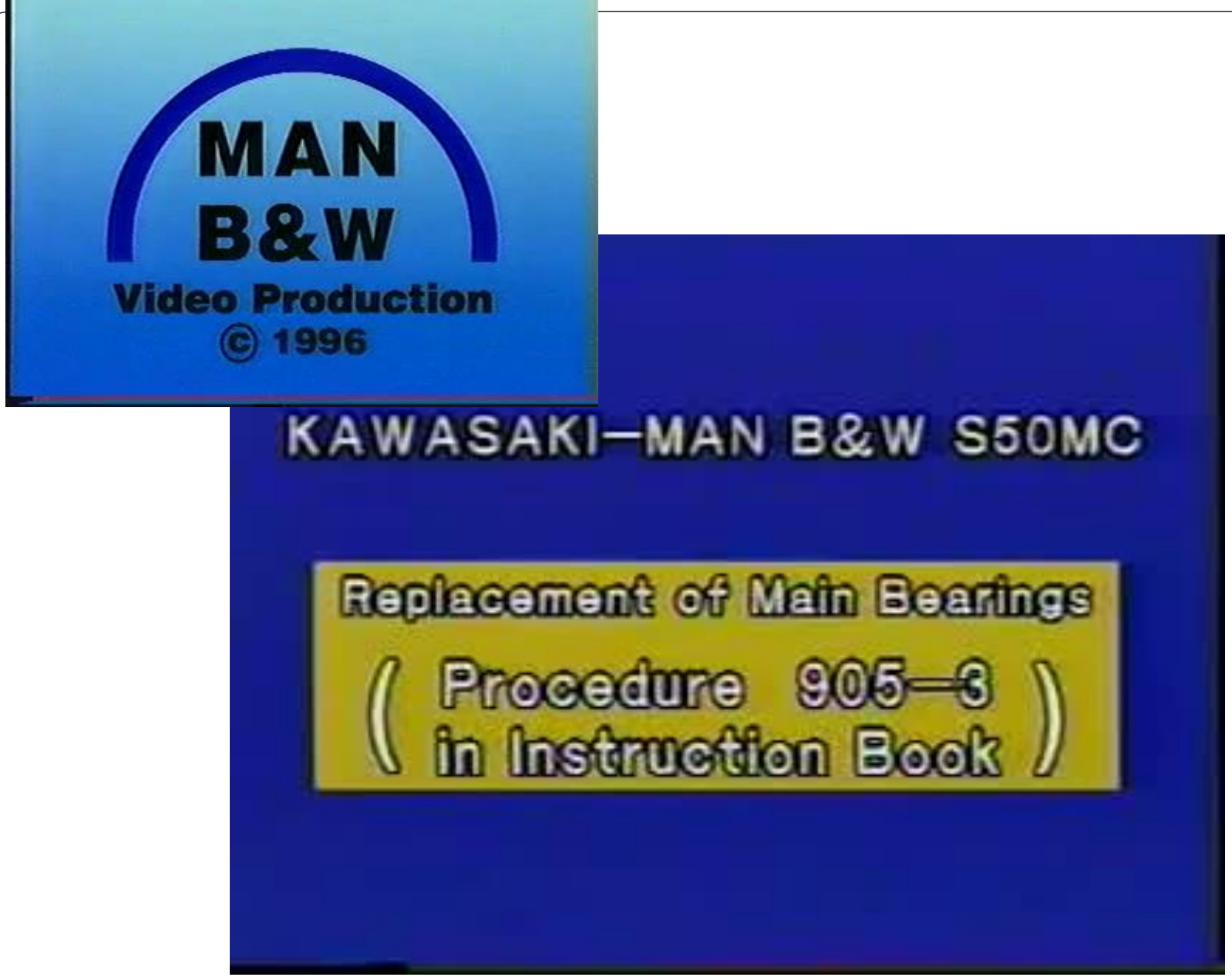
Crankshaft, Main Bearings and Shaft Alignment



- 02_Overhauling of Main Bearing of MAN B&W 2 Stroke Engine (1)
- 02_Main Bearing Dismantling, Overhaul, Checks

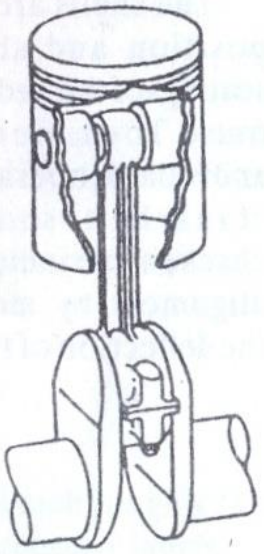


Fig.2.1

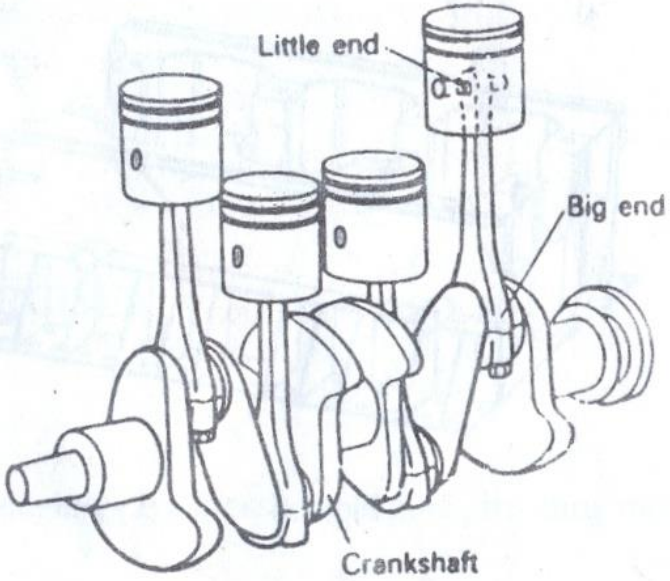


Fig.2.2

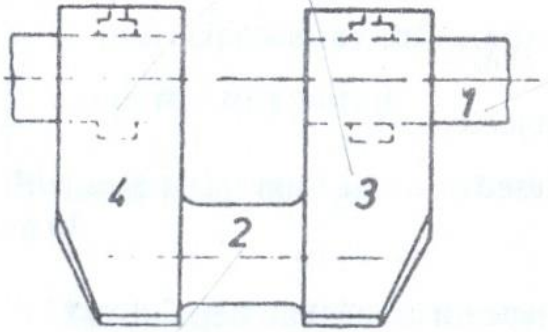


Fig 2.3.

Medium speed engines have crankshaft usually solid forged, i.e. made from a single piece ,while slow speed engine crankshafts are mostly of semi-built design with crankpins and webs forged or cast in one piece and shrunk on to the journals.

corrosion.

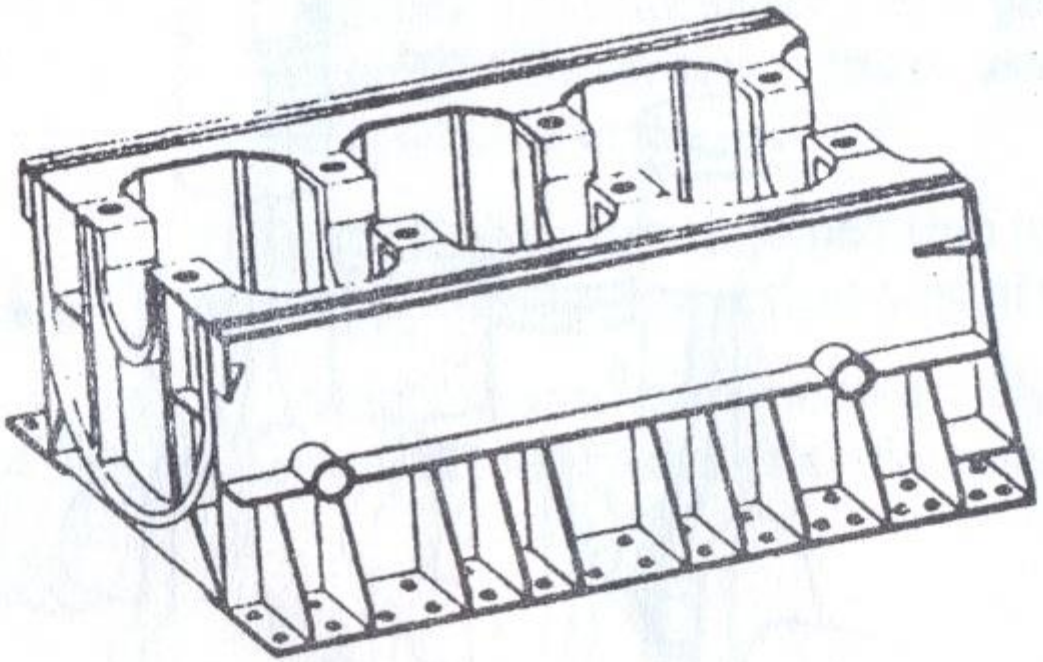


Fig.2.4

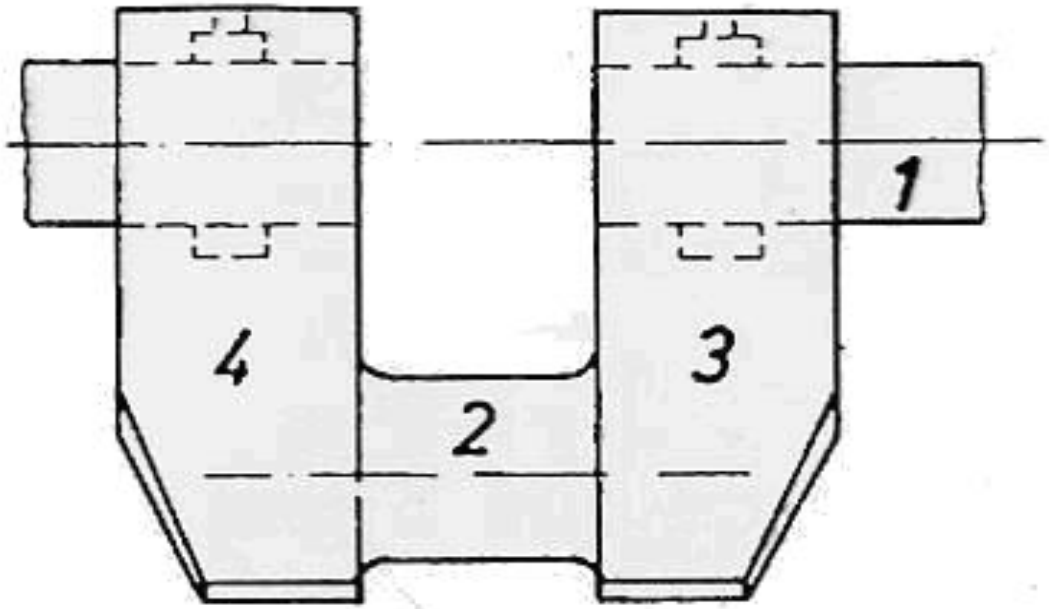
The crankshaft, which converts the reciprocating motion of the piston to rotating motion, must resist the **bending stresses** caused by the connecting rod *thrust* when the piston is at top centre.

Then the maximum gas pressure acts straight down on the **crankpin** and tends to *bend* the shaft between the adjacent **bearings**. The crankshaft must also *withstand* the torsional forces produced by the change of speed.

Supply the missing information in the sentences below

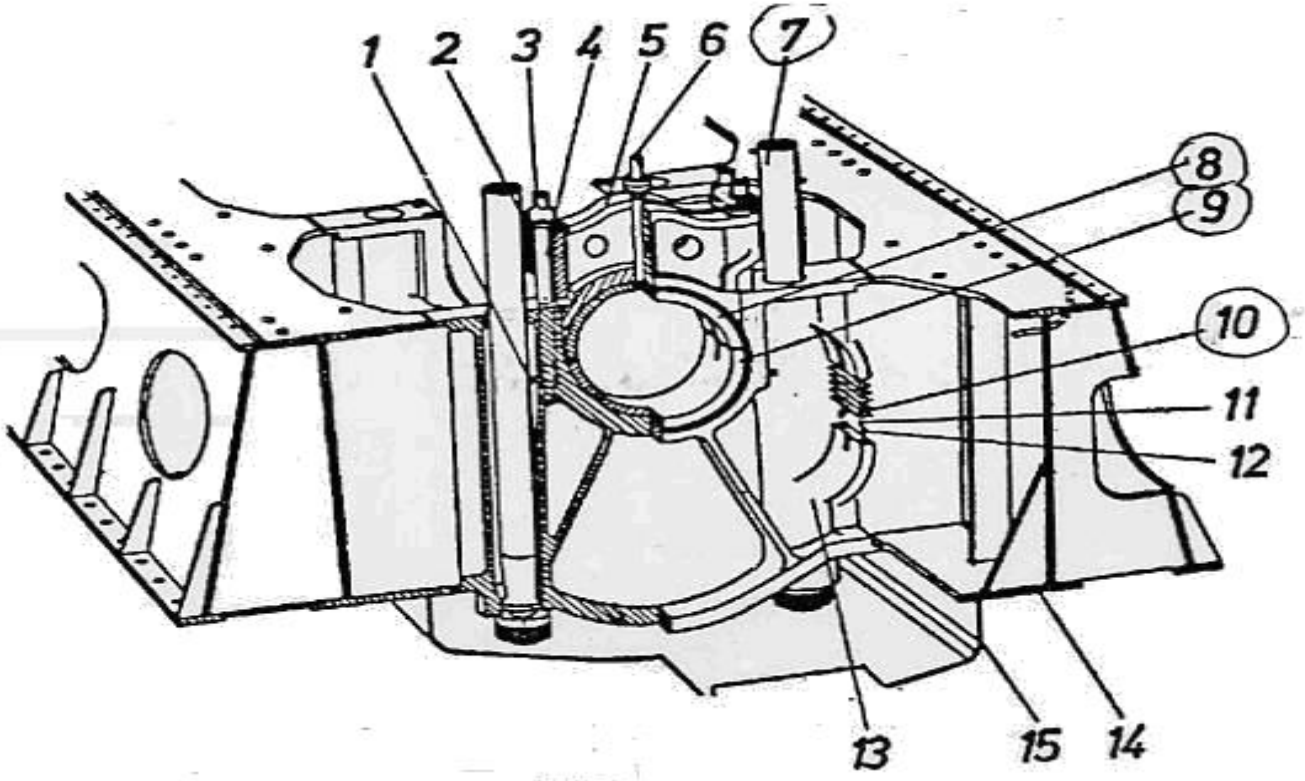
- The crankshaft converts … … to …. ….
- It must resist the **bending stresses** caused by the connecting rod *thrust* when … … .
- Then the maximum gas pressure acts straight down on the **crankpin** and tends to … ….
- The crankshaft must also *withstand* the … ….

CRANKSHAFT



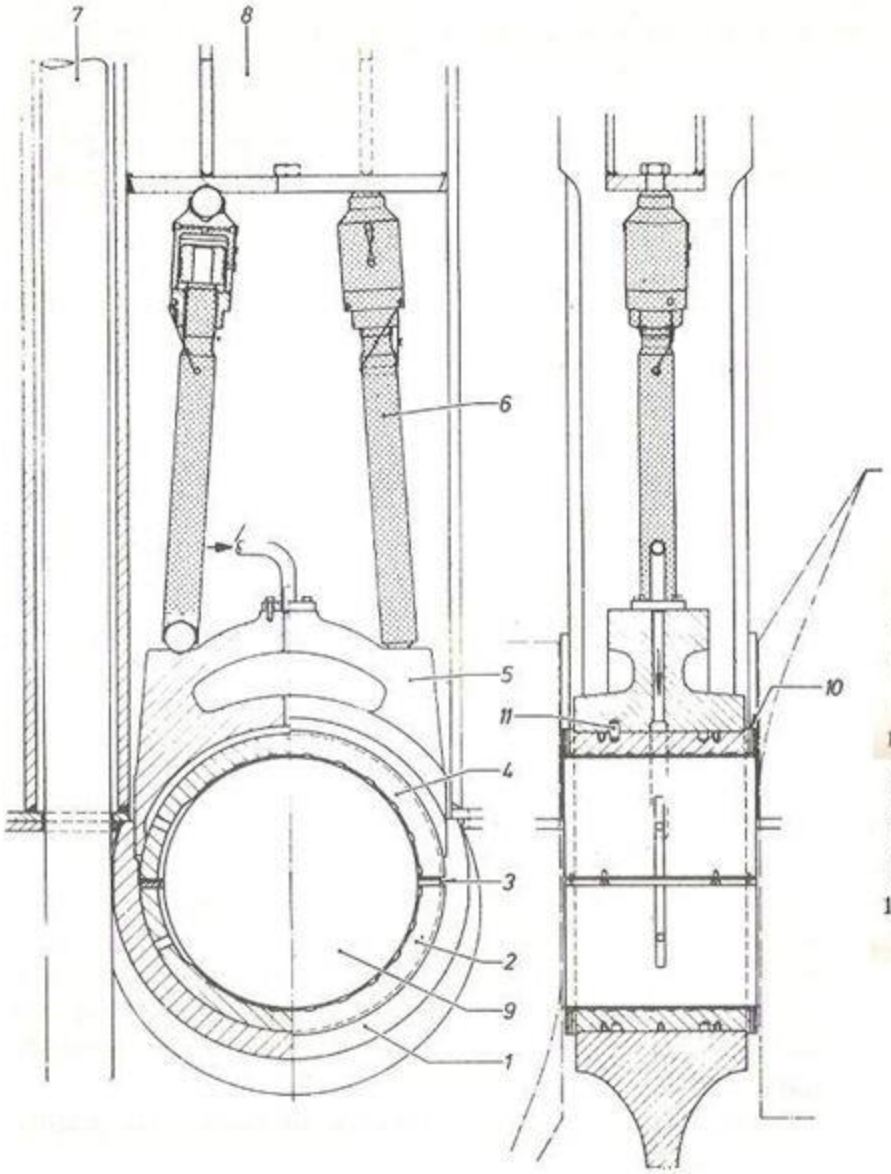
Semi-built crankshaft (1 journal; 2-crankpin; 3+4 webs)

MAIN BEARING (M.A.N.)



Temeljni ležaj motora MAN

1-provrt u donjem kućištu; 2-osigurač; 3-matica vijka temeljnog ležaja; 4-vijak; 5-gornje kućište; 6-cijev za dovod ulja; 7-kotveni vijak; 8-gornja blazinica; 9-donja blazinica; 10-podložak; 11-osigurač; 12-osigurač; 13-poprečni nosač temeljne ploče; 14-temeljna ploča; 15-karter



1. Bearing Housing
3. Shimp
5. Bearing Cover
7. Tie Rod
9. Crankshaft
11. Dowel pin.

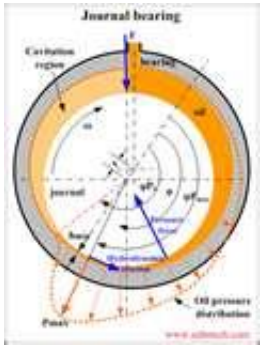
2. Bottom shell
4. Top shell
6. Thrust bolt
8. Column
10. Measuring hole for depth gauge

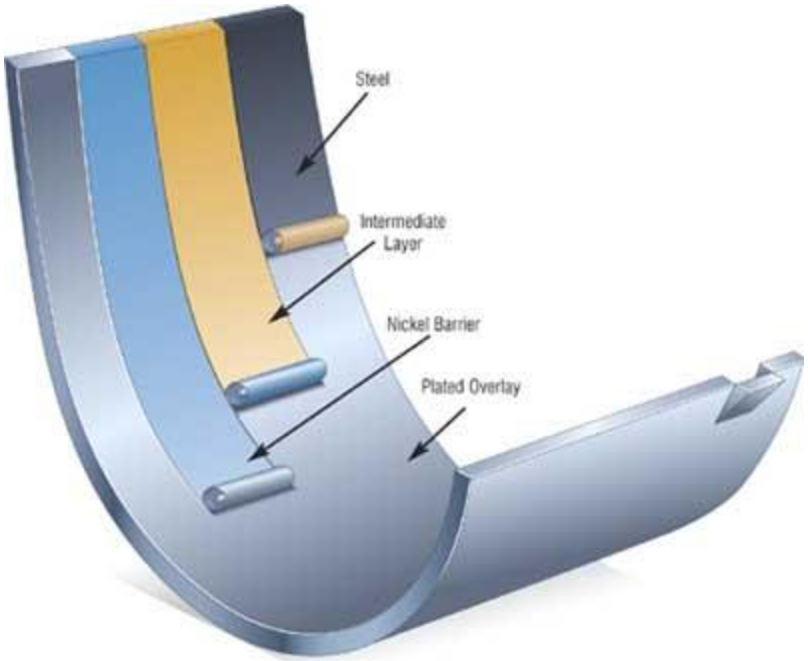
Medium speed engines have crankshaft usually **solid forged**, i.e. made from a single piece, while slow speed engine crankshafts are mostly of **semi-built design** with **crankpins** and **webs** forged or cast in one piece and *shrunk* on to the **journals**. The type of steel used, which is *carbon or alloy steel* containing nickel, chromium and molybdenum, is chosen for its strength, resistance to **fatigue** and **hardness** of bearing surface.

- Medium speed engines have crankshaft usually **solid forged**, i.e. made … …,
- Slow speed engine crankshafts are mostly of **semi-built design** with … …
- They are … or … in one piece and … on to the **journals**.
- The type of steel used for crakshafts is … …
- It contains nickel, … and must be resistant to … ….

The cranks of a ***multi-throw shaft*** are set at appropriate angles giving a "*firing order*" for the engine. The firing order is chosen primarily to obtain a *smooth torque* and the best mechanical balance. However, *main bearings loads*, exhaust arrangements suitable for turbocharging and torsional vibration may also be taken into account. Although the crankshaft appears to be *robust*, they rely on the main bearings to develop their full strength.

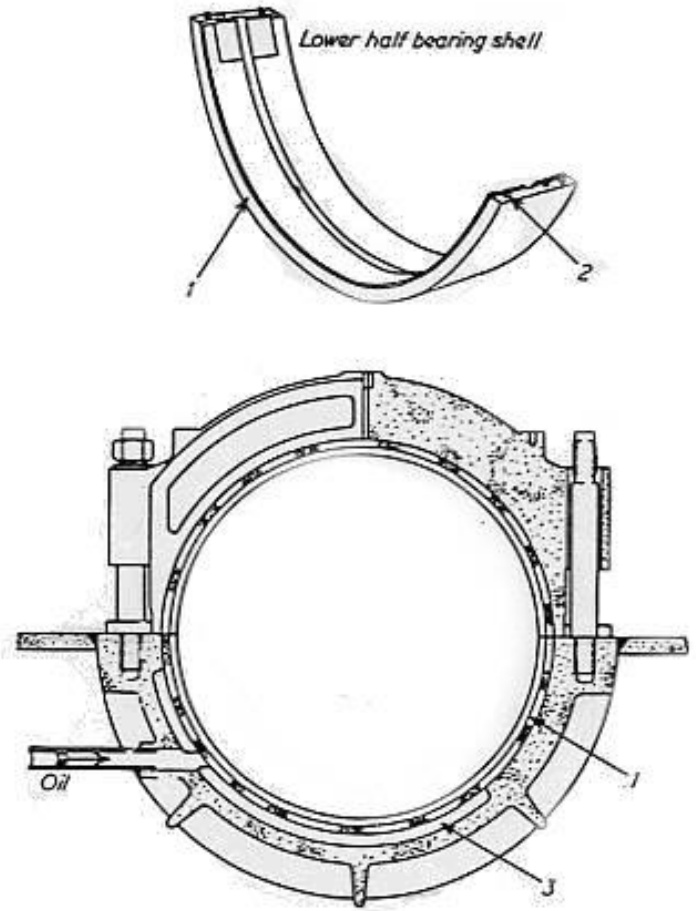
- cranks of a ***multi-throw shaft*** are set at appropriate angles giving … …
- The firing order is chosen primarily to obtain … … and … …
- However, we must also take ito account:
  - … *loads*,
  - exhaust arrangements suitable for … and
  - … …
- Crankshaft rely on the … … to develop their full strength.


Journal bearing
Cavitation region
bearing
oil
journal
Pmax
Oil pressure distribution


Steel
Intermediate Layer
Nickel Barrier
Plated Overlay

When a crankshaft has to be handled outside the engine, it should be carefully supported to *avoid high bending moments* on it by its own weight. In the engine it is essential to ensure that the bearings carrying it are *in good alignment*, as bearing **misalignment** will cause the crankshaft to bend and eventually break it.

When a crankshaft has to be handled outside the engine, it should be carefully supported to _____ *high bending moments* on it by its own weight. In the engine it is essential to ensure that the bearings carrying it are *in* _____ *alignment*, as bearing **misalignment** will _____ the crankshaft to bend and eventually break it.


Lower half bearing shell
1
2
Oil
1
3

The main **bearing shells** are made of steel with a lining of bearing metal which can be *white metal*, *copper-lead* or *aluminium-tin alloy*. A thin flash of lead or indium is often added to provide a layer giving protection against corrosion. The shells *are held in position* and shape by **seatings** of the bedplate or frame. To ensure efficient and reliable operation the crankshaft *should be checked periodically for alignment* by measuring the *deflection* of the **webs**.

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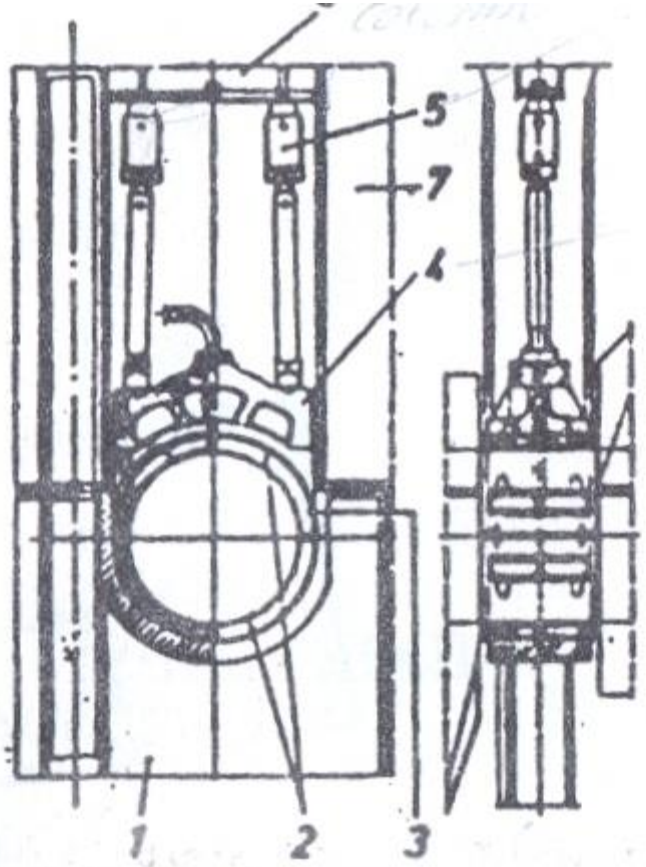
QUESTIONS AND DISCUSSION

1. State the function of the crankshaft.
2. What forces is a crankshaft subjected to?
3. What kind of crankshafts arer used in: a) Medium speed diesel
4. Slow speed diesel
5. 4. What does the choice of steel type for crankshaft depend on?
6. What is the “firing order”?
7. What else is taken into consideration in designing a crankshaft?
8. Why should special care be taken when handling crankshafts outside the engine?
9. How are the main bearing shells protected from corrosion?
10. How are crankshafts positioned in the engine with respect to their connection to the shaft?
11. What is a journal bearing? What other types of bearings do you know?
12. What is the function of the webs?
13. How are the main bearings examined for possible wear?



Fig

ar the following terms:

Test

CRANKSHAFT, MAIN BEARINGS AND SHAFT ALINGNMENT

- The crankshaft, which converts the _____ motion of the piston to rotating motion, must resist the _____ stresses caused by the connecting rod _____ when the piston is at top centre.
- Then the maximum gas pressure acts straight down on the _____ and tends to bend the shaft between the adjacent _____ . The crankshaft must also _____ the torsional forces produced by the change of speed.
- Medium speed engines have crankshaft usually solid _____ , i.e. made from a single piece, while slow speed engine crankshafts are mostly of semi-built design with crankpins and _____ forged or cast in one piece and shrunk on to the _____ . The type of steel used, which is carbon or alloy steel containing nickel, chromium and molybdenum, is chosen for its strength, resistance to _____ and hardness of bearing surface.