

## 3. Dismantling and Assembly Procedures on the Basic Engine

### 3.1 Basic Requirements

- The aim of this Repair Manual is to provide help with carrying out repairs to the engine.

#### **The requirements for this are as follows:**

- Trained specialist staff (of at least the minimum legal age);
- and a workshop where the necessary equipment, standard tools and special tools are available
- A well-lit, unrestricted working area, free from dirt and swarf, will make the work considerably easier.
- Clean the engine thoroughly before dismantling it.
- Attention must be paid to all the information and warning notices which have been affixed.
- Particular care is called for in the vicinity of rotating, moving or hot parts.



This symbol is used whenever failure to comply precisely with instructions or procedures may cause accidents which can result in injuries or death.



This symbol is used whenever failure to comply precisely with instructions or procedures may cause damage to the engine.



Advice and tips about special features when handling the engine.

## 3.2 DISMANTLING PROCEDURES

### 1. Drain lubrication oil :

Place suitable container under the drain hole.  
Remove 2 screws and cupper washers, remove  
oilscreen.



Caution

Clean oilscreen carefully.

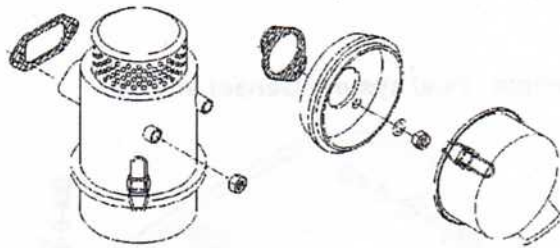
Replace if any deformations or other dam-  
ages.



### 2. Air cleaner

#### Engines installed in Generating Sets

Aircleaner-assy done from equipment manufac-  
turer. Follow instructions of the operating man-  
ual.



#### Marine propulsion engines

There are different versions of aircleaner and  
noise damper in use. In each case remove the  
2 selflocking nuts and pull of the assy.  
Discard gasket and replace filter element if ex-  
isting.

### 3. Muffler / Exhaust manifold

#### Engines installed in Generating Sets

Muffler-assy done from equipment manufac-  
turer. Follow instructions of the operating man-  
ual.

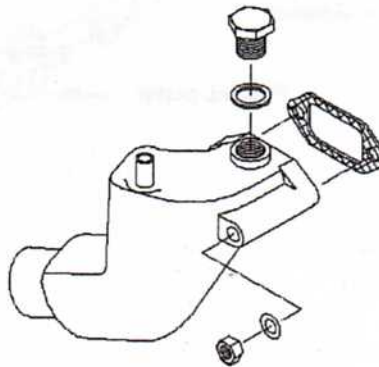
#### Marine propulsion engines

Special watercooled exhaust manifold.

Remove 2 hex-nuts and washers.

Discard gasket.

Replace clamp of the water-line if necessary.



## RE-ASSEMBLING PROCEDURES

### 4. Fuel lines, fuel filter

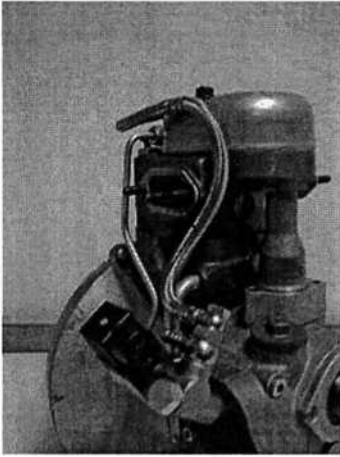
Remove banjo bolts, copper washers from injection pump and injector. If existing – remove fuel filter bracket, setscrews and spring washers.

Close ports of injection pump and injector with banjo bolts to prevent dirt.

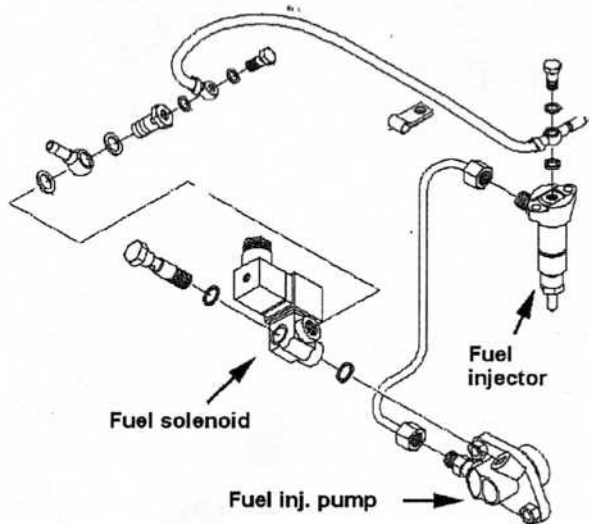


Caution

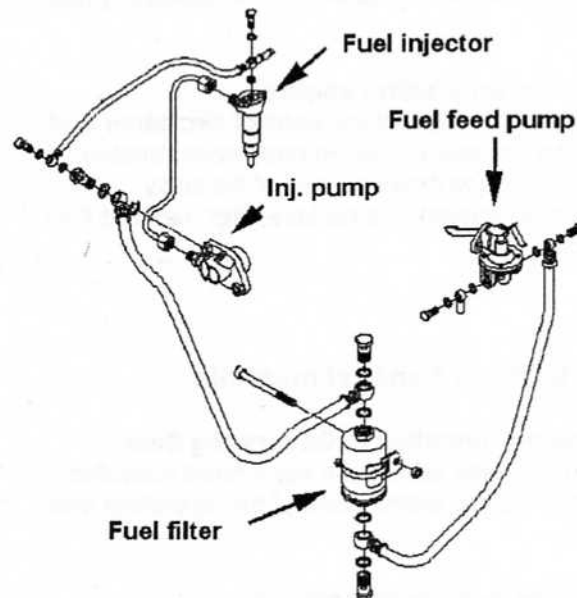
Use only original fuel filter and fuel persisted fuel lines for replacement.



Example : Fuel system Genset engine



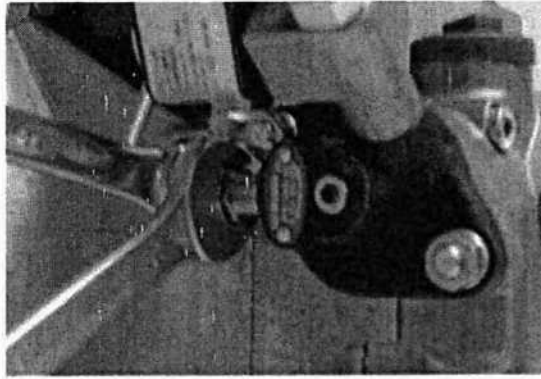
Example : Fuel system Propulsion engine



### 5. High pressure fuel line :

Loosen the high pressure fuel line by holding a 14 mm wrench on the delivery valve while unscrewing the fuel line fitting.

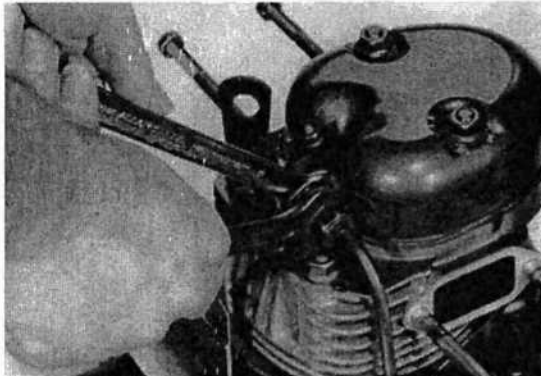
Loosen the high pressure line at the injector in the same way.



Caution

Check taper ends of the high pressure line for damage or wear.

Replace if necessary.



### 6. Fuel injector :

Remove hex nuts and lock washer from injector clamp. Pull out injector.



Caution

Sticking injector : Use a soft faced hammer and tap slightly.

OR : Take an old high pressure line to pull the injector out.

Check injector and cylinder head bore for the copper washer ! Copper washer has to be replaced in all cases !

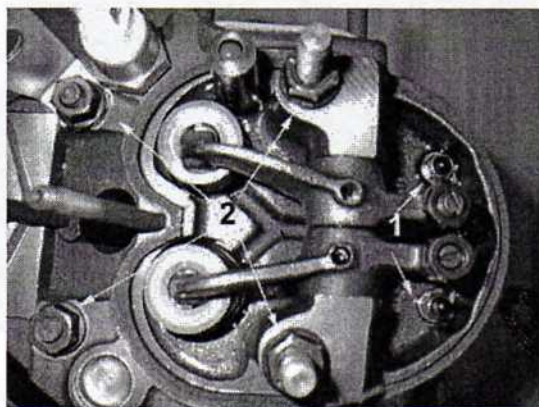


### 7. Cylinder head :

Remove the valve cover by removing the lock nuts and the plastic washers. If necessary tap the cover lightly with a soft faced hammer. Discard plastic washers and valve cover gasket.

Remove the 2 locknuts and washers (1) holding the protection tube retaining spring.

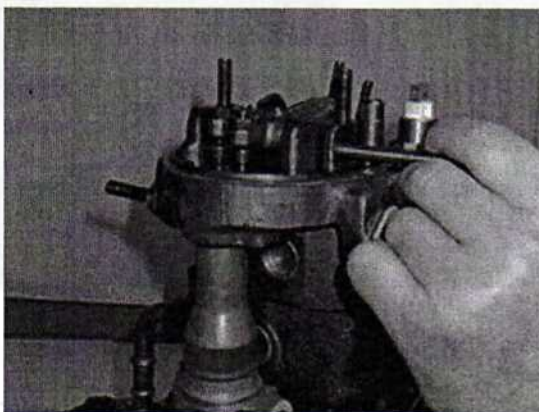
Loosen the 4 cylinder head nuts (2) using a torque wrench.



Drive out the rocker arm bolt with a drift pin and a hammer.

Remove rocker arms and push rods.  
Check rocker arm bushings for wear.  
Replace bushings if necessary.

Check push rods for bending and wear at the taper ends  
Replace if necessary..



Remove the cylinder head nuts and cylinder head. Remove the protection tube.  
Remove cylinder head gasket using a screw-driver.

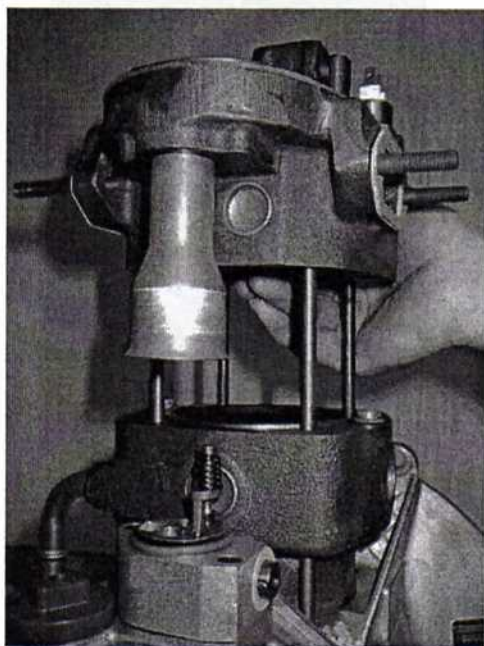
Check valves, valve seat and valve guide for wear or damage. Replace if necessary.  
Check blanking plugs ( water cooling room ) for leakage.



Caution

Use a valve spring compressor to remove the valves.

Valve guides can be easily removed with a valve guide driver ( refer to Special Tool List ! )



### 8. Decompression release

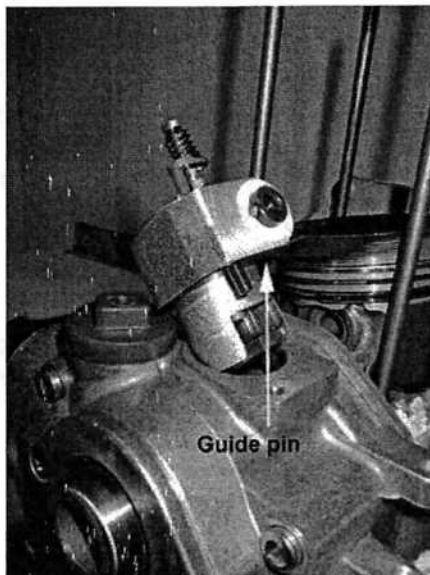
Remove 2 screws and pull the decompression Release out of the gearhousing.

Check gasket and o-seal. Replace if necessary.



**Caution**

Take care not to loose the guide pin !  
With missing guide pin shaft will move out when engine is in operation !



### 9. Cylinder

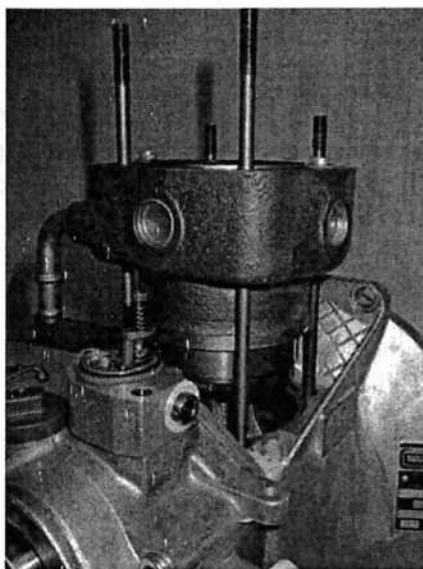
Rotate the flywheel until the piston the bottom of ist stroke. Carefully slide the cylinder up of the studs.

Check o-seals of water-overflow-jackets. Replace if necessary.



**Caution**

If the repair doesn't require replacement of piston and liner, leave the liner on the piston.  
Pull up liner so far that piston pin bore is free ->  
See next step.



### 10. Piston

Rotate the flywheel until the piston is in TDC – position. Use a needle nose plier to remove the piston pin retainer. With a drift pin gently hammer piston pin out of the piston ( from flywheel-side ).



#### Caution

If the piston pin is sticking you've to remove the complete piston and conrod assy. Remove piston pin on the work bench.



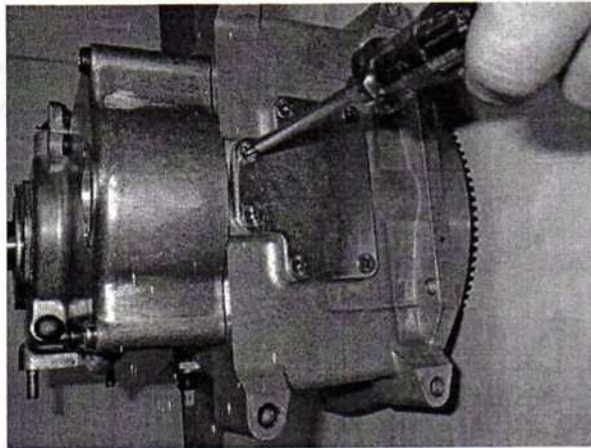
### 11. Conrod

Turn the flywheel until piston is in BTC–position. Put the engine down on flywheel-side. Remove the crankcase bottom plate by unscrewing the 6 head screws. Discard gasket.



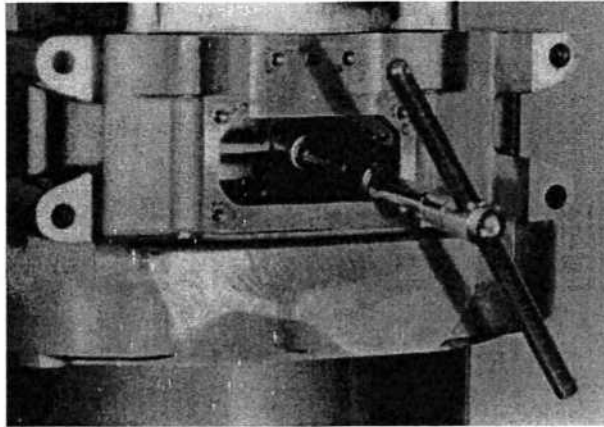
#### Caution

If the screws are very tight tap them with a hammer and and drift pin.



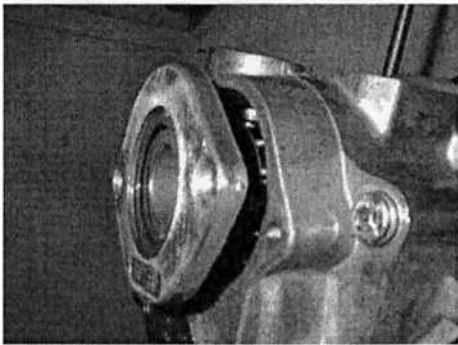
When reusing the conrod bearings you have to mark the bearing shells and the corresponding parts of the conrod. This ensures that the bearing runs in the same position again after installation.

Use a 13 mm socket to remove the hex nuts. Pull out the conrod big end using a plier.



### 12. Crankhandle guide

Remove the 2 crankhandle guide screws. Pull of the guide in a twisting motion.



### 13. Gear end cover

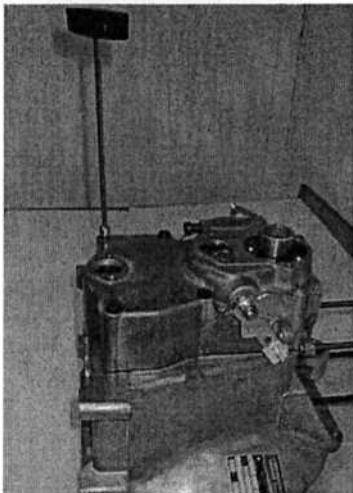
Remove the 6 allen screws and pull off the gear end cover. If necessary tap with a soft faced hammer.



Caution

While removing the gear end cover the gear of the camshaft could stick on the governor-body.

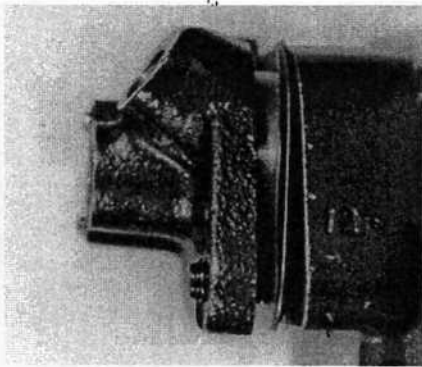
$\frac{1}{4}$  turn of the flywheel will free it !



### 14. Injection pump

Move acceleration lever to full speed position.

## RE-ASSEMBLING PROCEDURES



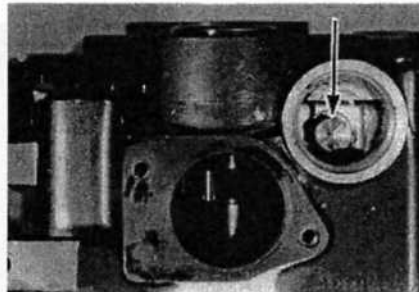
Remove the 2 hex nuts and lock washers. Pull off the inj. Pump. If necessary turn the flywheel to decrease force from the camshaft-side.



Caution

Leave gasket and shim on the gear end housing. Re-install hex nuts and lock washers on their studs.

To remove the injection pump camfollower unscrew fixing screw ( arrow ) through oil filling bore.

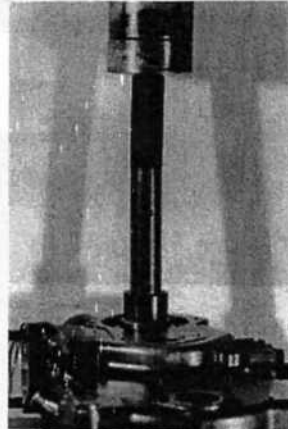


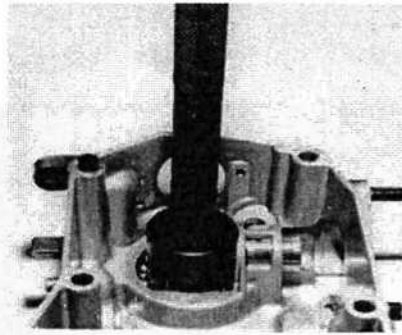
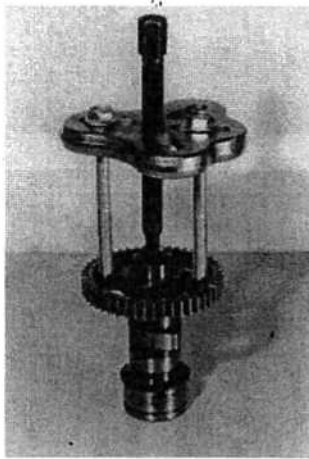
### 15. Camshaft

Remove the circlip lock ring fixing the camshaft in the gear end cover. Press out the camshaft using a driver ( see special tool list ).

To pull off the camshaft gear wheel use puller or press.

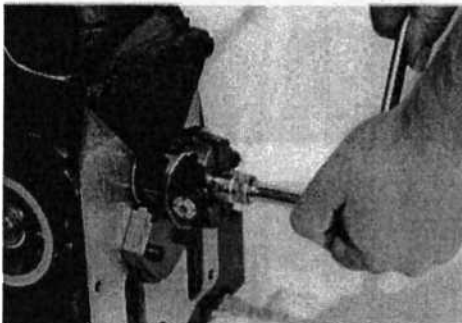
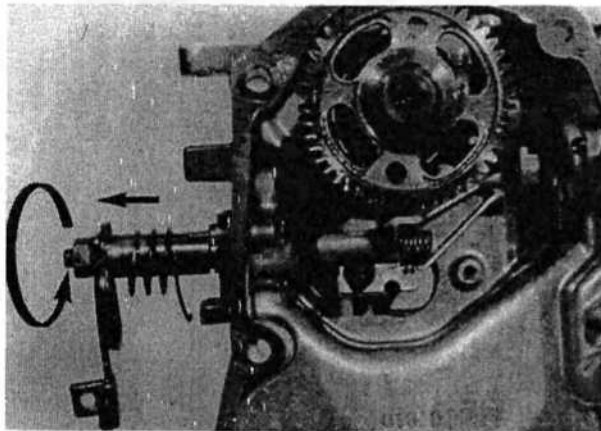
After removing the camshaft the roller bearing can be pressed out from the inside of the cover using a special driver.





### 16. Speed control assembly

Remove the retaining ring from the eccentric shaft using a pliers. Pull the exc. shaft outwards till the ratchet plate is free from the compression pin. Unhook the outer torsion spring from the boss ( use a pliers and watch out for your fingers). Hold the inner control lever and twist acceleration lever down to stop-position till the inner torsion spring is without tension. Then pull eccentric shaft out of control lever and bearing bush.



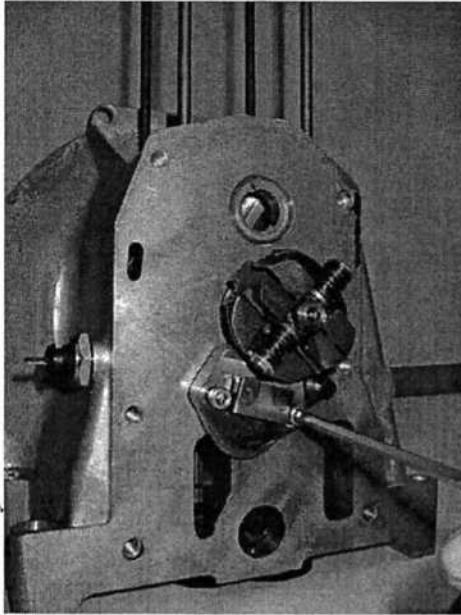
### 17. Governor

Install holding device ( special tools )  
Remove governor pin from governor.  
Spread flyweights with a screwdriver and use 14 mm socket to unscrew governor.



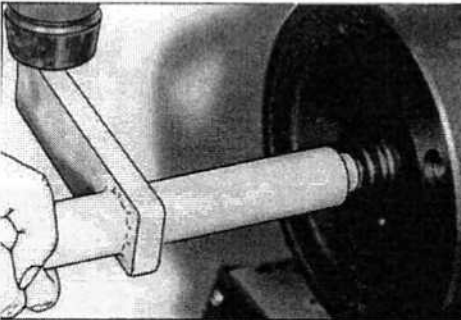
Caution

Governor mounted with left-hand-thread !



### 18. Oil pump

Remove the oil pump and valve bracket by unscrewing the 3 mounting screws.  
Discard gasket.



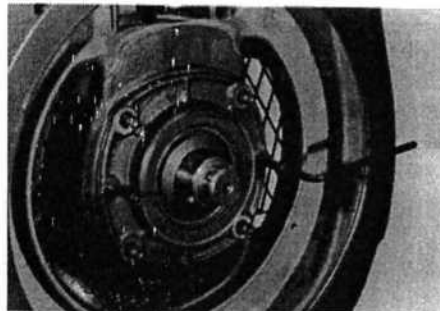
### 19. Flywheel

Remove the oil pump and valve bracket by unscrewing the 3 mounting screws.  
Discard gasket.

Leave the flywheel nut on the shaft. Install flywheel puller and turn the screws until the flywheel breaks loose from the crankshaft taper. Remove the puller, flywheel nut and flywheel.

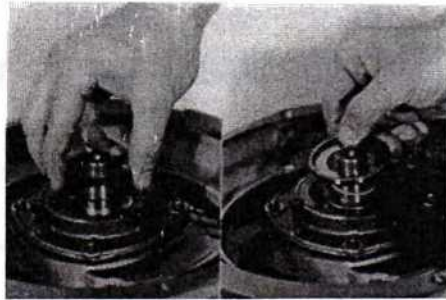
### 20. Main bearing housing

Remove the 4 main bearing housing nuts and washers.  
Next install 2 screws M6 x 30 into the thread holes. Screw them in until the housing breaks loose.



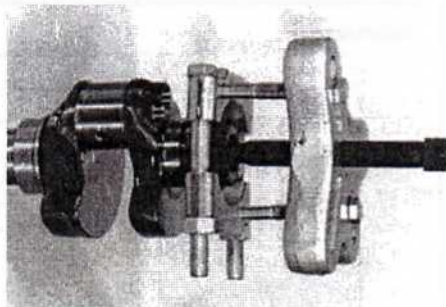
## RE-ASSEMBLING PROCEDURES

Remove the key, belleville washers, angle rings, o-ring and thrust washer.

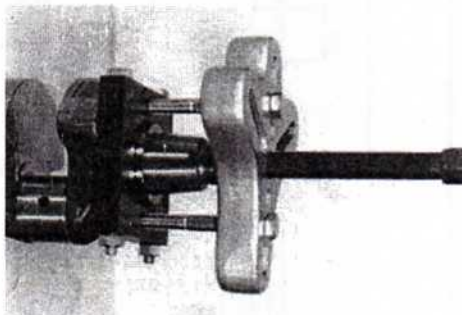


### 21. Crankshaft

Remove the crankshaft from the crankcase, being careful not to drag the crankshaft gear on the main bearing bushing. Use a puller to pull off the crankshaft gear.



In case the roller bearing needs replacement, replace also the inner race, which is shrunk fit on to the crankshaft. Use race puller to pull off the inner race.



The engine is now completely stripped down. Clean all parts with diesel fuel or other suitable cleaning agent. Check parts for damage, wear and tear. Replace is necessary.