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

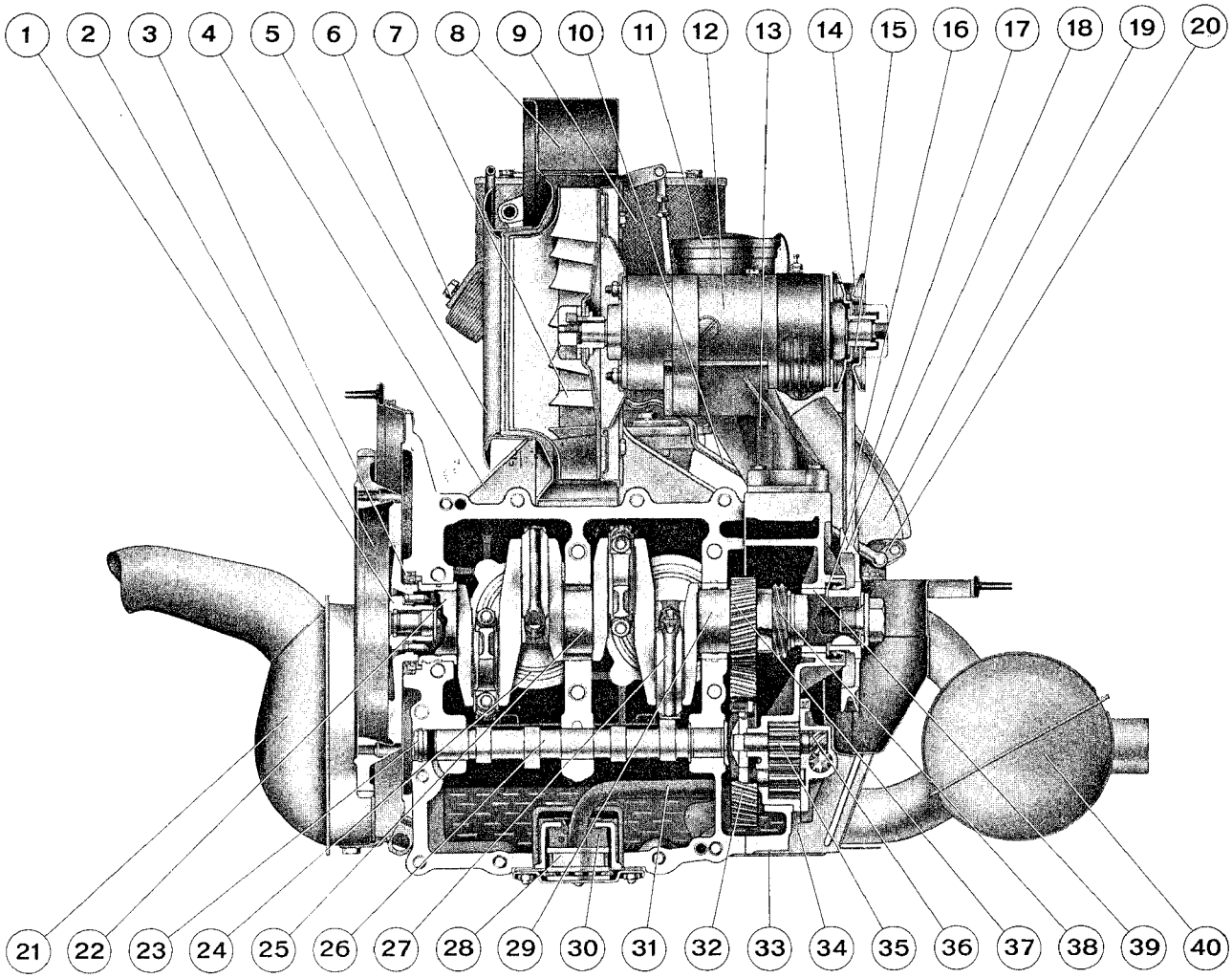

Fig. 1

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