

Engine Overhaul

Disassembling, cleaning and checking the engine; reassembling the engine after reconditioning

Types 220 and 220a

| |
|------------------|
| Operation No. |
| M 3 |

I. Disassembly

Special Tools:

| | |
|---|---------------|
| Mechanic's set, 20 parts, for hexagonal socket head screws | 000 589 04 07 |
| 2 Clamps for vibration damper | 187 589 04 31 |
| Offset spark plug wrench, opening 20.9 mm (0.82") | 186 581 03 36 |
| Socket wrench with T handle, opening 14 mm (0.55"), for oil pan, intake and exhaust lines | 136 589 00 09 |
| Special Allen wrench width over flats 8 mm (0.315"), length 300 mm (11.81"), for rocker arms | 187 589 04 07 |
| Puller for camshaft sprocket | 187 589 01 33 |
| Puller for guide rail pins | 187 589 07 33 |
| Special Allen wrench, width over flats 10 mm (0.39"), length 325 mm (12.8"), for cylinder head | 187 589 05 07 |
| Special Allen wrench, width over flats 6 mm (0.24"), length 425 mm (16.75"), for cylinder head screws M 8 | 187 589 03 07 |
| Valve lifter, 4 parts | 186 589 02 31 |
| Drift for valve guides | 136 589 00 39 |
| Special Allen wrench, width over flats 5 mm (0.2"), length 275 mm (10.83") for cover plates | 187 589 02 07 |
| Puller for intermediate gear | 187 589 02 35 |
| Puller for intermediate gear shaft | 187 589 07 61 |
| Puller for crankshaft sprocket | 187 589 00 33 |
| Puller for cover and ball bearing in crankcase | 136 589 07 33 |
| Socket screw wrench, width over flats 8 mm (0.315"), length 100 mm (3.94"), for engine bed plate | 187 589 00 07 |

Equipment

Engine assembly jig

Procedure:

Note: When disassembling the engine, mark the order of bearing shells, bearing caps, connecting rods, pistons and camshaft bearings.

1. Position engine in jig and bolt in place. Drain oil.
2. Unscrew fan. Slacken V-belt tensioner at generator as well as fastening screws, then take off belt (see Fig. M 3/80).
3. Turn out fastening screws for belt pulley on crankshaft and take off pulley together with vibration damper.

Note: Before removing the vibration damper, slip two clamps (187 589 04 31) over it. If this is not done the damper will come apart when it is taken off (see Fig. M 3/77).

4. Turn out the two hollow screws for the vent line from water pump to cylinder head and take the line off (see Fig. M 3/80). Unscrew water pump with pulley from cylinder crankcase.
5. Unscrew chain tensioner from generator. Turn out generator fastening screws and take off generator.
6. Disconnect the fuel and vacuum lines at carburetor, fuel pump and vacuum controller. Before taking off the two lines, unscrew clip at cylinder head front end.
7. Take distributor cap together with cables, incl. low-voltage cable, off distributor. Unscrew cable set with protecting pipe and take off.

8. Screw spark plugs out with off-set wrench 186 581 03 36.
9. Loosen cheese-head screw (1) locking the adjusting lever as well as trunnion screw (2) securing the distributor. Pull out distributor support with adjusting lever (4) after trunnion screw (3) has been loosened (Fig. M 3/9).

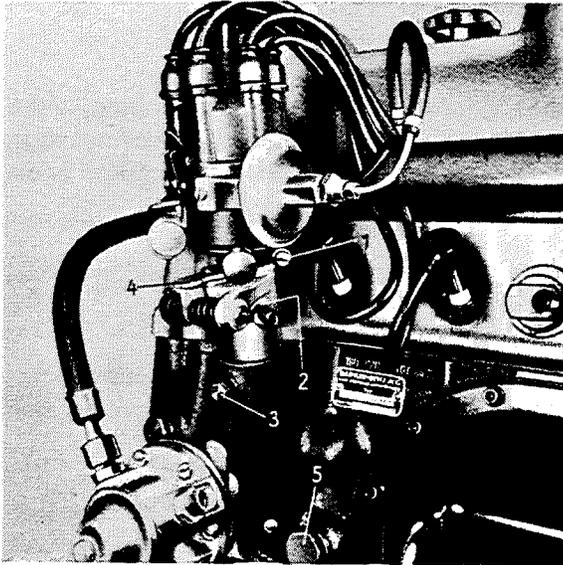


Fig. M 3/9

- 1 Cheese-head screw for adjusting lever
- 2 Distributor fastening screw
- 3 Distributor support trunnion screw
- 4 Distributor support with adjusting lever
- 5 Oil relief valve

10. Unscrew fuel pump with intermediate flange from cylinder crankcase.
11. Unscrew oil filter from cylinder crankcase
Turn oil relief valve (5) out of cylinder crankcase (see Fig. M 3/9).

Note: When removing the oil filter of engine Type 220, place an oil collecting vessel under the filter, loosen screw plug (2) and drain the oil (Fig. M 3/11).
To remove the oil filter of engine Type 220a, first unscrew oil filter pot with filter element so the lower fastening screw of the filter case can be loosened (Fig. M 3/11a).

12. Unscrew vent pipe from cylinder head cover. Take off intake silencer and unscrew the two supports.

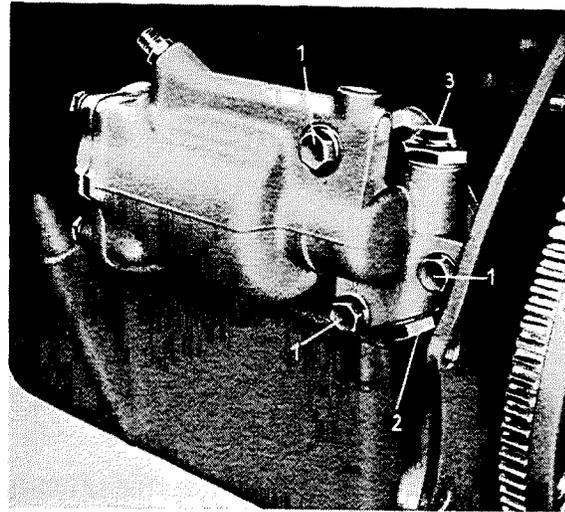


Fig. M 3/11

- 1 Fastening screws
- 2 Screw plug
- 3 Oil relief valve

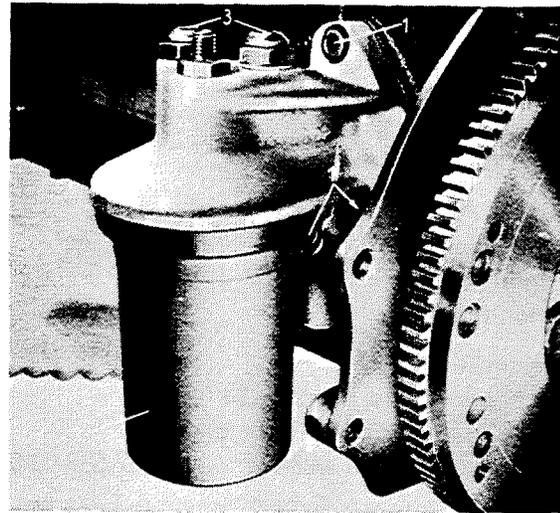


Fig. M 3/11a

- 1 Fastening screws
- 2 Lower part of oil filter case
- 3 Oil relief valves

13. Turn out cooling water outlet. Unscrew chain tensioner and take off.
14. Unscrew carburetor with intake pipe and exhaust manifold.
15. Loosen the three tightening screws for cylinder head cover and remove cover.
16. Turn out rocker arm bracket screws and remove brackets with rocker arms. Turn camshaft so that no load is placed on the rocker arm to be removed.

Note: It is recommended to loosen the camshaft sprocket fastening screw before removing the rocker arm brackets.

17. Disassemble rocker arm brackets. Before this is done with the engine of Type 220, take off snap rings (see Operation No. 74).
18. Unscrew camshaft sprocket fastening screw and take off sprocket. If necessary, use puller 187 589 01 33 (Fig. M 3/18). Place chain in sprocket housing. Watch out for key!

Note: If an offset key has been provided, this must in any case be returned. It is recommended to mark the direction of offset on the camshaft to be sure that the key will be returned into its original position.

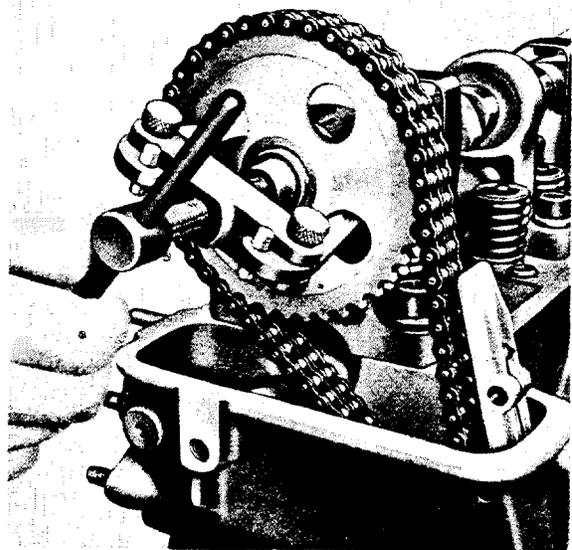


Fig. M 3/18

19. To remove the idler gear bearing, proceed as follows. Turn a conventional screw with thread M 5 into retaining pin and pull the pin out. Remove retaining ring from idler gear bearing and remove idler gear.
20. Pull the two guide rail pins in the cylinder head with puller 187 589 07 33 (Fig. M 3/20). When pulling out the pins, lift lock wire on guide rail with a hook.

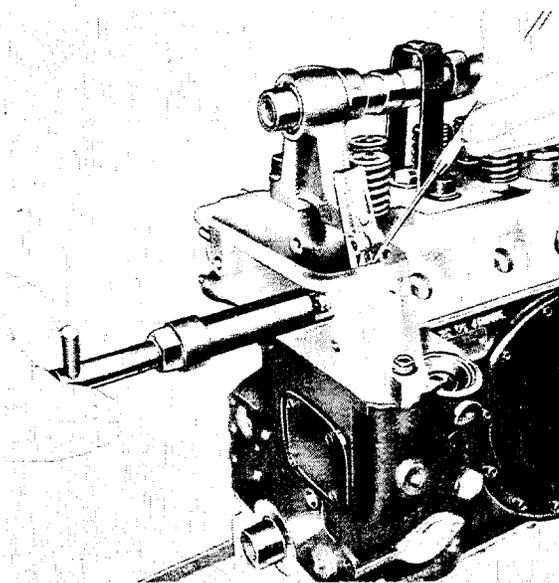


Fig. M 3/20

21. Turn out all cylinderhead screws. Take off yoke for cylinder head cover and pull out camshaft to the rear.
Warning! Remove cylinder head in **cold condition only** or it will deform.

Note: Do not forget the 4 hexagonal socket head screws M 8 (a, b, c and d in Fig. M 3/21)! Use wrench 187 589 03 07. In the first few engines the screw d is missing.

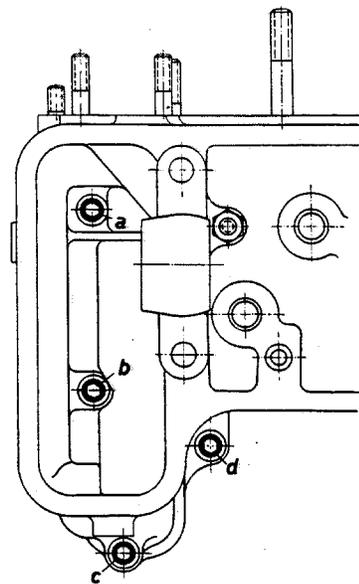


Fig. M 3/21

a, b, c and d — Hexagonal socket head screws M 8

22. Loosen camshaft bracket fastening nuts and screws, resp. and remove the brackets.

Note: This is only done, if it is required to remove the brackets.

23. Lift cylinder head off and remove gasket. Take water distributor out of cylinder crankcase.
24. Remove valve cone halves, valve retainers, inner and outer springs and take off valve spring supporting rings. Use valve lifter 186 589 02 31 (see Fig. M 22/1). Take out valves and drive worn valve guides out with punch 136 589 00 39.

Note: When working on engines that are provided with formerly used valve packing, remove the sealing ring retainers with the Burgmann sealing ring or the two oil scrapers with retaining ring (see also Fig. M 26b).

25. Unscrew cover plate of sprocket housing at cylinder crankcase. Loosen chain drive securing screw (see Fig. M 3/68).
26. Turn out intermediate gear fastening screw and pull intermediate gear off intermediate gear shaft with tool 187 589 02 35 (M 3/26). Before pulling the intermediate gear, take out distributor drive helical gear (see Fig. M 3/67).

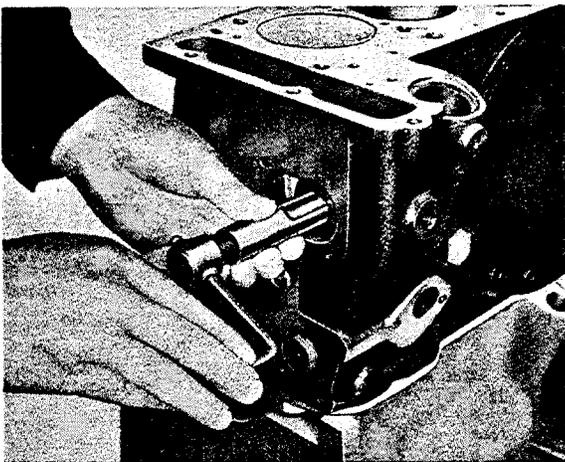


Fig. M 3/26

27. Unscrew lock washer for front bearing bushing (see Fig. M 3/43). Pull out inter-

mediate gear shaft together with front bushing by means of tool 187 589 07 61 (Fig. M 3/27). If the rear bushing is to be replaced, pull it with a suitable tool.

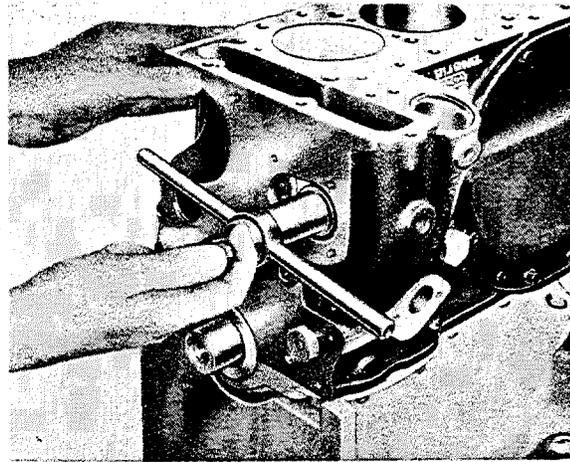


Fig. M 3/27

28. Unscrew front and rear part of oil pan.
29. Loosen clamp of suction pipe to oil pump, turn out hexagonal screw securing the oil pump to the cylinder crankcase and move oil pump out.
30. Unscrew connecting rod cap nuts. Loosen connecting rod bearing caps by tapping lightly with a plastic hammer and take them off.
31. Bend lock plates at crankshaft bearing caps upward, turn out screws and take caps off.

Note: The oil pump suction pipe of Type 220a has no clamp (see Fig. M 3/56a).

Note: In Type 220a the screws are no longer secured.

32. Lift out crankshaft with flywheel and front counterweight. Take off double-type roller chain.
33. Remove pistons with connecting rods.

Note: Before removing the pistons, scrape off any combustion residues at top end of cylinder bores to ensure that the piston rings will not be damaged.

34. Remove the two guide rails in the cylinder crankcase as described under cf. 20. The

upper retaining pin of the left guide rail (as seen in direction of travel) is provided with a hexagonal head screw plug.

35. If vertical bearing bushing for distributor drive helical gear is worn, drive bushing out with a suitable drift (see Fig. M 3/67).
36. After turning out the collar screw, pull front counterweight off crankshaft. Take off grease retainer and oil thrower. Pull crankshaft sprocket with tool 187 589 00 33 (Fig. M 3/36) and remove spacer ring.

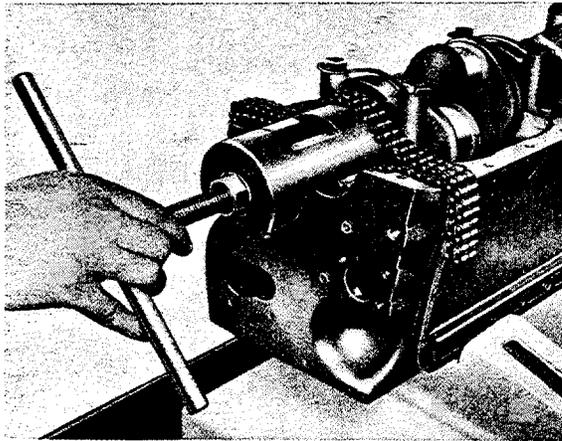


Fig. M 3/36

37. Remove flywheel from crankshaft. To do this, take the lock plates off the 6 screws and turn the screws out.

Note: The flywheel is now secured to the crankshaft with expansion screws. In this case no lock plates are used.

38. If grooved collar bearing is worn, pull it out of crankshaft together with cover plate by means of tool 136 589 07 33 (Fig. M 3/38).

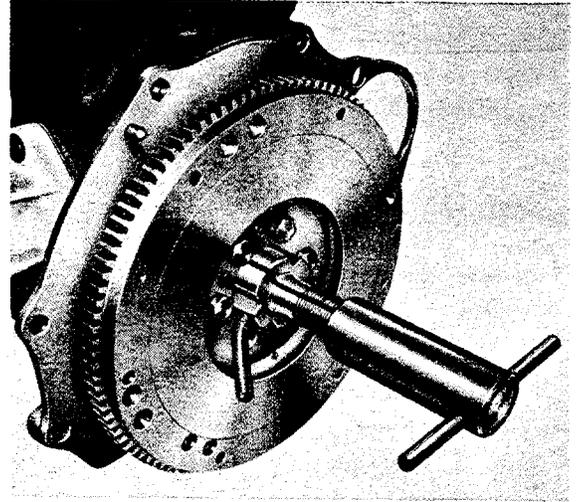


Fig. M 3/38

39. After the cylinder crankcase has been removed from the assembly jig, unscrew the two front engine supports and the intermediate plate on flywheel side.