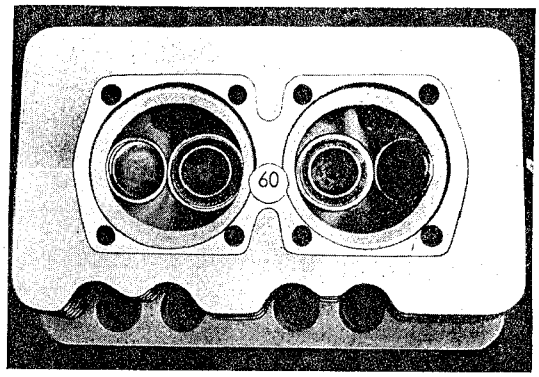


Fig. 4

VALVE CLEARANCE and TIMING

VALVE CLEARANCE

Valve clearance should be checked and adjusted only when the engine is cold. The following values apply:

	1600 C (616/15)	1600 SC (616/16)
Intake	0. 10 mm (. 004 in.)	0. 15 mm (. 006 in.)
Exhaust	0. 15 mm (. 006 in.)	0. 10 mm (. 004 in.)

The valve clearance must be checked at regular intervals and adjusted when necessary; this work requires skilled care.

VALVE TIMING

Due to the introduction of a differently cut camshaft in the 1600 C engine (616/15), the valve timing values have changed as follows:

Engine Type	1600 C (616/15) - 1600 S (616/12)	1600 SC (616/16) - 1600 S-90 (616/7)
Intake opens before TDC	10° - 17°	17° - 17°
Intake closes after BDC	44° - 53°	53° - 53°
Exhaust opens before BDC	42° - 50°	50° - 50°
Exhaust closes after TDC	6° - 14°	14° - 14°
Valve lift: Intake	10 mm (. 394 in.) - 10.8 mm (. 425 in.)	/ 10.8 mm (.425 in.) - 10.8 mm (.425 in.)
Exhaust	8.6 mm (. 339 in.) - 9.2 mm (.362 in.)	/ 9.2 mm (.362 in.) - 9.2 mm (. 362 in.)

NOTE: These values are applicable with a valve clearance of 1. 00 mm (. 039 in.) and the engine cold. The valve clearance must be readjusted to normal values upon completion of the valve timing test.

ADJUSTING CRANKSHAFT END PLAY

GENERAL

Crankshaft end-play (for installation) in the 1600 C and 1600 SC engines is 0,13 mm (.005 in.) to 0,18 mm (.007 in.). To compensate for size variations, thrust shims are available in 6 thickness groups:

Group A = 0,80 mm (.032 in.)

Group B = 0,85 mm (.034 in.)

Group C = 0,90 mm (.036 in.)

Group D = 0,95 mm (.037 in.)

Group E = 1,00 mm (.039 in.)

Group F = 1,05 mm (.041 in.)

Thrust shim size is indicated on the shims with alphabetical group symbols.

1. Insert bearing inserts for main bearing 2 and 3 into the two crankcase halves, and coat with oil.
2. Oil bearing sleeve for main bearing 1 and slide onto crankshaft journal, mount crankshaft.
3. Place thrust shim on crankshaft at main bearing 1.

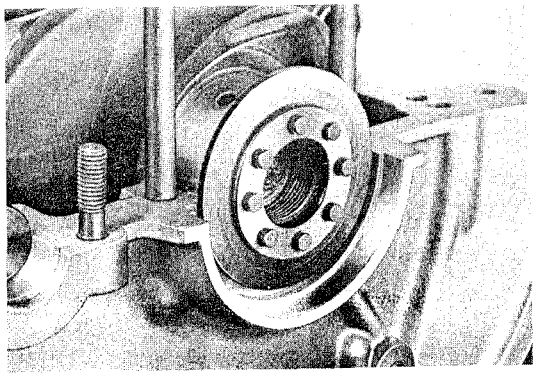


Fig. 5

4. Install the second crankcase half and tighten crankcase nuts to specified torque.
5. Install flywheel and soft iron gasket, tighten gland nut to 45 - 50 mkg (325 to 362 lbs/ft).

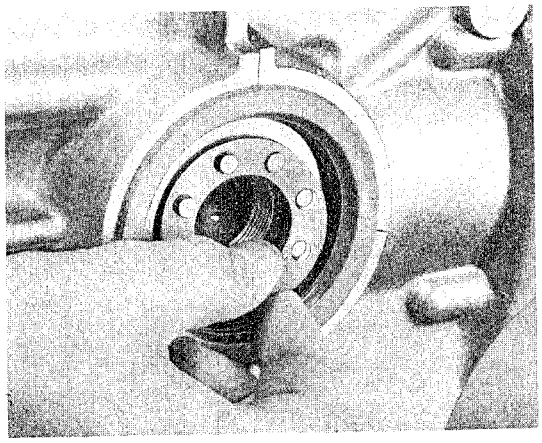


Fig. 6

6. Attach dial gauge to crankcase using special tool (P 17) so that the gauge sensor touches the flywheel at right angle.

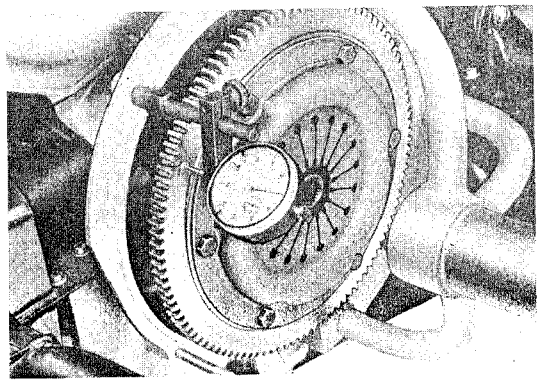


Fig. 7

7. Check the end-play by moving the crankshaft axially from stop to stop; if necessary, adjust to specification by using a different thrust shim of appropriate size.

MAIN BEARING and CRANKSHAFT DIMENSIONS

for Engines Type 1600 C (616/15) and 1600 SC (616/16)

MAIN BEARINGS

Nomenclature	Version		Bearing 2 to 3 (in mm)	Bearing 1 (in mm)
Crankshaft Journal	Standard	Diameter	54.990 - 54.971	49.991 - 49.975
Bearing Insert	Inside standard	Wall thickness	2.615 - 2.603	5.096 - 5.108
	Outside standard	Outside dia.	-	60.29 + 0.02
Crankcase Bore	Standard	Diameter	60.24 ± 0.005	60.24 ± 0.005
Crankshaft Journal	Standard	Diameter	54.990 - 54.971	49.991 - 49.975
Bearing Insert	Inside standard	Wall thickness	2.740 - 2.728	5.221 - 5.233
	Outside oversize	Outside dia.	-	60.54 + 0.02
Crankcase Bore	Oversize	Diameter	60.49 ± 0.005	60.49 ± 0.005
Crankshaft Journal	1st undersize	Diameter	54.740 - 54.721	49.741 - 49.725
Bearing Insert	Inside undersize	Wall thickness	2.740 - 2.728	5.221 - 5.233
	Outside standard	Outside dia.	-	60.29 + 0.02
Crankcase Bore	Standard	Diameter	60.24 ± 0.005	60.24 ± 0.005
Crankshaft Journal	1st undersize	Diameter	54.740 - 54.721	49.741 - 49.725
Bearing Insert	Inside undersize	Wall thickness	2.865 - 2.853	5.346 - 5.358
	Outside oversize	Outside dia.	-	60.54 + 0.02
Crankcase	Oversize	Diameter	60.49 ± 0.005	60.49 ± 0.005
Crankshaft Journal	2nd undersize	Diameter	54.490 - 54.471	49.491 - 49.475
Bearing Insert	Inside undersize	Wall thickness	2.865 - 2.853	5.346 - 5.358
	Outside standard	Outside dia.	-	60.29 + 0.02
Crankcase Bore	Standard	Diameter	60.24 ± 0.005	60.24 ± 0.005
Crankshaft Journal	2nd undersize	Diameter	54.490 - 54.471	49.491 - 49.475
Bearing Insert	Inside undersize	Wall thickness	2.990 - 2.978	5.471 - 5.483
	Outside oversize	Outside dia.	-	60.54 + 0.02
Crankcase Bore	Oversize	Diameter	60.49 ± 0.005	60.49 ± 0.005

Nomenclature	Version		Bearing 2 to 3 (in mm)	Bearing 1 (in mm)
Crankshaft Journal	3rd undersize	Diameter	54.240 - 54.221	49.241 - 49.225
Bearing Insert	Inside undersize	Wall thickness	2.990 - 2.978	5.471 - 5.483
	Outside standard	Outside dia.	-	60.29 + 0.02
Crankcase Bore	Standard	Diameter	60.24 ± 0.005	60.24 ± 0.005
Crankshaft Journal	3rd undersize	Diameter	54.240 - 54.221	49.241 - 49.225
Bearing Insert	Inside undersize	Wall thickness	3.115 - 3.103	
	Outside oversize	Outside dia.	-	60.54 + 0.02
Crankcase Bore	Oversize	Diameter	60.49 ± 0.005	60.49 ± 0.005

Dimensions of crankshaft journals and bearing inserts for main bearing 4, as well as crank pin journals and bearing inserts for connecting rods are the same as for engines Type 1600 (616/1), 1600 S (616/12), and 1600 S-90 (616/7).

Crankshafts for engines Type 1600 C and 1600 SC can be reconditioned or exchanged only at the factory since these must be subjected to a special metal treatment.

The respective undersize bearings are to be ordered as spare parts whereby it must first be established if the main bearing seats in the crankcase are standard or oversize.

Measuring point for establishing thickness of bearing inserts

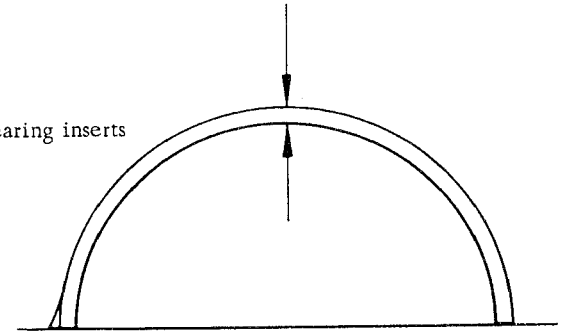


Fig. 8

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Tolerance and Wear Linits for 1600 SC Engine

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Measuring Point		Tolerance (new)	Wear Limit	
7. Depth of recess to web	mm	3,10 - 3,15	-	
	in.	.1220 - . 1240	-	
8. Width of oil seal surface	mm	8,250 - 9,250	-	
	in.	.3248 - .3642	-	
9. Valve springs Free length	mm	49,00	-	
	in.	1,93		
Installed length				
Intake	mm	41,0	-	
	in.	1,61		
Exhaust	mm	40,0	-	
	in.	1,575		

TOLERANCES and WEAR LIMITS

TYPE 1600 C ENGINE

Measuring Point			Tolerance (new)	Wear Limit	
1. Piston/cylinder clearance		mm	0,041 - 0,059	0,20	
		in.	.0016 - .0023	.0079	
2. Piston ring gap		mm	0,25 - 0,50	0,95	
		in.	.010 - .020	.037	
3. Compression ring/groove clearance	Ring 1	mm	0,075 - 0,107	0,30	
		in.	.0030 - .0042	.0118	
	Ring 2	mm	0,060 - 0,080	0,30	
		in.	.0024 - .0031	.0118	
	Ring 3	mm	0,035 - 0,062	0,30	
		in.	.0014 - .0024	.0118	
4. Oil ring/groove clearance		mm	0,025 - 0,052	0,30	
		in.	.0010 - .0020	.0118	
5. Crankshaft/main bearing clearance (end-play)		mm	0,130 - 0,180	0,30	
		in.	.0051 - .0071	.0118	
6. Crankshaft journal/main bearing clearance					
	Bearing 1	mm	0,028 - 0,078	0,170	
		in.	.0011 - .0031	.0067	
	Bearing 2 and 3	mm	0,035 - 0,090	0,170	
		in.	.0014 - .0035	.0067	
	Bearing 4	mm	0,040 - 0,104	0,170	
		in.	.0016 - .0041	.0067	

Measuring Point		Tolerance (new)	Wear Limit	
7. Depth of recess to web	mm	3.10 - 3.15	-	
	in.	.1220 - .1240	-	
8. Width of oil seal surface	mm	8.250 - 9.250	-	
	in.	.3248 - .3642		
9. Valve springs Free length	mm	49.00	-	
	in.	1.93		
Installed length				
Intake	mm	42.5	-	
	in.	1.67		
Exhaust	mm	41.5	-	
	in.	1.63		

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1600 C Engine.

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