O. Removal and Installation of Crankshaft and Flywheel

Repair procedure see Job No. 03—5.

Removal:

1. Remove the camshaft timing gear (see Job No. 01— 4, Section C).

2. Remove the counterweight (see Job No. 01— 4, Section N).

3. Remove the oil pan (see Job No. 01— 4, Section L).

4. Remove the oil pump (see Job No. 01— 4, Section M).

5. Remove the connecting rod nuts. Use a plastic hammer slightly to knock back the connecting rod pins, and then loosen and remove the bearing caps. Remove the crankshaft bearing caps in the same manner.

Note: When disassembling note the order of the bearing shells and the bearing caps.

6. Pull out the lower pivot pin for the right chain guide (seen in the direction of travel) with Puller 187 589 07 33. In doing this lift the lock wire on the chain guide with a suitable hook.

Note: When pulling out the pivot pins for the chain guide use the correct thread adapter of Puller 187 589 07 33. The pivot pins originally had an M 5 thread and were later provided with an M 6 thread.

7. Remove the grease seal and oil thrower-ring from the crankshaft. Pull off the crankshaft timing gear with Puller 187 589 00 33 (Fig. 01— 4/39). In doing this it is essential to lift the twin roller chain. Remove the Woodruff key and the compensating ring.

8. Remove the crankshaft and the flywheel. Then remove the bearing shell halves from the crankcase and the bearing caps.

   If necessary take off the check plate halves from the center crankcase bearing cap.

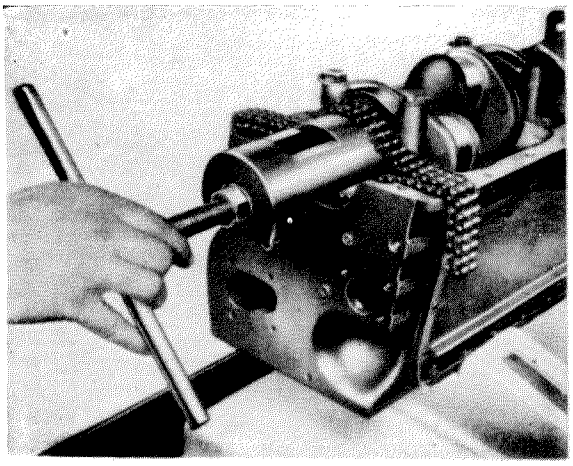

Fig. 01— 4/39

Installation:

9. Remove all dirt from the base bores and bearing shell halves with a clean, soft chamois leather, before installing the bearing shell halves in the base bores.

   The upper and lower bearing shell halves are fitted with lugs. When fitting, therefore, the bearing shell must first be placed in the base bore so that the lug fits into the groove which is made to receive it. Only then is the bearing shell pressed into the base bore. The shells must be seated perfectly in the base bore (Fig. 01— 4/40 and 01— 4/41).

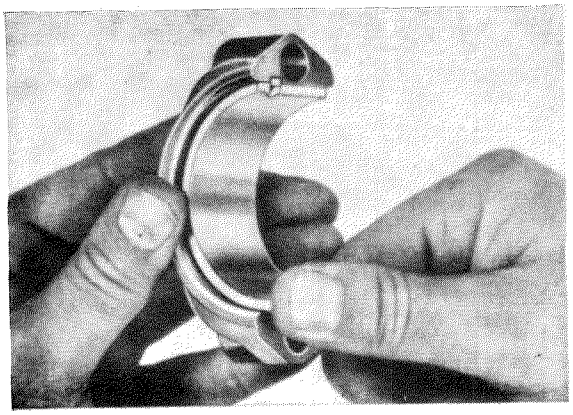

Fig. 01— 4/40

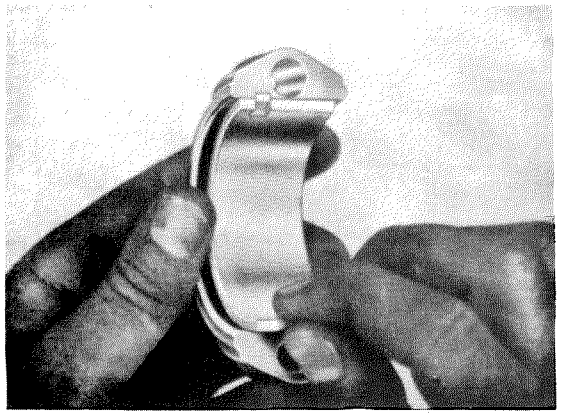

Fig. 01— 4/41

10. Fit the check plate halves on the center crankshaft bearing caps.

Note: The center crankshaft bearing is the locating bearing. In place of bearing shells with a shoulder on the side, normal bearing shells are installed and a check plate half is fitted at each side of the bearing cap (Fig. 01— 4/42).

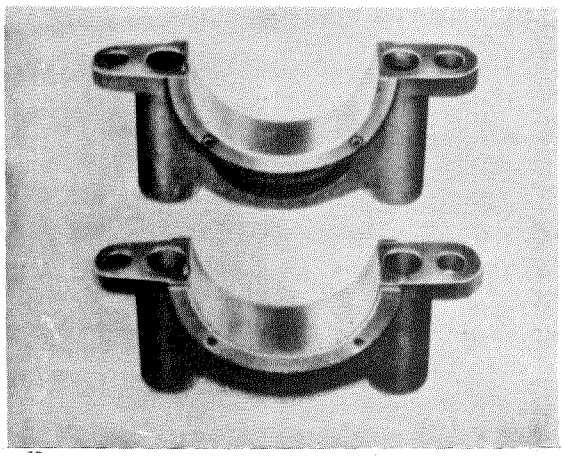

Fig. 01— 4/42

The check plate halves are fixed to the bearing cap with two heavy dowel pins. Care must be taken to ensure that these do not protrude. When the check plates are removed the heavy dowel pins should protrude 1.5 ± 0.1 mm beyond the level of the bearing cap (Fig. 01— 4/43).

In order to facilitate adjustment of crankshaft end play, the check plates are available in the following thicknesses:

2 mm (standard), 2.05 mm, 2.10 mm, 2.15 mm, 2.20 mm, 2.25 mm, 2.30 mm and 2.35 mm.

Select check plate halves so as to allow an end play of from 0.040 to 0.096 mm. For further details (see Job No. 03—5, Section B).

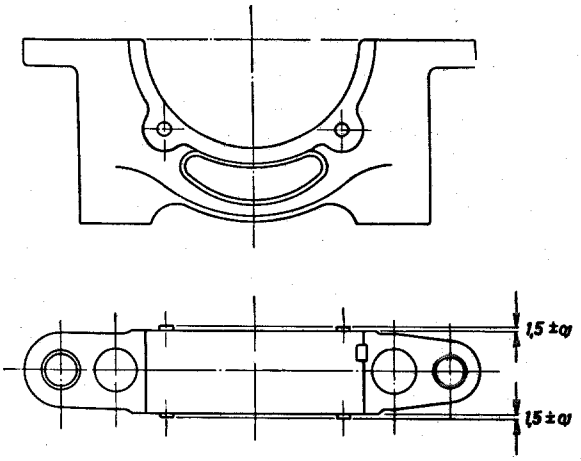

Fig. 01— 4/43

11. Clean the fitted bearing shells and the crankshaft bearing surfaces (use a clean soft chamois leather), and then apply graphite oil and place the crankshaft in position.

12. Fit the main bearing caps. Then apply graphite oil to the main bearing screws and the washers, screw them in and then tighten them in stages to the following torque:

First tightening	2 mkg
Second tightening	5 mkg
Third tightening	8 mkg
Fourth tightening (check)	8 mkg

The main bearing screws are not locked.

Note: The right front crankshaft bearing cap screw serves at the same time as a fixing screw for the oil pump bracket. In this case do not install a washer. Fit washers to all other screws on the crankshaft bearing caps. In the second version the oil pump bracket is fixed by a hexagon screw on the right screw for the front bearing cap. For this reason the screw has a deeper head with a M 8 internal thread and must be fitted with a washer (see Fig. 01— 4/37a).

13. Turn crankshaft by hand and check that it turns freely.

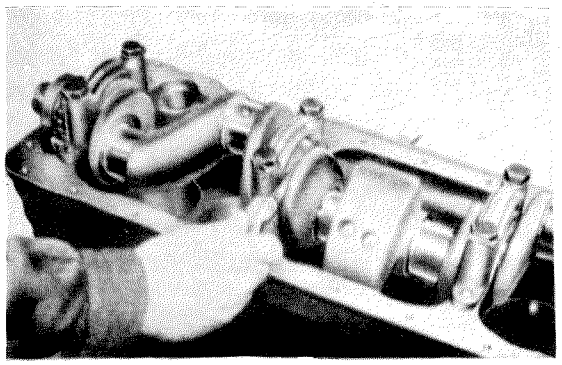

Fig. 01— 4/44

Check end play at locating bearing (0.040 to 0.094 mm) by moving the crankshaft sideways. The end play can be measured with either a dial gage or tolerance feeler band (Fig. 01— 4/44).

If the crankshaft is difficult to move, check the alignment of the bearing caps and, if necessary, correct by lightly tapping with a plastic hammer. To ascertain which bearing is binding, the bearings should be loosened in turn while the crankshaft is being turned until the fault is discovered. If the faulty bearing shell is a new one, it must be replaced.

14. Remove the bearing caps and take out the crankshaft.

    The fabric sealing ring half on the flywheel side should only be fitted in the crankcase after the crankshaft has been checked for freedom of movement.

    Apply talc, or if necessary oil, to the fabric sealing ring and fit in the crankcase. The fabric sealing ring must not be inserted under too great pressure.

Note: Do not snap the locking pin for the fabric sealing ring! Oil all contact surfaces and after placing the crankshaft in position, replace the bearing caps and tighten to the specified torque.

15. Screw on the oil pan with fabric sealing ring fitted and check whether the crankshaft can be turned easily.

    The fabric sealing ring must not exert too much pressure. Then unscrew the oil pan again. If the shaft does not turn freely, the high spots on the fabric sealing ring must be removed by rolling out with a suitable piece of rod. Take care not to damage the sealing ring when doing this!

16. Press the compensating ring and the crankshaft timing gear onto the crankshaft extension pin. Do not omit the Woodruff key!

17. Check alignment of crankshaft timing gear to idling gear. This is done by means of a depth micrometer or a depth gage which is used to measure the distance from the front face of the crankcase to the crankshaft timing gear and to the idling gear (Fig. 01— 4/45). To obviate the error caused by end-play, both the crankshaft and the idling gear must be pushed to the rear as far as they will go while measurement is taking place.

    The permissible degree of misalignment (difference between the two measurements) is 0.1 mm.

    If the misalignment exceeds this figure, the compensating ring behind the crankshaft timing gear must be replaced.

    Compensating rings are available in the following sizes:

    5.45 mm, 5.60 mm, 5.75 mm, 5.90 mm and 6.05 mm.

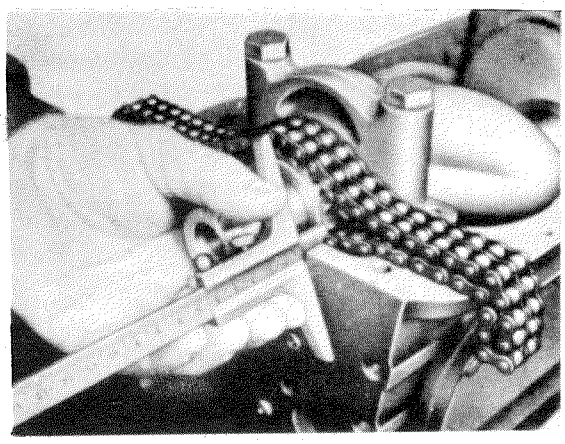

Fig. 01— 4/45

When finally fitting the crankshaft timing gear do not omit the Woodruff key!

18. Fit the connecting rod bearing caps and tighten up nuts. Make sure that the nuts are the right way up.

    The connecting rod pins are tightened up to a "stretch" (i.e. the difference between tightened and untightened length) of 0.1 mm. They are not locked. Measure the "stretch" of 0.1 mm with a dial gage or a micrometer (Fig. 01—4/46).

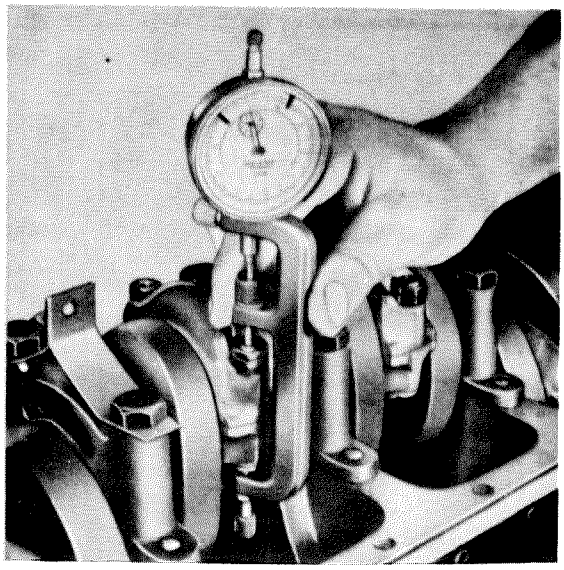

Fig. 01—4/46

Carry out the measurement in accordance with the following procedure:

First measure the length of the connecting rod pins without the nuts screwed on. The nuts are then fitted and tightened to the point where the pins are 0.1 mm longer than the original measured length (Fig. 01—4/47).

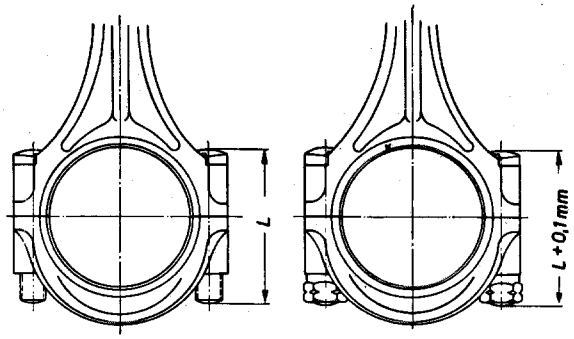

Fig. 01—4/47

When tightening the connecting rod pins, care must be taken to ensure that the pins are not stretched too much or overtightened. If necessary, use new pins. In exceptional cases the nuts can be tightened up with a torque wrench to a tightening torque of 3.75—3.80 mkg. Care must however be taken to ensure that graphite oil is liberally applied beforehand to the threads of the connecting rod pins and the contact surfaces of the nuts.

19. Press in the lower pivot pin for the chain guide (51 mm) until the lock wire on the chain guide engages in the annular groove in the pivot pin.

20. Press the oil thrower ring and the seal onto the crankshaft extension pin. To avoid damage to sealing lips of seal, use a suitable mounting sleeve with pressure block when fitting the seal.

Note: Before pressing the seal onto the crankshaft extension pin, fill the space between the two sealing lips with high-viscosity grease.

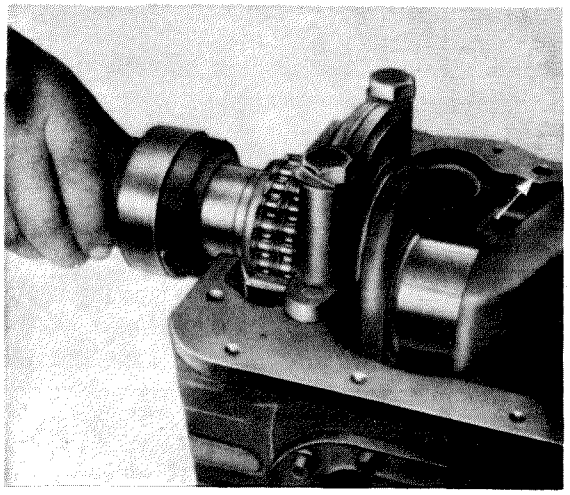

Fig. 01—4/48

21. Reinstall the oil pump, the oil pan, the counterweight and the camshaft timing gear (see Job No. 01—4, Section C, M, N and L).

22. Set the ignition (see Job No. 01—3, Section E).