

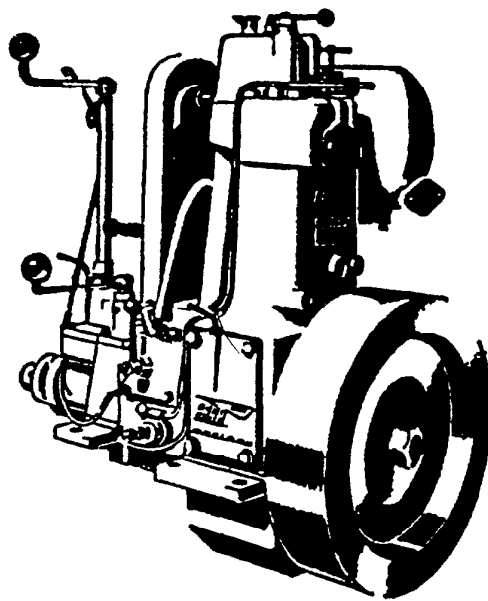
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**SABB DIESEL**

MODEL G

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**INSTRUCTION BOOK AND  
PARTS LIST**



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**SABB MOTOR A.S**

**BOX 40 - 5031 BERGEN - NORWAY**

**Telegram address: Sabbmotor – Telephone: 26 05 04 – Telex: 42559 sabb n**

**When you consult the SABB Distributor or the Factory about your engine always state Engine Serial Number. The Serial Number is plated at the rear of the Starting Bracket, and the Number also indicates the Engine Model.**

**As an example: G 73-235 means Model G, made in 1973 and that it is the 235th engine of this model made in 1973.**

#### **ENGINE SERIAL NUMBER .....**

**When ordering spare parts the Part's Name and Number must also be stated. The names and numbers will be found in the Parts List of this book, divided into Groups as sub-assemblies.**

# **INSTRUCTION BOOK**

## **AND PARTS LIST FOR SABB MARINE DIESEL ENGINE**

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### **M O D E L G :**

**Engine with variable pitch propeller**

### **M O D E L G G :**

**Engine with reverse gear and solid propeller**

### **M O D E L G S P :**

**Engine with fully feathering propeller**

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***SABB MOTOR A.S***

**BOX 2626 – 5010 BERGEN – NORWAY**

**Telegram: Sabbmotor – Telephone: 26 05 04 – Telex: 42559 sabb n**

## **INTRODUCTION :**

The diesel engine (compression ignition engine) is the simplest and most reliable of prime movers, with the lowest fuel consumption. To ensure satisfactory functioning of the engine however, there are certain requirements as regards care and maintenance which should be considered, but these are easily managed by anyone interested in boats and engines.

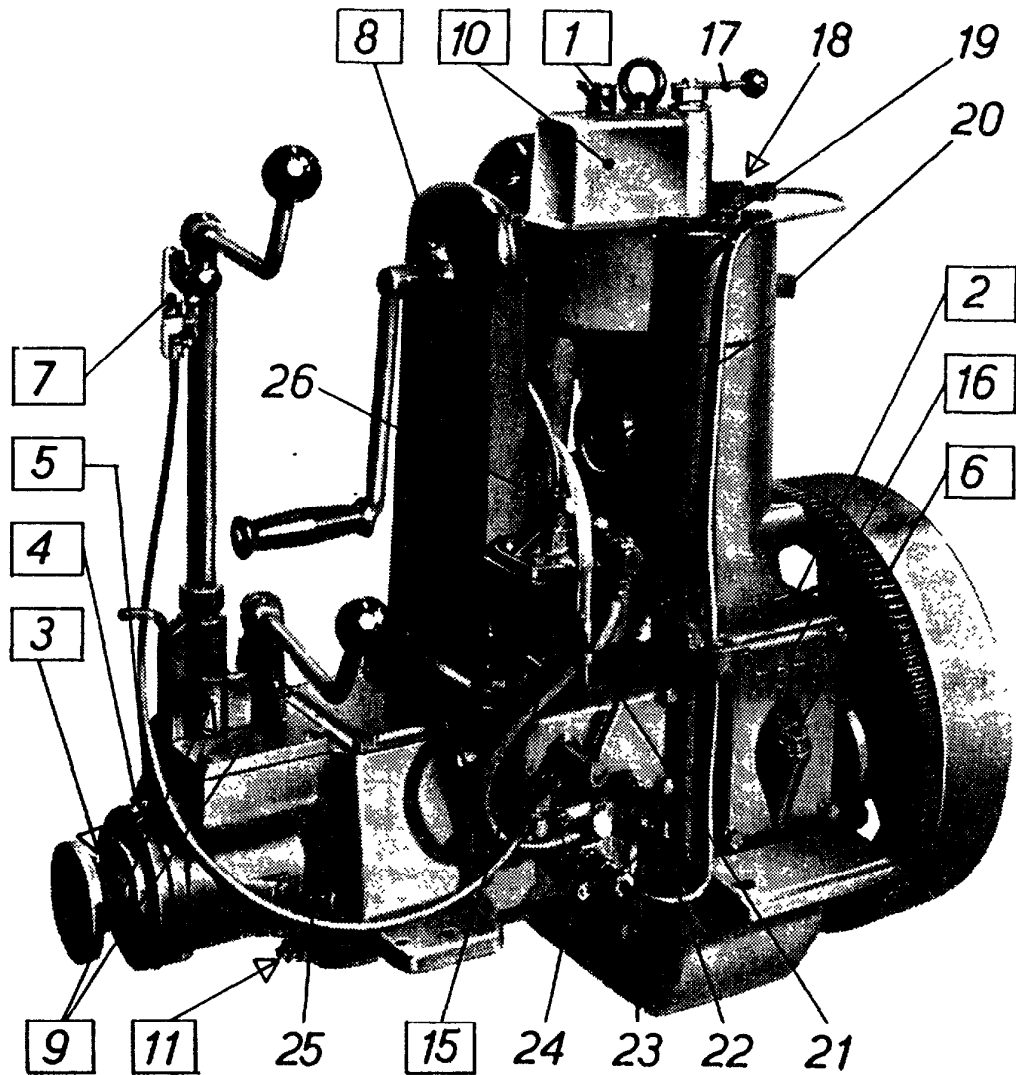
The manufacturers' engine guarantee is effective on the condition that the engine is installed, operated and serviced in accordance with the directions of this manual. Therefore our clients are recommended to study the main points of the manual before the engine is put into operation, it will pay off. The contents are based on many years' experience in operation, service and maintenance of SABB diesel engines. The first part of the manual deals with installation and regular engine service and operation. The second part contains parts lists and repair guide. Finally, a chapter on faults location..

July 1973

**SABB MOTOR A·S**

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## LUBRICATING AND SERVICING CHART

### Every 5 hours (daily)

1. Fill valve lubrication cup.  
Give propeller greaser and stuffing box greaser one turn each.  
Page 16 (not shown on picture).
2. Dipstick. Check oil level.

### Every 25 hours (weekly)

3. Sliding bolts, 5 shots with grease gun (page 65).
4. Rear oil seal, 5 shots.
5. Reversing bearing, 5 shots.

### Every 50 hours

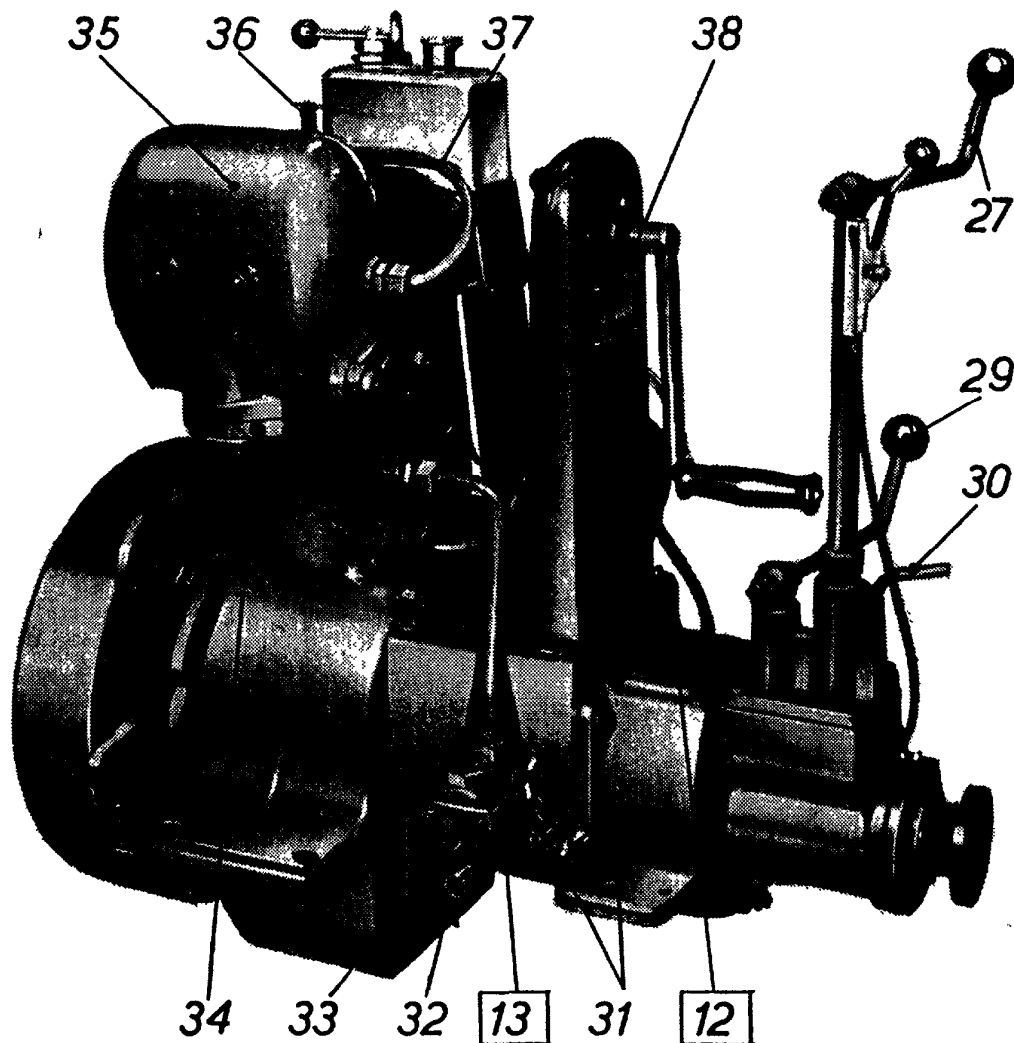
6. Lub. oil filler plug. Change sump oil, 2 litre. Page 14.

7. Governor control handle.  
Grease or oil.

8. Starting shaft. Grease.
9. Clutch and reversing shafts.  
Grease.

### Every 300 hours (yearly)

10. Grease rocker arm bearings in connection with valve adjustment. Page 37.
11. Change lub.oil in clutch or reverse gear, 1/2 litre.  
Use the sump-pump. Page 15-16.
12. Clutch cover. Check clutch tension. Remove cover to adjust (no. 12, page 5). Page 65.



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|---|--|
| <p>13. Inspect water pump diaphragm.<br/>Page 41.</p> <p>15. Change fuel oil filter element.<br/>Page 17.</p> <p><b>Every 600 hours (every 2nd year)</b></p> <p>16. Remove crankcase cover for<br/>cleaning of interior, centrifugal<br/>filter and magnet. Page 14-15.</p> <hr/> <p>17. Decompressor handle</p> <p>18. Injector</p> <p>19. Plug for thermometer</p> <p>20. Starting cigarette plug<br/>(or glow plug nipple)</p> | <p>21. Lub.oil draining handle<br/>(before 1972)</p> <p>22. Inj. pump adjusting screw</p> <p>23. Idling adjusting screw</p> <p>24. Injection pump</p> <p>25. Propeller pitch stop screw</p> <p>26. Fuel leak-off pipe connection</p> <p>27. Pitch control handle</p> <p>29. Clutch handle</p> <p>30. Pitch control hand screw</p> <p>31. Water (pump) draining</p> <p>32. Water intake elbow, 1/2" BSP</p> <p>33. Water valve housing</p> <p>34. Exhaust flange, 1 1/2" BSP</p> <p>35. Exhaust silencer</p> <p>36. Two way cock</p> <p>37. Wet exhaust pipe</p> <p>38. Engine number plate</p> |
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## SPECIFICATION

Model G, one-cylinder, 4-stroke diesel engine, Swirl type combustion chamber. Roller bearing as big end- and main bearings. Removable cylinder liner (wet type). Centrifugal governor. Splash lubrication. Centrifugal oil filter. Bosch fuel injection equipment. Vibration damper. Disc type clutch. Reversing mechanism and variable pitch propeller or reverse gear and solid propeller.

Cylinder bore . . . . .	90 mm	3,54 in.
Stroke . . . . .	120 mm	4,72 in.
Cylinder displacement . . . . .	760 cm <sup>2</sup>	46,37 cu.in.
Compression ratio . . . . .	1:20	
Compression pressure . . . . .	30 kp/cm <sup>2</sup>	426,7 p.s.i.
Continuous rating at 1500 r.p.m. . . . .	8 HP	
Continuous rating at 1800 r.p.m. . . . .	10 HP	
Brake mean effective pressure: 6,3—6,55 kp/cm <sup>2</sup>	89,6—93,4 p.s.i.	
Fuel consumption (10 hp) . . . . .	2,5 litres/h	4,5 pints/h
Reduction gear ratio . . . . .	2:1	
Propeller torque, cont. rating, 7,65—7,95 kpm	55—57 ft.lbs.	
Direction of rotation . . . . .	Left	
Weight of engine without prop. equipm. G-GG	200 kilos,	441 lbs.
Max. permissible installation angle . . . . .	15 degrees	
Valve clearance, intake and exhaust, cold . . . .	0,3 mm,	.012"
Piston top clearance incl. gasket . . . . .	1,5-2 mm	.059-.079 in.
Injection pressure (opening) . . . . .	100 kp/cm <sup>2</sup>	1422 p.s.i.
Injection commences . . . . .	8 degrees before	TDC
Injection ceases . . . . .	7 degrees after	TDC
Exhaust valve opens . . . . .	60 degrees before	BDC
Exhaust valve closes . . . . .	10 degrees after	TDC
Inlet valve opens . . . . .	12 degrees before	TDC
Inlet valve closes . . . . .	45 degrees after	BDC

### Lub.oil Capacities:

Engine sump . . . . .	2 litres,	3,5 pints
Clutch housing, G . . . . .	0,5 litres,	.88 pint
Reverse gear, GG . . . . .	0,5 litres,	.88 pint
Lub.oil viscosity (above freezing point) . . . .	SAE 20	
Lub.oil viscosity (below freezing point) . . . .	SAE 10	
Capacity of cooling water system . . . . .	4 litres,	.88 Imp.gall.

### Torque Load of Nuts and Bolts:

Cylinder head nuts . . . . .	14 kpm,	100 ft.-lbs.
Big end bearing bolts (Verbus-Tensilock) . . . .	18 kpm,	130 ft.-lbs.
Big end bearing bolts, <sup>3</sup> / <sub>8</sub> B.S.P. (old type) . . . .	14 kpm,	100 ft.-lbs.
Gear housing bolts (Page 34, Fig. 26) . . . . .	8,5 kpm,	60 ft.-lbs.

## **INSTALLING THE ENGINE (See Installation and Dimensional Drawing)**

Installation is a one time job and it will be worth your while to use some time and care to get the engine installed solidly and correctly.

### **Foundation**

The engine should be installed so that it will be easy to work with when overhauling or servicing. The maximum permissible installation angle is not to exceed 15°.

**In wooden boats** the foundations should be made of two alongships beams of 4"×4" resting on 3 or better 4 cross beams exactly shaped to fit the hull of the boat. The cross beams should not be less than 2 1/2" thick. The use of pine is recommended for these parts because of its good vibration and noise dampening properties. It is important that the foundation is bolted well to the keel and hull using metal or stainless steel throughbolts. The engine is then bolted down by 4 throughbolts (5/8") which should be heated at the lower ends before being rivetted over, and two 1/2" wood screws for the clutch housing lugs.

**NOTE:** The clutch housing foundation lugs are not machined on the base. It might be necessary to shim the rear lugs to make the rest flush with the machined crankcase foundation lugs.

The engine frame has 4 adjusting screws facilitating lining-up of engine. Fit shims under engine lugs to required height and loosen again the adjusting screws before tightening down the foundation bolts.

**In steel boats** the engine foundation is made of section steel welded to the hull. In order to insulate the engine from the bed, reducing the hull resonance, one can use blocks of oak or mahogany of about 1/2" thickness or 1/8" (3 mm) hard synthetic rubber.

### **Glass fibre hulls (GRP)**

As a rule glass fibre boats are built complete from the boat building yards with ready made foundations. In some cases it will be necessary to reinforce the foundations with several additional layers of glass fibre. It is very important to obtain a good jointing between the foundation and the hull in order to get maximum rigidity and dispersing of the load on the largest possible area of the hull. The engine can be bolted direct to the foundation using studs, space should be provided for, so that nuts can be fastened to the lower ends of the studs. 5/8" wood studs can also be used, these should be glued into the woodwork.

The engine can also be fastened to either flat steel or L shaped steel (galvanized) which must be solidly bolted to the moulded foundation. Glass fibre is a hard and strong material for hulls and foundations, but it has very poor vibration- and noise dampening properties. One must therefore take a lot of care in noise insulation. (Cont. page 24.)

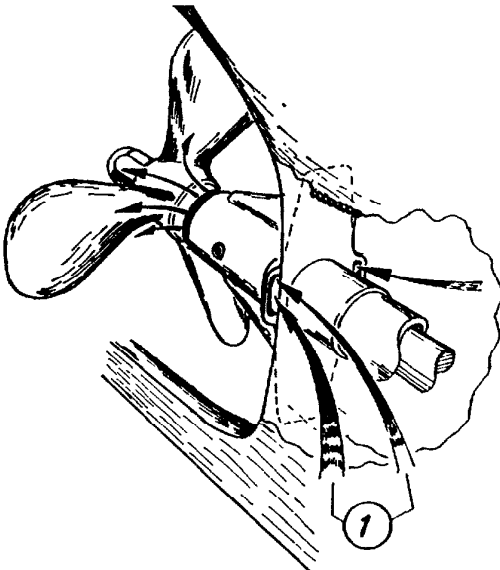
## PROPELLER

The propeller should be fitted as low as possible. Before fitting the propeller shaft, see that it is straight and undamaged. *The engine and the propeller shaft must line up exactly to avoid bend in bearings and trouble with reversing mechanism or reverse gear.* Check the alignment with a feeler blade between the two flange coupling halves.

The stern post must be properly fitted to the stern bearing. To prevent leakage, use a mixture of zinc-white and tar underneath bearing flange. Above and below the stern bearing the stern post should be sharpened to allow proper flow of water to the propeller. The distance between stern and propeller wing should not be less than 1 inch. If there is insufficient room for the propeller a loose stern batten has to be fitted, thereby enabling the propeller to be moved further back. The greaser tube to propeller is inserted together with the stern bearing. Drill  $\frac{1}{2}$ " hole 10 degrees upwards through the stern post, or drill parallel with the stern tube if more convenient.

*Remember to fill propeller boss with heavy waterproof grease before assembly.*

See page 16.



### Water Lubricated Stern Bearing

This is available for shafts to solid propellers only. The stern bearing comprises a rubber lining which is lubricated by the water streaming through it (1). No greasing is required for the stern bearing.

Before fitting the propeller shaft check that it is completely straight, and not damaged during transport. If free length of propeller shaft (between int. stuffing box and shaft coupling) exceeds 1,5 metre (60 in.) a support bearing should be fitted.

**The shaft for variable pitch propeller must be cut and fastened to the flange coupling when both propeller wings and pitch control lever are adjusted for full pitch astern.**

Before the shaft is secured for good, it is advisable to control the propeller pitch at sea, to see that ahead and astern pitch is correct. The shaft and the reversing mechanism should move freely. Finally, countersink for the two set screws into the shaft, using a  $\frac{13}{32}$ " (10,5 mm) drill through the tapped holes and tighten the set screws securely. A  $\frac{1}{4}$ " (or 6,3 mm) hole should be drilled through the shaft corresponding with the hole in the flange. Secure the shaft with the  $\frac{1}{4}$ " pin provided.

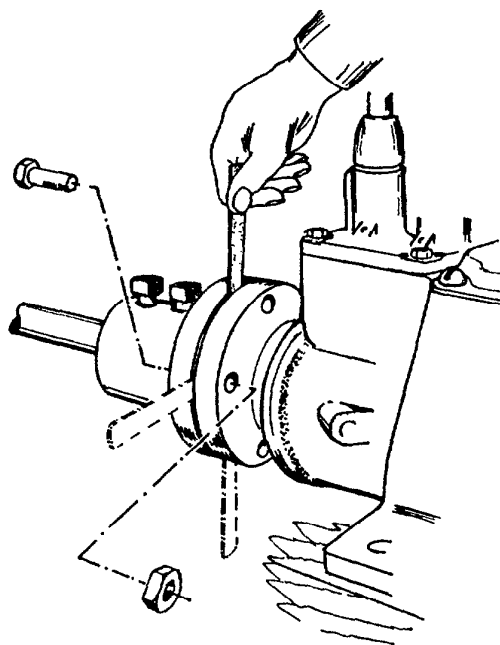
### Adjustment of Propeller Pitch Stop Screw

The stop screw, Pos. 25, page 4, facilitates operation of the variable pitch propeller, and should be set during the test run. Adjust the screw so that the engine gets its most favourable full speed r.p.m. with respect to boat speed, vibration and other factors. The most favourable r.p.m. depends on shape and size of the boat and should be between 1500 and 1800, not exceeding 1800.

### CHECKING THE ALIGNMENT

The alignment of engine and propeller shaft should be checked after the boat has been in the water a sufficient length of time to permit the hull to set. The alignment is controlled with a feeler gauge between the coupling flanges (see fig.), in 4 positions up, down and laterally.

If required loosen engine fixing bolts and fit shims under frames until flanges are exactly parallel. Check again after engine is fixed.



### ENGINE CASE AND NOISE DAMPENING

The function of the engine case is to protect the engine and to reduce the noise. It is recommended to make the case in one piece with a removable lid which fits around the case top rim and to cover the lid with a suitable hard plate. (See page 87.)

Marine plywood is suitable for the case. However, at least 1/2" plywood is required to avoid resonance. To insulate further, the case can be lined internally with acoustic plate or 20 mm heavy, reinforced foam plastic or PVC insulation material. Heavy wood like oak, teak or mahogany, 1 or 1 1/4" are suitable materials. The heavier the case the better the insulation. However, some noise is transmitted through the engine foundation to the hull. It will help to insulate the cabin ceiling with acoustic material.

**IMPORTANT:** The engine case and the flooring must not touch the engine.

## **PIPING**

The sea cock and strainer should be fitted through the bottom of the boat near the cooling water pump. Easy access to the cock and water filter (if any) is important. The internal water filter is recommended if the boat is to be operated in sandy or muddy waters. The filter is fitted directly to the sea cock. The cooling water discharge pipe is connected to the two-way cock on cylinder head.

For fresh water cooling, see page 19—20.

The fuel oil tank should be installed as high as possible, bottom of tank at least 4 inches (10 cm) above fuel filter. See that the fuel tank pipe gets even fall from the tank, without ups and downs, to avoid air traps.

The tank has two bleeding nipples. Avoid smell of fuel oil under deck by fitting two 1/4" PVC hoses, «swan-necked» overboard to avoid any water entering.

**Fuel lift pump** can be fitted, page 43, for lower installation of tank.

### **Dry exhaust**

Steel pipe (galvanized or black) is used for dry exhaust. Copper pipe is not recommended. Stainless steel is the best.

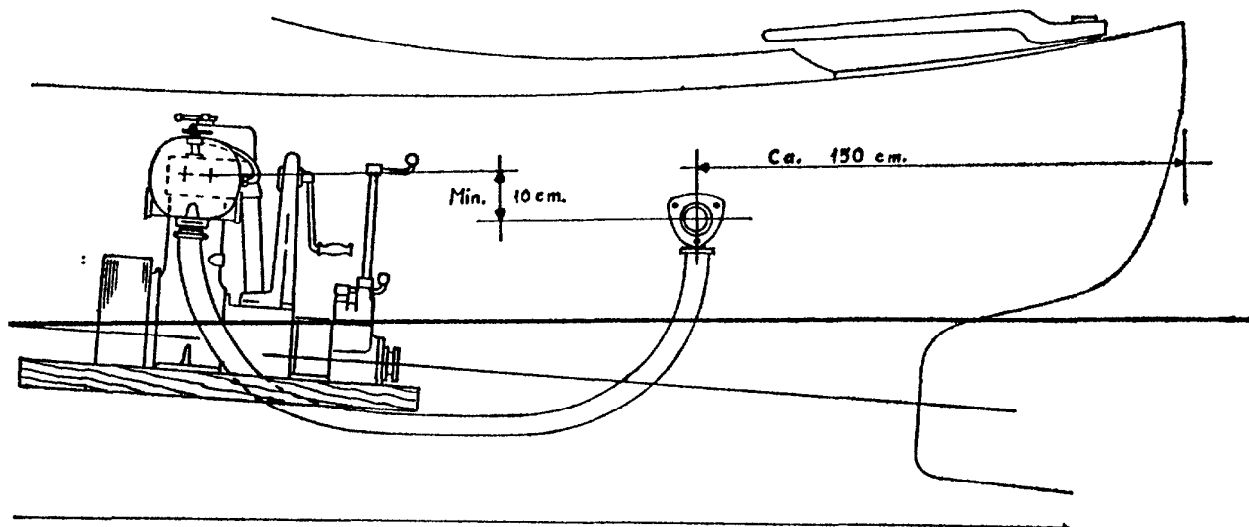
The exhaust can be piped in 3 directions. The usual way is to pipe it out from underneath the silencer for engine without electric starter, or out in rear end of the silencer for engine with selfstarter, under the flooring and out through the side or stern of the hull. The pipe should be insulated with asbestos. The pipe is connected to the silencer with pipe bend 1 1/2" BSP. By turning the silencer 180 degrees, the exhaust can be piped upwards. Vertical exhaust pipe, however, may cause condensed water from pipe to be blown out over the boat.

For dry exhaust the water pipe between two-way cock and silencer must be blinded off. A small copper washer is supplied in the tool box for this purpose.

### **Wet exhaust**

Wet exhaust is used to reduce exhaust noise and to keep temperature of silencer and exhaust pipe low. Rubber exhaust pipe is recommended. The pipe is a special rubber hose, easy to fit and long lasting. It is absolutely necessary that the hose is water cooled except on idling and up to 1/4 of normal output.

Heavy steel pipe can be used, stainless steel is excellent. Copper pipe is not recommended. The silencer must be in opening/down position and the pipe outlet through the hull must be as low as possible. It is important, in order to prevent water from returning to the silencer when the engine is being stopped, that the hose is laid with a deep bow from engine, forming an ample water reservoir. (See sketch).



The rubber exhaust pipe, when correctly fitted, will swallow all the cooling water from the engine at all speeds. The two way cock on cylinder head is operated only to blow dry the exhaust pipe. If the exhaust valve gets damaged from water or vapour the silencer should be by-passed by fitting a nipple with water inlet on the exhaust pipe itself. A damaged exhaust valve is noticed by lack of compression and cylinder head bottom corrosion. To remedy, insert replacement valve. In severe cases the entire cylinder head has to be replaced.

It is not necessary to fit water drain cock on the exhaust pipe. The engine will dry the pipe completely after a few minutes at high r.p.m. with all cooling water discharged directly overboard.

**In sailing boats** special precautions must be observed for the exhaust piping. Cooling of entire pipe is difficult to arrange as the exhaust outlet is situated far above the engine. It is therefore vital that the steel pipe has a swan neck arrangement well above the water line, preferably in connection with a non return valve (Elastomuffle). This eliminates any danger of sea water flowing into the engine. The cooling water pipe should be tapped into the exhaust pipe on the stern side of the swan neck, this will prevent cooling water from draining back into the engine.

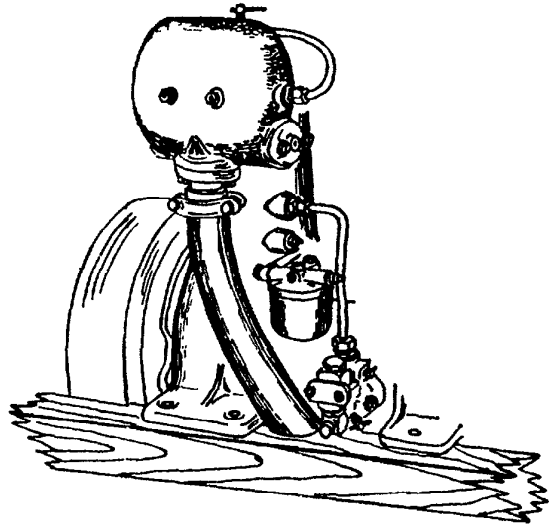
To avoid excessive heating of the engine compartment it is recommended to install a copper or stainless steel jacket cooler 1—1.25 meter (40—50 in) fitted around the exhaust pipe. The cooling water from the engine goes through the cooler and from this to the swan neck.

## Exhaust pipings

Rubber exhaust pipe fitted. This piping is usually recommended. The pipe is led under the engine and backwards. It is necessary to cut out for it in the foundation plank.

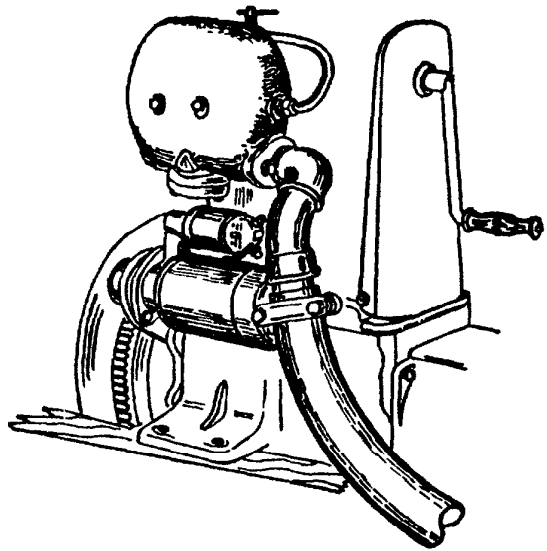
Pipe bend 1½" 45 degrees — wrought iron galv. — ext./ext. threads (not shown on sketch) — fitted in the exhaust flange.

Rubber exhaust pipe fitted to the bend with galv. hose clip.



Rubber exhaust pipe used in connection with electric starter. This method is used if room for bilge pump below starter is wanted.

One 1½" elbow with ext./int. threads. One 1½" 45 degrees bend with ext./int. threads. — Nipple (ext./ext. threads) fitted in bend.



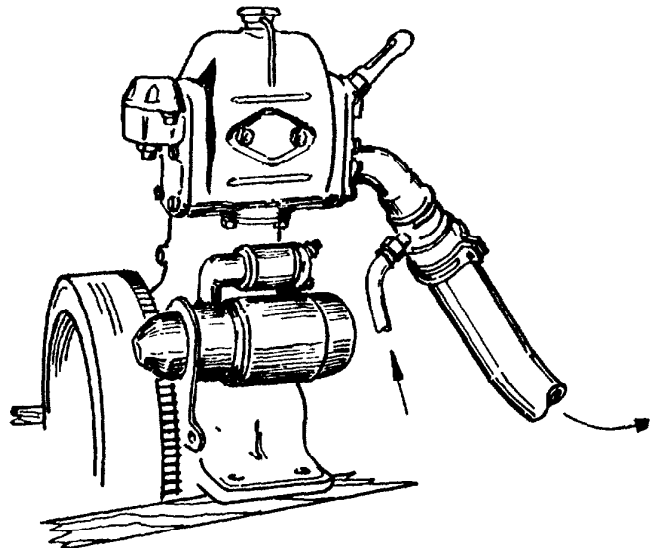
Engine fitted with self starter — fresh water cooling, rubber exhaust pipe and extra water pump (see gr. G 42—2).

Outlet from rear end of silencer. One 1½" 45 degrees bend with ext./int. threads and hose nipple, 1½", with sea water inlet from extra water pump.

Rubber exhaust pipe connected to hose nipple with hose clamp.

Note: Engine with fresh water cooling without self starter and without extra water pump. Uncooled pipe. Outlet from underneath.

Insulated with asbestos yarn.



## SUPPLIES

### A. LUBRICATING OIL

Check sump oil level regularly with dipstick which has two marks. Top mark indicates full sump, i. e. 2 litres (3.5 pints). Never permit level to sink below lower mark.

To ensure successful operation over a long span of time, it is not enough to see that the engine gets sufficient lubricating oil, it is equally important to use oil with the right qualities.

#### LUBRICATING OIL:

Use lubricating oil of good brand, «Service DG or DM».

#### VISCOSITY:

Below 0° C temperature  
(+ 32° F) . . . . . SAE 10

Between 0° C (32° F)  
and 30° C (+86° F) . . . . SAE 20

Above 30° C . . . . . SAE 30

A multi-grade oil (SAE 10—20—30) can be used. Use same lubricating oil also for the clutch or reverse gearbox.

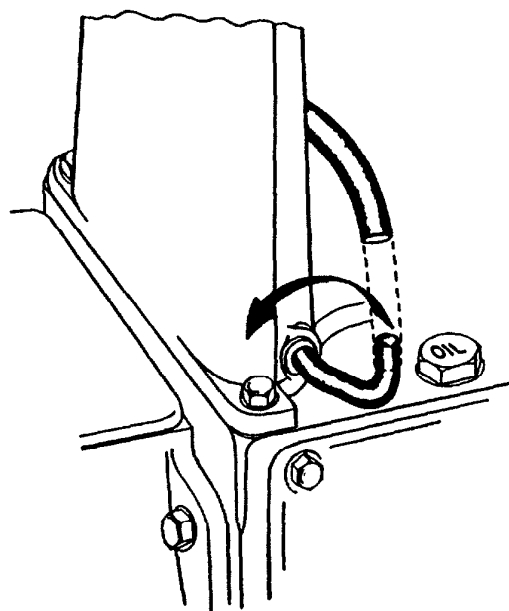


Fig. 7.

#### *Recommended lubricating oils:*

BP Energol IC-MB

Chevron Supreme Motor Oil

Esso Motor Oil

Fina Solna HD-S.3

Gulflube Motor HD

Mobiloil Special

Ocean Diesoline

Reginol Motorolje

Shell Melina Oil

Texaco Havoline Motor Oil

#### **EVERY 50 OPERATING HOURS: Sump Oil Change.**

Change the sump oil after the first 25 hours of operation and clean the magnet in the crankcase. (Page 14.)

Later oil changes every 50 hours of operation. (Unless the engine has a tachometer with hourmeter, it is easier to record fuel oil consumption than operating hours, i. e. 50 hours equal to 125 litres (27,5 Imp.gall) fuel consumption).

#### **(Engine with automatic sump oil change system.) Fig. 7.**

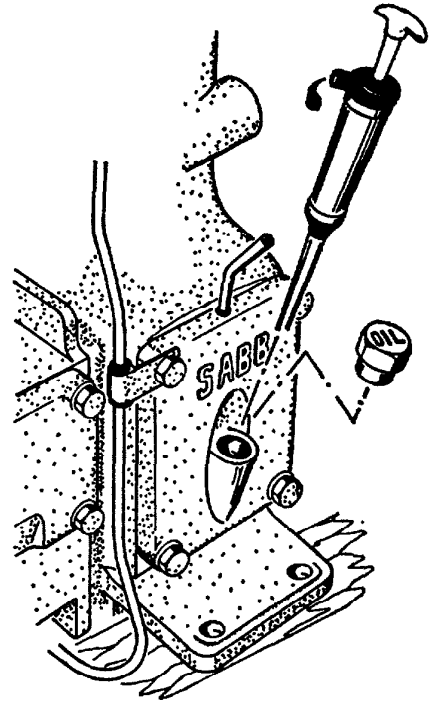
Always change lub. oil with warm engine: Let the engine run idling at approx. 500 r. p. m. Loosen the plastic hose from the lub. oil draining handle and put hose into an empty tin.



Close breather valve by turning draining handle backwards. The pressure thereby built up in the crankcase will force the oil out through the plastic hose. When all lub. oil is out, turn draining handle up and stop the engine. Put the plastic hose back on the handle so that both are kept in place. Fill 2 litres (3,5 pints) of clean lub. oil through the filler plug hole or through the crankcase cover.

**Engine with sump drain pump  
(delivered after G.71.984)**

1. Stop engine.
2. Unscrew «OIL» plug in crankcase cover.
3. Insert hand pump into sump and pump out. Use a tin or bottle under pump outlet.
4. Pour 2 litres new oil into sump through plug hole. Fit «OIL» plug.



**IMPORTANT:**

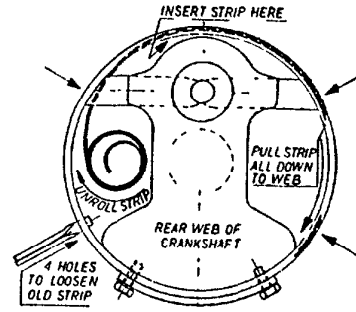
If the engine has been immersed in water, the oil in crankcase and clutch housing (or reverse gear box) should be changed without delay.

**Every 600 operating hours (for pleasure craft: Every 2nd year)**

the crankcase interior and the centrifugal oil filter should be cleaned. Fill  $\frac{3}{4}$  litre (1,3 pint) of *fuel oil* into the sump before draining the lub.oil. Let the engine run for about 5 min. at 1000 r.p.m., then drain the oil as described. Stop the engine and remove the crankcase cover. Wash engine interior with clean fuel oil, removing soot deposits and sediment. It is recommended after some years of operation to remove governor cover and wash interior with fuel oil. Use sump pump to drain. Dry with cloth or paper waste. Remove the magnet placed in front of the crankcase bottom. Clean and replace.

## Centrifugal Lubricating Oil Filter

The centrifugal oil filter is fitted to the rear crankshaft web. It contains a paper strip on to which the sediment is clogged. The strip is used to ease the cleaning. Remove the strip, rinse in fuel oil and wipe off the dirt inside the steel ring. If undamaged, the paper strip can be used again. New strip is made from carton or kraftpaper. Measure:  $520 \times 32$  mm ( $20\frac{1}{2}'' \times 1\frac{1}{4}''$ ).



**EVERY 300 OPERATING HOURS: (At least once yearly)**

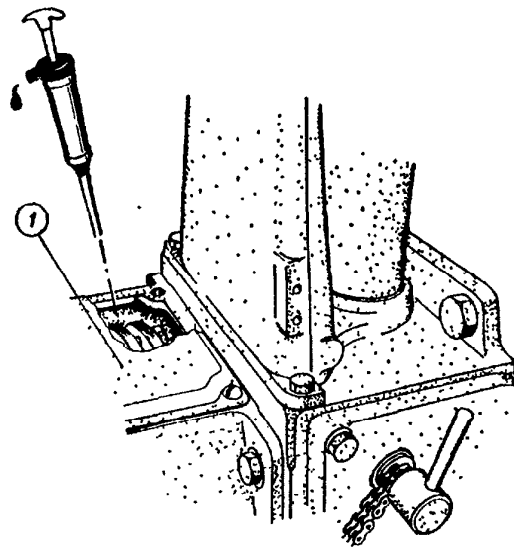
### Clutch Oil Change (Model G and GSP)

Unscrew housing cover (1). Insert hand pump into sump and pump out. Use a tin or bottle under pump outlet. Alternatively drain by means of plug in rear end of housing. If clutch oil gets thick and dirty, wash out with fuel oil and dry well before new oil is filled up.

Pour  $\frac{1}{2}$  litre new lub. oil through lid opening.

Do not pour extra oil into clutch housing as the housing is ventilated to the air intake and excessive oil may be sucked into cylinder head causing carbon deposit on the valves.

If the clutch is slipping, tighten clutch clamp nuts  $\frac{1}{6}$  turn, through lid opening.



## EVERY 300 OPERATING HOURS: (At least once yearly)

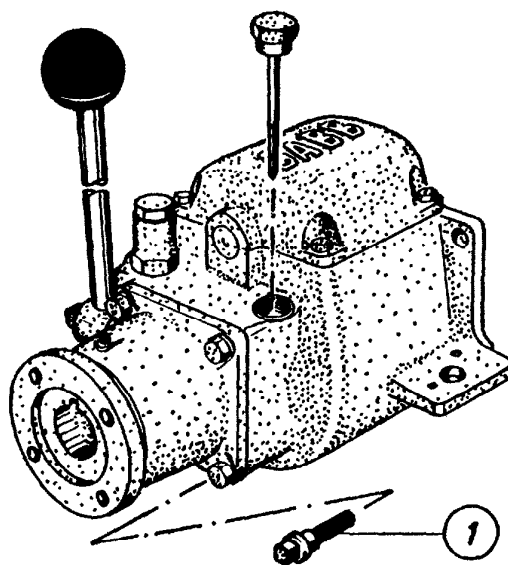
### Reverse Gearbox Oil Change (Model GG)

The gearbox contains 1/2 litre lub. oil. Change oil after the first 25 hours and clean the magnet in the drain plug (1).

To drain remove the dipstick plug at rear end of gearbox righthand side. Insert hand pump into sump through the dipstick plug hole, and pump out. Use a tin or bottle under pump outlet.

If lub. oil gets thick and dirty, remove the gearbox cover, wash out gearbox with fuel oil and dry well before new oil is filled up.

Do not pour extra oil into gearbox as the gearbox is ventilated to the air intake and excessive oil may be sucked into cylinder head causing carbon deposit on the valves.



Excessive oil will also influence the clutch operation.

Check lub. oil level regularly, every 25 hours.

Note that the dipstick reading depends upon the installation angle.

### Greasing

The engine should be greased regularly with a grease gun, page 4. The variable pitch propeller and stern gear are greased by means of a special greaser which should be given at least one turn a day. When operating in sandy and muddy waters it is essential that the propeller receives ample and regular greasing.

*Following water proof, multi-purpose grease can be used for all greasing points (engine and variable propeller):*

Esso MP-Grease Beacon EP2  
Shell Alvania Grease EP2  
Molilux Grease No. 2  
Fina Marson EPL

B. P. Energrease N1  
Texaco Multifak EP2  
Chevron Dura-Lith Grease EP2

If the variable pitch propeller is heavy and sluggish to operate after the boat has been out of use for some time, a possible reason can be that the propeller grease has been washed away. In such cases special stern tube grease should be used for the propeller.

## B. FUEL OIL

For fuel oil always use gas oil (destillate fuel). Dirty fuel oil should never be used, the cleaner the fuel, the better the performance of the engine.

*Drain water and sediment from fuel tank regularly.*

Use strainer in the funnel when filling tank. (Ladies' nylon stocking.) Make sure that the fuel tank never runs dry. In case the engine stops because of an empty fuel tank, the whole fuel system must be bled again.

When leaving the boat, it is not necessary to close the fuel tank cock, because leakage is impossible provided the suction pipe connections are properly tightened. If you forget to open the fuel tank cock before starting, the engine will run for a few minutes and then stop. To start again, it is necessary to bleed the whole fuel system.

### Fuel Oil Filter (fig. 1)

Water coming in with fuel will accumulate in the fuel filter bowl. Foreign particles will settle in the filter element. The element should be changed every 300 hours (Equal to 750 litres (165 Imp.gall.) fuel oil consumption) or whenever fuel supply becomes irregular. The element is of the "throw-away" type, can *not* be cleaned. (Bosch FJ/Sj 2751—1 457 431 324 or H filter E2K.) Close fuel tank cock. Unscrew the filter central bolt and pull down the filter bowl. Clean the filter bowl and fit a new element. See that the rubber ring in filter cover is in its groove before tightening the bolt. Remember to open cock. The element will last longer if the filter bowl is cleaned now and then.

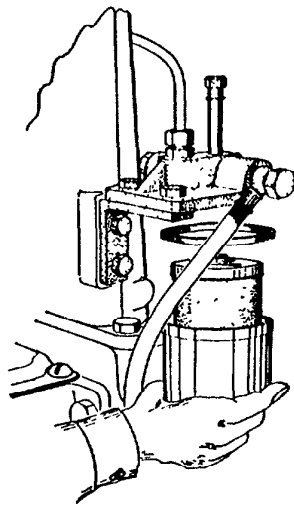


Fig. 1.

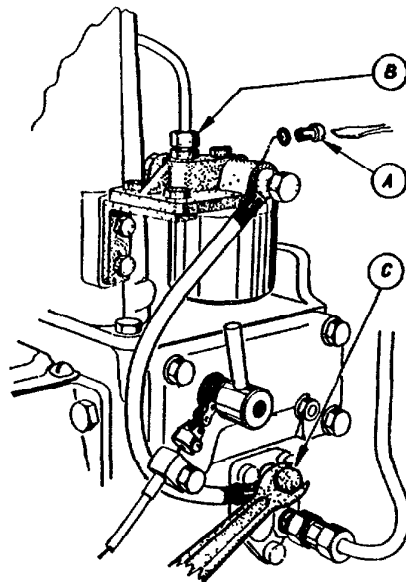


Fig. 2.

### **Bleeding the Fuel System (fig 2)**

1. Fuel filter and fuel tank tube are bled by loosening the fuel leak-off pipe nut on filter (B) or the small bleeding screw (A). Keep open until fuel flows freely without bubbles. Tighten securely.
2. To bleed the fuel suction hose between filter and injection pump loosen the banjo nipple (C) screw on fuel pump 3 turns (see fig. 2). Shake the hose and keep screw open until the fuel flows freely.  
Note: The pressure valve on the injection pump should not be unscrewed for bleeding of the pump.  
Tighten the banjo nipple screw. The suction hose end should point upwards from the banjo nipple to avoid air lock (fig. 2).
3. To bleed the injection pipe crank the engine with governor handle in full speed position, until noticeable "jerks" in the injection pipe tell that the fuel has arrived to the injector and that the injector functions.

### **C. COOLING WATER**

The cooling water pump is of diaphragm type. (Page 41.) For sea water cooling the water discharge temperature should be between 50 and 60°C (122—140°F) and it is controlled by adjusting the sea cock at full speed.

#### **Sea Water Cooled Engine: Important.**

Make it a rule—before starting in cold weather—to ease carefully the starting handle to ascertain that there is no undue resistance to turning, caused by ice in water pump. Close sea cock and drain water from engine and water pump before storage and after each time of operation in freezing temperature. There are two drain plugs in the water pump. To avoid air lock, keep two-way cock on cylinder head open to exhaust side.

#### **Thermostat controlled Sea Water Cooling (open circuit)**

See page 59. The thermostat with its valve is fitted in the thermostat housing on top of cyl.head. When cold, the thermostat valve is closed and most of the circulating water by-passes the block and cyl.head to the thermostat housing and is discharged. Upon reaching approx. 55 °C (131 °F) the thermostat valve will start opening and allow more water to pass through the engine. By metering the sea water through the engine, the thermostat will keep the water temperature between 50 and 60 °C (122—140 °F) at all speeds.

**Maintenance: (Cont. page 24.)**

## Fresh Water Cooling System (closed circuit). Page 58

The SABB fresh water cooling system has the water tank combined with the silencer. The thermostatic operated valve is placed in thermostat cover (see fig.).

### Mounting Keel Cooler:

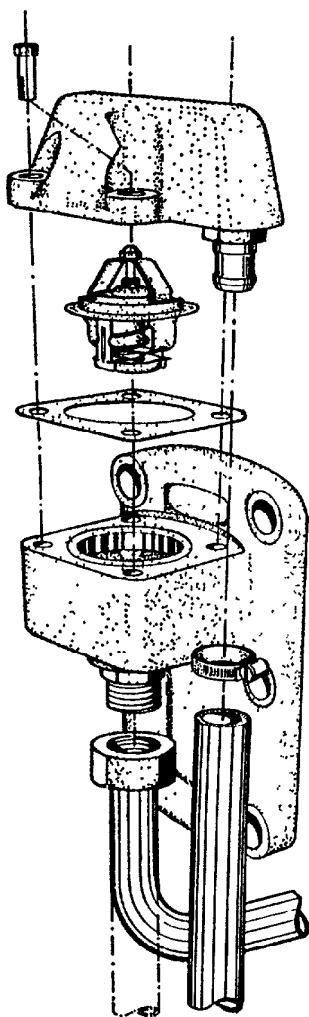
The outboard keel cooler should be placed so that the pipe nipples run through the bottom near the water pump. Use stainless steel screws ( $\frac{1}{4}$ ) for the retainer plates. The cooler pipe may point forward or backwards, but it should preferably be fastened close to the keel to ensure the best protection.

For Glass Fibre Hulls use small blocks of wood solidly glued, on the inside, to secure the fixing screws. Do not paint the cooler pipe, as paint insulates and reduces the efficiency of cooling.

### Operation:

When engine is started from cold, position of the thermostat and valve is such that all water in circulation by-passes the outboard cooler and is returned directly to pump suction. On reaching  $55^{\circ}\text{C}$  ( $130^{\circ}\text{F}$ ), the thermostat opens and allows a portion of water to pass through cooler. A balance is reached between the thermostat opening and the quantity of

water passing through the cooler when engine reaches its working temperature. Normal coolant temperature is between  $55$  and  $65^{\circ}\text{C}$  ( $130$ - $149^{\circ}\text{F}$ ). Due to the pressurised system water will not boil until temperature exceeds  $105^{\circ}\text{C}$  ( $221^{\circ}\text{F}$ ). In this case steam will come out of pressure cap pipe.



### Maintenance:

When starting engine for the first time, close drain cocks on water pump and fill fresh water tank with clean water. Run engine at idling speed for some minutes with pressure cap off and top up until water level remains even. Check all water pipe connections for leakage.

*At regular engine operation check water level each week and add up if necessary. Be careful not to burn your hands when removing pressure cap with warm engine.*

Once a year remove thermostat housing and thermostat for cleaning and inspection. To check thermostat put it into hot water of more than  $60^{\circ}\text{C}$  and see that it opens fully. When put into cold water it should close again completely. If necessary unscrew thermostat cover and clean thermostat strainer.

## IMPORTANT:

If the thermostat is defect, the cooling system can be used without thermostat, but it is necessary to blind by-pass pipe by inserting a copper washer in the nut against nipple face. Remember to open pipe again when fitting a new thermostat.

**Too high water temperature**, even at moderate engine load, is usually caused by:

1. Water system not filled up.
2. Reduced cooling effect due to paint or growth on the keel cooler.
3. Thermostat defective or thermostat and strainer clogged.
4. Poor water circulation. Water valve clogged in its housing (page 41). or damaged water pump diaphragm.
5. Cylinder head cracked, compression leaking into the water jacket. Noticed by heavy bubbling in the water tank with cold engine at idling speed.
6. Excessive friction in cylinder liner, blow-by in scored liner.

*If the keel cooler becomes corroded, suitable zinc anodes should be fitted close to the cooler.*

### **Winter operation:** (Fresh water cooling with antifreeze liquid)

The closed circuit cooling system permits use of antifreeze liquid in water, thus avoiding daily draining of cooling water when ambient temperature approaches freezing point. As antifreeze solution use a glycol-base liquid of good brand which can be obtained from most car service stations. The water capacity of the engine including water tank and standard pipes amounts to 4 litres (.88 imp. gall.).

With 1 litre (1,75 pint) of ordinary glycol-base antifreeze, the coolant mixture stands  $-12^{\circ}\text{C}$  ( $+10^{\circ}\text{F}$ ). With 1,5 litre (2,65 pints):  $-22^{\circ}\text{C}$  ( $-9^{\circ}\text{F}$ ). After adding antifreeze run engine for about 3 minutes to ensure safe mixing of coolant.

When using a good antifreeze solution it is not necessary to drain the cooling system in spring, provided the mixture is still clear without foam and rust particles. Dirty coolant, however, makes it advisable to flush the system thoroughly.

## **D. AIR**

The air is drawn into the cylinder through the starting bracket which serves as intake silencer. The crankcase and the pump housing are ventilated to the starting bracket through clutch housing so that smoke and oil vapour are sucked back into the engine.

The engine case should be fairly tight above the flooring. Then most of the intake air will be cold and humid coming from the room under the flooring. Valves, see page 37.

## **STARTING RULES**

Easy starting depends on 3 factors:

1. Correct injection with proper atomization of fuel.
2. Proper compression and sufficient flywheel speed when decompressor is turned.
3. Thin lubricating oil in order to get good speed on engine when cranking.

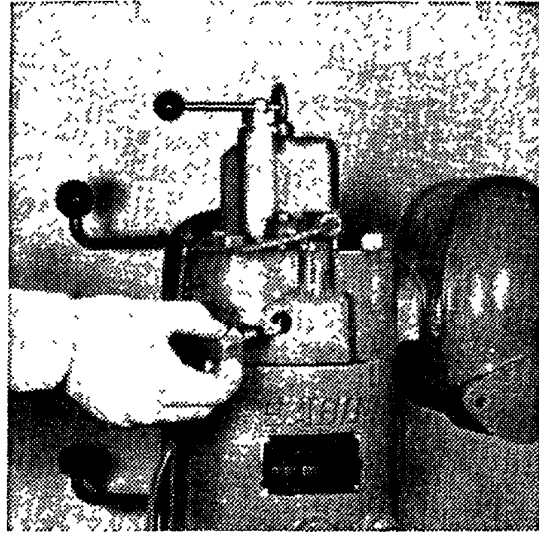
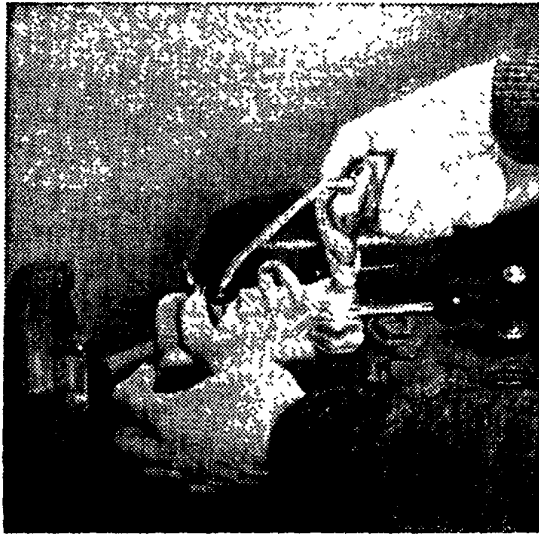
When the decompressor valve on top of cylinder head cover is in its lower position, i.e. handle pointing ahead or astern, the inlet valve is kept open and the engine can be turned easily (page 27).

To ensure proper injection the fuel must be clean and the nozzle in good working order. Check by holding right hand on injection pipe when cranking. A noticeable «jerk» in the pipe for each turn of the crank tells that the nozzle functions. (See page 18. Bleeding pos. 3.)

When the engine has been out of operation for some time the oil has evaporated from the cylinder liner, making it dry, and the piston rings can not seal properly.

This is remedied by squirting a small quantity of lubricating oil into the start oil tube in the valve lub. cup (Page 4, no. 1 or above). Inject 6 shots (6 cm<sup>3</sup>) with squirt can through the tube or through the starting cigarette hole (Page 4, no. 20). Use of starting cigarette is recommended in cold weather to facilitate starting.





**The cigarette** (6 mm) is self-igniting when dry. Insert white end of cigarette into the plug and fit plug again.

In very cold weather, use both starting cigarette and lubricating oil.

#### **CHECK BEFORE STARTING FIRST TIME:**

1. Fuel tank filled up and fuel tank cock open.
2. Fuel system «bled» and all pipe connections securely tightened.
3. Lubricating oil in engine and clutch (reverse gearbox).
4. Sea cock open (open circuit). The two drain cocks closed.
5. Fresh water cooled engine:  
Watertank filled up (closed circuit), and drain cocks closed.
6. Electrical equipment correctly connected. See wiring diagrams. Be particularly careful with AC-arrangement, otherwise the equipment can be destroyed.

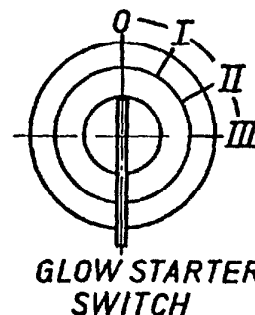
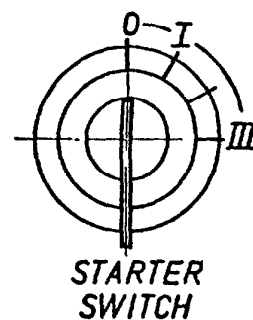
#### **HAND START:**

1. Propeller (clutch) disengaged.
2. Governor handle in full speed position.
3. Open decompressor. Handle forward or astern.
4. In cold weather. Inject 6 shots lub. oil into lub. oil start tube, or use starting cigarette.
5. Operate crank with left hand and decompressor handle with right. Stand on right side of the engine, not behind it. Crank rapidly and close decompressor by turning handle  $\frac{1}{4}$  turn while cranking. Engine starts.
6. Control engine speed with governor handle.
7. Check cooling water circulation.

## ELECTRICAL START:

With a good battery decompression of engine is not necessary.

1. Propeller (clutch) disengaged.
2. Governor handle in full speed position.
3. 0 KEY SWITCH: Inserted and pulled out in this position only.  
I ON: Normal position.  
II HEATING: Keep in position for 20—40 sec.  
III START: Push key in and turn clockwise. When engine starts, release key which will return to pos. I.
4. Control engine speed with governor control handle.
5. Check cooling water circulation and battery charging.



## RUNNING-IN PERIOD

Run engine with moderate load when new; full speed only for short periods. Increase load gradually during the first 25 hours.

### After the first 25 hours:

1. Change lubricating oil in engine sump . . . . . page 13—14
2. Model GG: Change lubricating oil in reverse gearbox .. page 16
3. Model G: Check clutch tension . . . . . page 65
4. Check engine alignment . . . . . page 9
5. Check all pipes connection.

### After the first 50—100 hours:

1. Adjust valve tappet clearance . . . . . page 37
2. For later servicing, see . . . . . page 4—5

## OPERATION:

Let the engine idle at 400—600 r.p.m.

1. Engage clutch. Press clutch lever *completely* forward, as far as it goes. See that the lever does not hit any obstruction, and is free to move.
2. Select the propeller pitch with pitch control handle.
3. Control engine speed with governor handle.  
Never race a cold engine. Always permit engine to warm up gradually with moderate load and speed. Never stop the engine suddenly from full speed, but let it idle for some minutes to dissipate heat gradually.

Cont page 24.

Cont. from page 23.

4. Check the instruments.

Cooling water:

Fresh water cooling 55—65 °C. Sea water (open circuit) 50—65 °C.

Charge control lamp: Light off.

**IMPORTANT:**

Be certain that the clutch is completely engaged. Do not slip the clutch. All maneuvering of the boat should be done with the propeller control lever, not the clutch.

*Always reduce engine speed before operating propeller control or reverse gear.*

**Thermostat controlled Sea Water Cooling**

**Maintenance:** (Cont. from page 18.)

Once a year or whenever water temperature becomes irregular the thermostat housing should be removed for inspection of the parts.

Check thermostat by putting it into hot water (more than 60 °C) and see that it opens fully. If required rinse all parts in white spirit and flush through the entire cooling system with fresh water.

**IMPORTANT:**

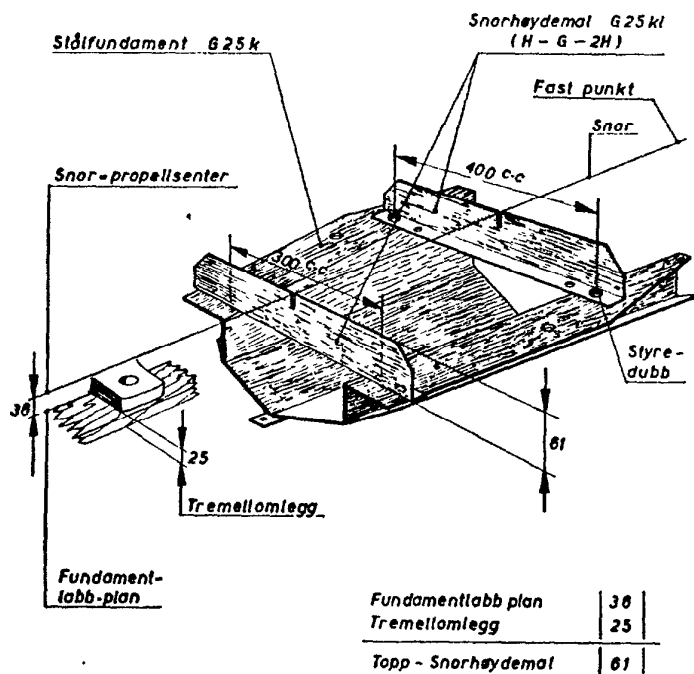
If the thermostat becomes defect, remove thermostat and valve and blind off the by-pass pipe by means of a suitable gasket or coin in the pipe nut.

**Steel Concrete Foundation** (cont. from page 7)

This technique of installing a diesel engine into a GRP boat is developed by SABB in order to combine the ballast usually required in the displacement boat with the excellent noise- and shock-absorbing properties of the concrete.

The special steel frame (fig.) is laid into the concrete mould, and after hardening the whole foundation unit is covered with GRP.

Detailed information on request.



## **Group G 10-20. CYLINDER HEAD AND SILENCER**

If the water gaskets (14) are leaky, this is due to overheating or rubber becoming old and hard, or insufficient gasket pressure. The gaskets should be renewed. Do not attempt to put excessive force on cylinder head bolts as the rubber compression is determined by the cylinder liner flange. (Gr. 20, pos. 2), liner flange ring and cylinder head gasket. The water gaskets should be compressed 0,3—0,8 mm (.12—.31"). Use only original gaskets (3 mm). The piston top clearance (clearance between piston and cylinder head) should be 1,5—2 mm (.059—.079") including cylinder head gasket (Gr. 20 Pos. 13). The clearance is adjusted by means of the 0,5 mm (.02") liner flange rings (Gr. 20 pos. 14) underneath cylinder liner flange. Torque load: Page 6.

**The aluminium cylinder head cover** (2) contains the decompressor, wick tubes with start oil tube. To remove tilt cover forward and lift so that the start oil tube is not bent. The wick tubes lubricate valve springs and adjusting screws. If the engine is steeply installed, the rear wick tube ends should be squeezed some or plugged to allow for more oil at the fore wick ends. When fitting cover see that the start oil tube enters the air inlet in cylinder head and that it does not touch the valve springs.

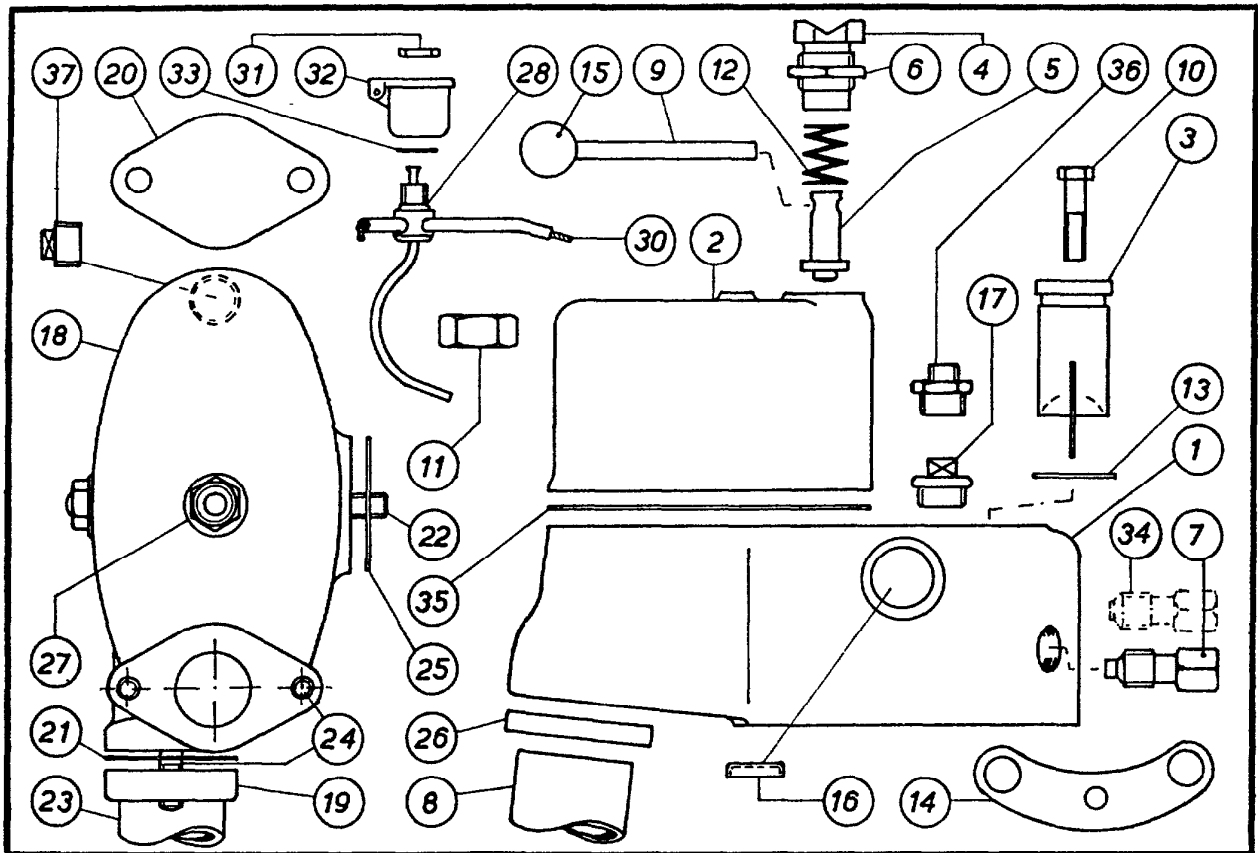
*Cont. page 27.*

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## **WINTER STORAGE**

When the boat is put ashore for the winter the engine should be protected against rust and frost:

Change the lub. oil in sump and clutch (reverse gear). Grease all nipples. Let the engine blow the water from wet exhaust pipe. Drain cooling system, water pump and pipes. Flush through system with fresh water if possible, and drain completely. (Fresh water cooled engines (closed circuit system) see page 19.) Lubricate rocker arms and valve springs with squirt can. Unscrew starting cigarette plug and inject 10 shots lub.oil (10 cm<sup>3</sup>) through plug hole. Crank the engine to lubricate cylinder. Wash or clean the engine exterior and restore paint wounds. Cover engine and keep it dry. Drain water and sediment from fuel tank and top up with fuel oil. Remove battery, charge it and store in a dry and cool place.



### Group G 10-20. CYLINDER HEAD AND SILENCER

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Cylinder head . . . .	G11A	15	Handle knob . . . .	911i
2	Cylinder head cover .	G11F	16	Core plug (1") . . . .	711p
3	Swirl chamber insert with glow wire . . . .	G11j-2	17	Plug (1/2") . . . . .	911a
4	Decompressor sleeve .	G11g	18	Silencer . . . . .	S1-G21C
5	Decompressor bolt ..	G11h	19	Exhaust pipe flange .	G21E
6	Decompressor nut . . .	411k	20	Blank flange . . . . .	G21M
7	Torch paper holder .	G11c	21	Exhaust flange gasket	821v
	Torch paper (1 box 100 pcs) . . . .	911c	22	Silencer stud, (3/8"×134) . . . . .	411g
8	Air intake tube . . . .	G11k	23	Exhaust pipe (not std.)	G21f
9	Decompressor handle .	411hc	24	Exhaust flange bolt (3/8"×25) . . . . .	411mb
10	Bolt (5/16" UNC×1 3/8" B 80) ..	453d	25	Exhaust flange/ Water gasket . . . . .	821va
11	Nut (5/8" W) . . . . .	415L	26	Intake tube seal, upper (5065) . . . . .	984t
12	Decompressor spring .	711h	27	Nipple (3/8") . . . . .	521b
13	Swirl chamber gasket .	811j			
14	Water gasket, 3 mm .	811e			

**Group G 10-20.** (Cont. from page 25.)

**IMPORTANT:**

The decompressor has to be correctly adjusted. Adjust by means of the sleeve (4). If sleeve is too high the inlet valve is not enough open and the engine is hard to turn. If sleeve is adjusted too low the rocker arm might touch the decompressor bolt with decompressor in "closed" position, causing loss of compression and valve damage. To adjust loosen nut (6). Place piston in top position with both valves closed. The handle (9) should be in its groove. Adjust decompressor sleeve (4) until the decompressor bolt is lifted slightly (0,5 mm) each time piston passes top dead centre, turning the flywheel slowly left and right by hand. Then adjust the decompressor holder so that the groove points forward and the bolt is still affected by the piston in its top position. This is the correct position of the decompressor and the nut is tightened.

Air and fuel are mixed in the swirl chamber which is machined in the cylinder head. The top half of the swirl chamber is formed by the insert (3) kept in place by the two injector fixing bolts (10). The insert should be removed only when gasket (13) under the flange is leaky. It is internally threaded and is removed by means of a  $\frac{5}{8}$ " W threaded bolt and a clamp. Check the flange copper ring and anneal if necessary.

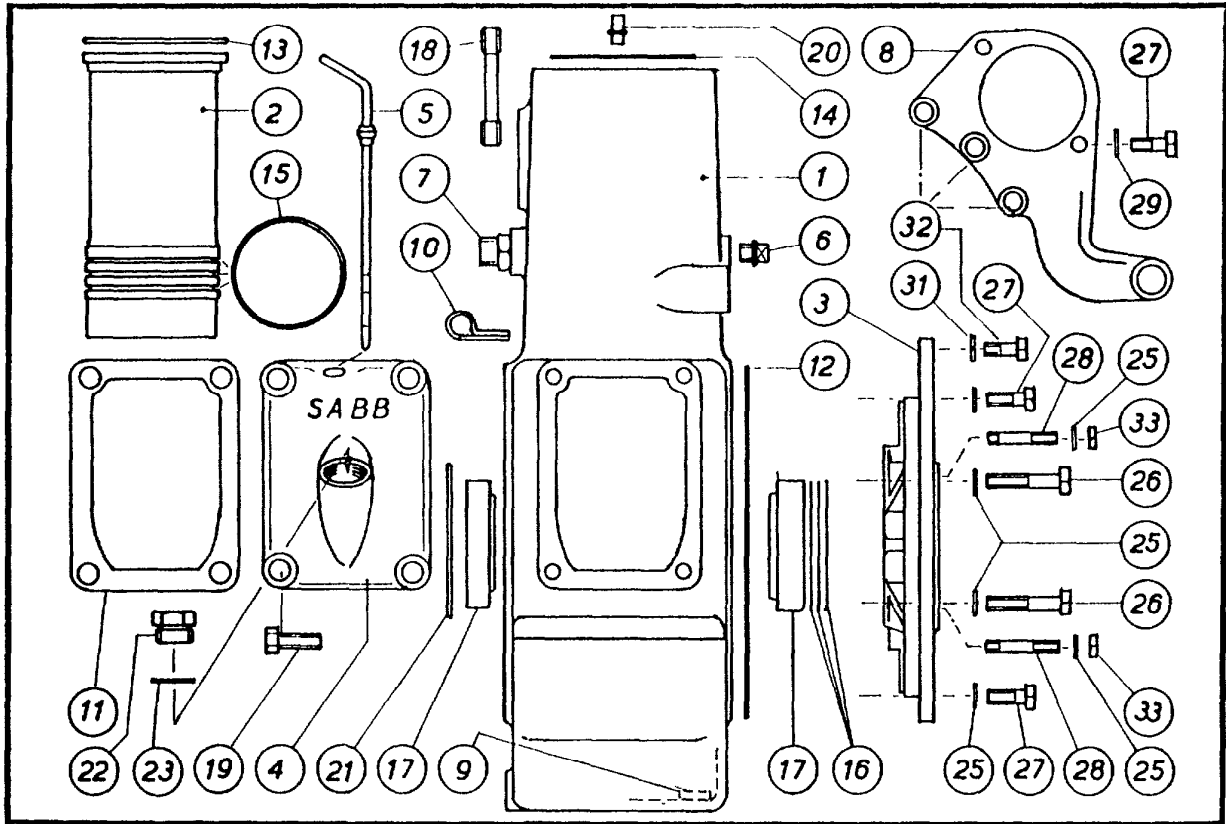
The function of the glow wire (3) is to improve the combustion and give easier starting. When inserting see that the glow wire is placed at silencer side, and the glow wire end should be approx. 2 mm off centre towards silencer side, and about 2,5 mm rear of centre.

The core plug (16) in cylinder head should be checked regularly. Replace if sign of leakage. To fit new, clean hole carefully. Place a piece of wood over the plug and hammer into place.

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**Group G 10-20. CYLINDER HEAD AND SILENCER**

No.	Part Name	Part No.	No.	Part Name	Part No.
28	Wick tube/Start oil pipe, compl. . . . .	S1-H11fm	34	Glow plug nipple (Extra equipment) ..	G11cb
29			35	Cylinder head cover gasket .. . . .	811fb
30	Wick .. . . .	811fL	36	Reducing nipple ( $\frac{3}{8}$ " $\times$ $\frac{1}{2}$ "BSP) .. .	521i
31	Wick tube nut .. .	443m	37	Plug ( $\frac{3}{4}$ " .. . . .	922a
32	Oil cup . . . . .	911f			
33	Oil cup gasket .. .	811n			



### Group G 20. CYLINDER BLOCK

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Engine block . . . . .	G23A	18	Cylinder head stud ..	423a
2	Cylinder liner . . . . .	G21N	19	Bolt ( $\frac{3}{8}$ "UNC $\times$ 1 $\frac{1}{4}$ ")	484c
3	Bearing flange . . . . .	G23LD	20	Water temp. nozzle ..	652bg
4	Crankcase cover . . . . .	G22DC	21	Bearing thrust ring (Circlip 100i) . . . . .	723a
5	Dipstick . . . . .	G23c-2	22	Oil filler plug ( $\frac{3}{4}$ " BSP) . . . . .	522dc
6	Plug ( $\frac{3}{8}$ " BSP) . . . . .	921a	23	Fibre gasket . . . . .	882d
7	Nipple, water ( $\frac{1}{2}$ " BSP) . . . . .	511a	25	Lock washer B 10, DIN 137 . . . . .	723h
8	Start-bilgep./bracket .	G68AB	26	Bolt ( $\frac{3}{8}$ " UNC $\times$ 2,5") ..	431i
9	Magnet . . . . .	923a	27	Bolt ( $\frac{3}{8}$ " UNC $\times$ 25) . . . . .	421Lb
10	Injection pipe clamp .	733jb-2	28	Stud ( $\frac{3}{8}$ " $\times$ 45) . . . . .	411b
11	Crankcase cover gask.	822hb	29	Washer ( $\frac{3}{8}$ "') . . . . .	766b
12	Bearing flange gasket .	823m	31	Lock washer ( $\frac{3}{8}$ "') ..	768a
13	Cylinder head gasket .	821r	32	Bolt ( $\frac{3}{8}$ " UNC $\times$ 22) .	435m
14	Liner flange ring . . .	823a	33	Nut ( $\frac{3}{8}$ "') . . . . .	415g
15	Cyl. liner rubber (3 pcs. OR-94,5 $\varnothing$ $\times$ 3 $\varnothing$ ) .	821p			
16	Main bearing shim (99,2 $\times$ 84,8) . . . . .	723L/Lb			
17	Tapered roller bearing (SKF 32211) . . . . .	931a			

## **Group G 20. CYLINDER BLOCK**

The cylinder liner (2) is fitted into cylinder block (1). Under the liner top flange is a copper ring (14) and on top of flange is the cylinder head gasket (13). The cylinder liner has in its lower part grooves to take three rubber rings (15) sealing cooling water jacket from crankcase.

The piston should be replaced if scratched or if top groove is worn to 3,3 mm (.130"). Original ring groove 3,07 mm (.113"). Replace rings if ring gap exceeds 2 mm (.079") when fitted in liner. Original 0,2 mm.

### **Piston ring set S1-G32b:** (Page 32.)

Top compression ring is chromium plated. No. 2 is plain and no. 3 is a combined compression/scrapper ring with «nose». No. 4 is oil control ring. (In case of excessive lub.oil consumption no. 3 ring should be replaced by a "super ring", Part no. G32be).

NOTE: That piston ring marking is facing upwards.

**The life of the cylinder liners** depends mainly on the following factors: Correct quality of lubricating oil and regular changes. Correct cooling water temperature.

The liner should be renewed when worn 0,25 mm (.01"), i.e. it measures 90,25 mm dia. New liner measures 90,00 mm, new piston 89,90 mm which means that the cylinder/piston clearance is 0,10 mm (.004").

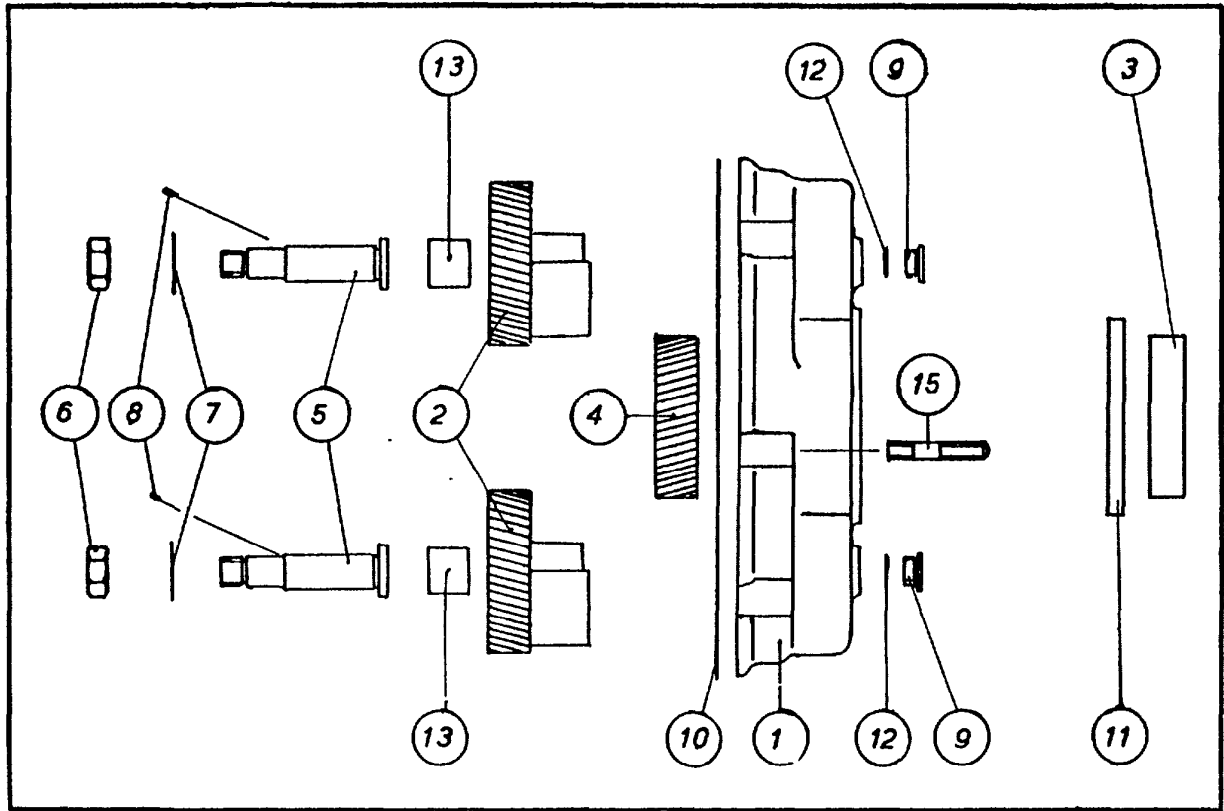
Heat piston carefully 80—100 °C (176—212 °F) to remove and fit the gudgeon pin. The small end bush (Gr. 30—11) is press fitted in the connecting rod. Correct bush pin clearance 0,03 mm (.0012"), max. allowed 0,10 mm (.004").

Use traverse when extracting cylinder liner. A simple extracting tool can be made for this purpose: See page 86.

Before inserting new liner, clean all contact surfaces. Test by inserting liner without O-rings. Correct fit allows liner to be pressed in and out by hand. Put on new O-rings and apply some clean engine oil to the O-rings. Only original 3 mm circular section rings (O-rings) must be used. Rings of different dimensions will either compress the liner or give leaky joint. Drive home the liner by hammering on a wooden block placed on top of liner.

**Note:** Inner dia. of liner when fitted must not measure less than 90.00 mm.





**Group G 23. VIBRATION DAMPER**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Vibration damper housing . . . . .	G23KL	8	Lock pin . . . . .	743a
2	Vibration damper wheel . . . . .	G23ND	9	Inspection plug . . . . .	523k
3	Flywheel brass ring ..	633a	10	Housing gasket . . . . .	823p
4	Flywheel gear ring ..	G33Am	11	Oil seal, spiral groove (100—120—13) . . . . .	937bb
5	Vibration damper shaft . . . . .	G23md	12	O-ring (14,3×2,4) ..	842q
6	Nut . . . . .	415p	13	Needle bearing (7/8"×1 1/8"×1") . . . . .	923n
7	Washer . . . . .	725.002	15	Stud (3/8"×45) . . . . .	411b

## **Group G 23. VIBRATION DAMPER**

The vibration damper housing (1) is fastened to the bearing flange (Gr. 20, Pos. 3) in front of the engine. The housing contains the vibration damper wheels (2), the lead counter weights rotating in the opposite direction of engine and driven from the flywheel gear ring (4) which is shrunk on the flywheel boss.

In order to achieve correct effect from the vibration damper it is essential that the damper wheels are correctly timed, i.e. when piston is in its upper position (T.D.C.) the damper counterweights should be in lower position. If the flywheel and vibration damper housing have been removed, timing should be carried out as follows.

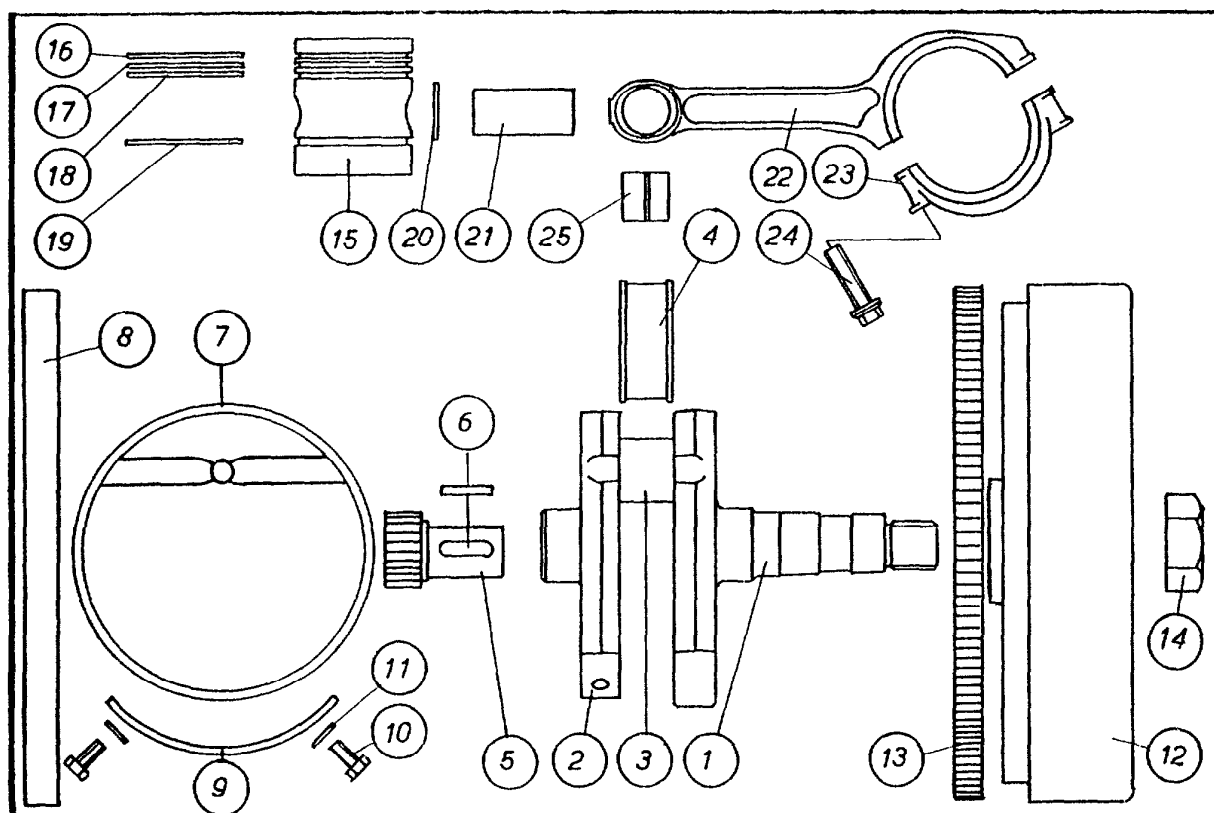
Fasten the housing in correct position on its guide ring. Remove the two inspection plugs (9) with the  $\frac{3}{16}$ " socket wrench. Place piston in exactly top position (T.D.C.). This position is easily found by watching the decompressor bolt (Gr. 10—20 Pos. 5) which is lifted slightly each time the piston hits the inlet valve, when crankshaft is turned slowly left and right by hand. Place flywheel carefully on the crankshaft taper and note that two holes in flywheel correspond with inspection holes in housing. The edge of the damper weights can be observed through inspection holes. With both damper edges horizontally the flywheel is pushed backwards until the gears engage. Check position once more. Press the flywheel on and give a few gentle strokes with a hammer to make it bite on the taper. See page 33 for fitting the flywheel nut.

Squirt some lubricating oil through the plug holes and fit the plugs with O-rings.

### **Replacing Front Oil Seal**

The vibration damper is lubricated from the sump. If leakage occurs around the flywheel boss the oil seal (11) should be replaced. See that the oil seal lip is undamaged. To fit the oil seal in the housing, apply some lub. oil to the ring surface and place a plane wooden chock on the oil seal and hammer it in. If the chromium plated brass ring (3) is worn, this should be pressed further in or it should be replaced by a new ring.

Special tools are required. It is recommended to contact SABB Service Shop or the factory. Replacement flywheels with new rings are available.



### Group G 30-1. CRANKSHAFT

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Crankshaft front part	G31A	12	Flywheel . . . . .	G33AE
2	Crankshaft rear part .	G31B		(Do., light) . . . . .	(G33AF)
3	Crankpin, 49 mm . . .	G31qc	13	Starter ring . . . . .	G33AL
	Crankshaft complete		14	Flywheel nut . . . . .	433b
	with roller bearing		15	Piston . . . . .	G32A
	and centrifugal filter		16	Compression ring	
	ring . . . . .	S2-G31A		(chromium pl.) . . . . .	G32b
4	Roller bearing		17	Compression ring . . .	G32bb
	(SKF 31 53 93) . . . . .	932fb	18	Compr./scraper ring .	G32bd
5	Crankshaft pinion ..	G31p	19	Oil control ring . . .	G32bc
6	Crankshaft drive key		20	Circlip (35i) . . . . .	732a
	(7×8×40) . . . . .	434e	21	Gudgeon pin . . . . .	G32d
7	Centrifugal filter ring	G31AK-2	22	Connecting rod . . . .	G32Eb
8	Filter paper strip . . .		22	Connect. rod, compl. .	S2-G32Eb
9	Centrifugal filter		23	Big end bearing cap .	G32G
	clamp . . . . .	G31AL	24	Connecting rod bolt	
10	Bolt			(M14×2 Verbus	
	( <sup>5</sup> / <sub>16</sub> " UNC×20, K80)	434c		Tensilock . . . . .	432g
11	Lock washer		25	Small end bush	
	( <sup>5</sup> / <sub>16</sub> " AZ) . . . . .	734h		(39∅×35) . . . . .	632e
				Piston ring set . . . .	S1-G32b

## Group G 30-1. CRANKSHAFT

(Piston service, page 22)

The connecting rod (22) big end is divided at an angle so that the piston with connecting rod can be removed through the liner. The connecting rod bolts (Verbus Tensilock) are self-locking. However, the locking effect is reduced by repeated unscrewing. Torque load 18 kpm (130 ft. lbs).

**The crankshaft** (1) consists of two parts in which the crankpin (3) is press fitted. To replace the complete big end roller bearing or the rollers the crankshaft will have to be parted in a hydraulic press. Place the shaft on solid base, taper pointing down. Press out the crankpin enough to make rear part and bearing loose. Then apply some oil to the pin and press it back until it protrudes 71,5 mm from the web. To fit, place from shaft with the pin pointing up. Heat the big end bearing in oil to 150 °C (302 °F) and drop it on the pin. Then heat rear shaft web to approx. 300 °C (572 °F) and fit it. Permit the shaft to cool before adjusting the webs. Place it in a lathe between center supports. Check that the front center is undamaged. When correctly adjusted the shaft will run completely straight. To easen the control remove the two main roller bearings. Use a 1/2" brass drift.

*The factory and SABB Service Shops stock reconditioned crankshafts for replacement.*

### Adjusting of axial movement

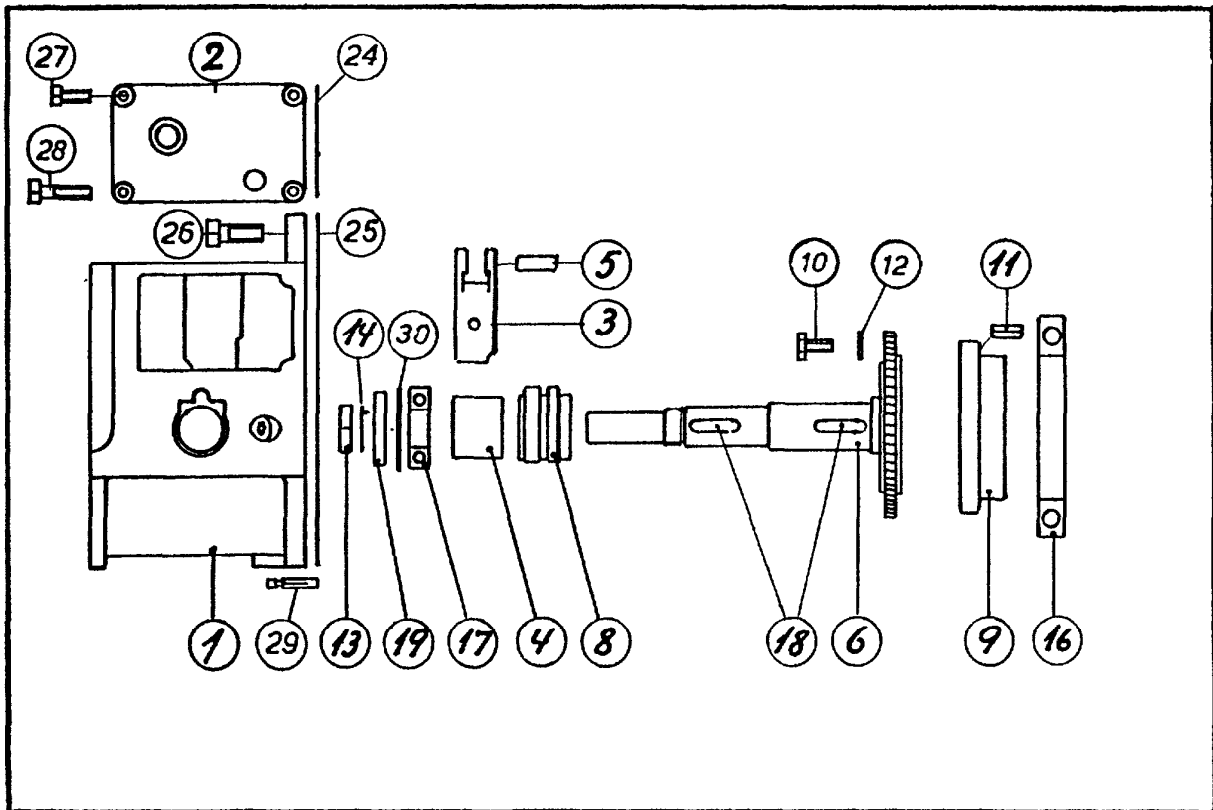
The crankshaft runs in tapered roller bearings (Gr. 20, fig. 17), «Timken» bearings. Any wear of the rollers or race will allow axial movement of the crankshaft. If the movement exceeds 0,3 mm (.012") the end play should be adjusted by means of shims (Gr. 20, fig. 16) under front bearing race. The end play should be 0,05—0,10 mm (.002"—.004"). If too small clearance the shaft and the flywheel will tend to be warmer than normal. Standard shims measure 0,2 and 0,05 mm (.0079" and .002").

To adjust the bearing clearance the flywheel must be removed by two 5/8" W threaded bolts and a clamp. Do not attempt to withdraw the flywheel by wedges or by hammering.

When fitting the flywheel use a strong spanner (25 cm), preferably ring spanner on the flywheel nut and tighten with a heavy hammer (5 kilos). See page 31 for timing of the vibration damper.

**The bearing flange** (Gr. 10—20 Pos. 3) is removed with two 3/8" W. bolts in the free holes of the bearing flange plane. The roller race is hammered out with 1/4" brass drift.

See page 15 for centrifugal filter service.



### Group G 30-2. GEAR HOUSING

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Gear housing . . . .	G34A	17	Ball bearing (6206) ..	934c
2	Governor cover .. ..	G34B	18	Crankshaft drive key (7×8×40) . . . . .	434e
3	Eccentric ring . . . .	G31D	19	Oil seal with dust lip (4256) .. . . . . .	934eb
4	Eccentric pulley .. ..	G31C	24	Governor cover gasket	834b
5	Pump cross head bolt	G31g	25	Gear housing gasket .	834a
6	Camshaft .. . . . .	G34C-2	26	Bolt (1/2"×1 1/4") . . .	482b
8	Cam .. . . . . . . .	G34e	27	Bolt (5/16" UNC×1 3/8") ..	453d
9	Internal gear wheel ..	G34f	28	Bolt (5/16" UNC×50) . . .	422n
10	Flange screw (5/16" UNC×20) . . .	434c	29	Dowel (1/4") . . . . .	483g
11	Elastic pin (8∅×24) .	734d	30	Shim .. . . . . . . .	734e
12	Lock washer (Nomel 5/16") . . . .	734h	31	Stud (5/16" UNC×18) . . .	421h
13	Camshaft nut . . . . .	484t	32	Nut (5/16") . . . . .	415e
14	Lock washer .. . . .	784b			
16	Gear wheel ball bearing (16022) .. . .	934f			

## **Group G 30-2. GEAR HOUSING**

The gear housing (1) is fitted between cyl.block and clutch housing. It contains important small parts: Reduction gear, injection pump, governor, cams and valve lifters, water pump eccentric etc. All parts are lubricated by oil mist from crankcase. Oil is thrown into the reduction gear through a hole in cyl.block and returns to sump through a lower hole.

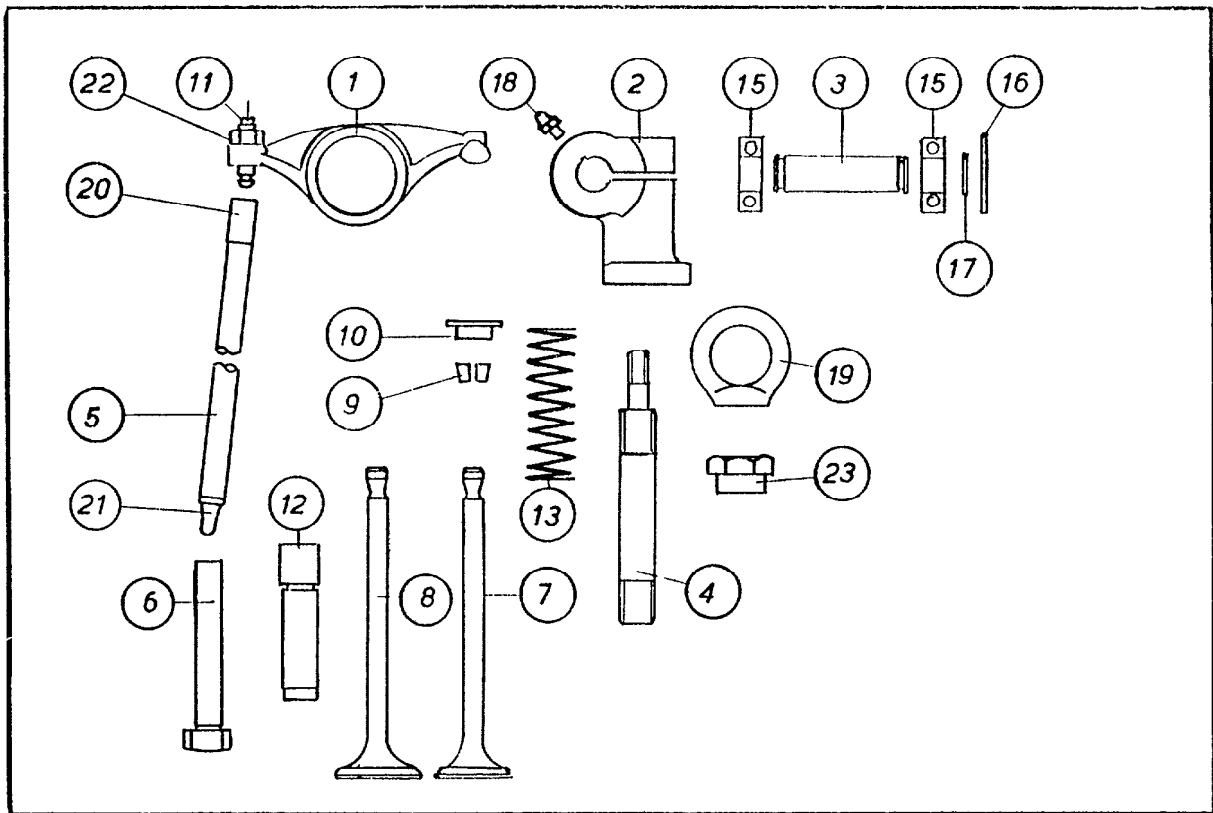
The camshaft (6) runs in ball bearings (16—17). The camshaft parts are kept in position by the front clutch member (Gr. 80 Pos. 1) and the nut (13). The axial position is fixed by shims (30) behind the small ball bearing. The internal gear wheel (9) is fastened by flange screws and elastic pins to camshaft flange. The internal gear wheel meshes the crankshaft pinion (Gr. 30—1 Pos. 5) giving 2:1 reduction.

The tooth clearance between pinion and internal gear wheel is determined by the two dowels (29) fixing position of the entire gear housing. If gear housing, cylinder block or one of the gears have been replaced, readjustment of tooth clearance will be necessary:

### **Adjusting of gear wheel clearance**

Fit gear housing loosely and tighten retaining bolts (26) just enough to allow the internal gear wheel to rest against the crankshaft pinion. Note: Correct timing, page 85. When turning flywheel carefully by hand, the gear housing will move some up and down due to the permissible untrue run of the gears. Use a magnet foot type dial indicator to determine highest position of housing, and from this position the housing is lifted 0,05—0,10 mm (.002—.004") which becomes the minimum tooth clearance. Tighten retaining bolts, torque load 8,5 kpm (60 ft. lbs.). Make sure that the gears have clearance in all positions by feeling the play of the camshaft (or front clutch member Gr. 80—1, Pos. 1), turning flywheel little by little two turns.

It is possible to adjust roughly the clearance without dial indicator by feeling the camshaft play in all positions for two turns of the flywheel, reducing the clearance gradually by lowering the gear housing.



### Group G 34. VALVE GEAR

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Rocker arm .. . . .	G34Q	12	Valve guide .. . . .	2G34m
2	Rocker arm bracket .	G34R	13	Valve spring .. . . .	734m
3	Rocker arm bolt . . .	G34j	15	Rocker arm ball	
4	Bracket bolt .. . . .	G34t		bearing (6202) . . . . .	934q
5	Push rod .. . . . . .	S1-G34h	16	Circlip, big (35i) . . .	732A
6	Valve lifter .. . . .	G34g	17	Circlip, small (15a) .	734j
7	Valve, inlet .. . . .	G34k	18	Grease nipple . . . . .	934r
8	Valve, exhaust .. . .		19	Eye nut ( $\frac{3}{8}$ " ) . . . . .	934t
9	Valve spring cone		20	Push rod top .. . . .	G34hk
	( $\frac{2}{2}$ ) .. . . . . . . . .	G34p	21	Push rod foot . . . . .	G34hL
10	Valve spring collar ..	2J34n	22	Nut ( $\frac{5}{16}$ " UNC) . . . .	415e
11	Rocker arm adjusting		23	Rocker arm bracket	
	screw .. . . . . . . .	G34s		nut ( $\frac{5}{8}$ " UNC) . . . . .	415L

*Cont. from page 37.*

The valve guides should be replaced if bore in guide is worn oblong. Always have valves and seats lapped after replacing valves or guides.

**The rocker arm ball bearings** are greased through the nipple (18) in the bracket (2) every 300 hours or yearly. Besides the valve parts are lubricated from the oil cup on top of the head cover.

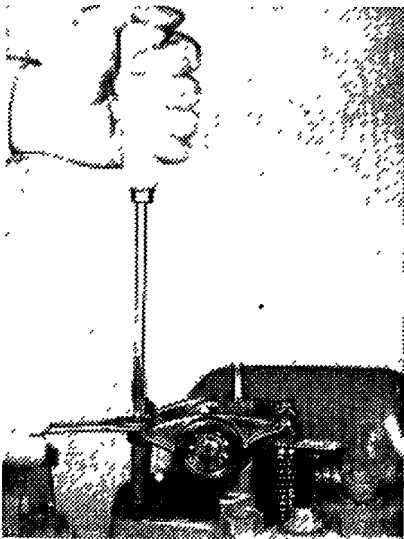
See that cyl.head cover clears the valve springs and rocker arms.

## Group G 34. VALVE GEAR

Overhead inlet and exhaust valves (7 and 8) are controlled by the cams (Gr. 30—2, Pos. 8) in the gear housing through the valve lifters (6) push rods (5) and rocker arms (1).

The exhaust valve on port side is served by the rear and the inlet valve by the front valve lifter. The valve lifters can be seen at the bottom of the air intake tube (Gr. 10—20, Pos. 8).

The valves move in replaceable guides (12) of fine grained cast iron pressed into the cylinder heads. Inlet and exhaust valves are identical and marked G34K. Each cylindrical valve spring (13) is locked by the valve spring cone (10) and the two-piece collar (9). The springs are identical.

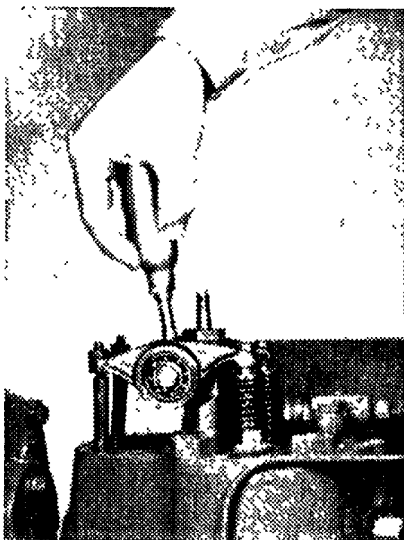


### Valve adjustment

All valve parts are easily accessible for control by removing the cylinder head cover.

The valve clearance should be checked after the first 50 hours of operation and later every 300 hours or when noisy tappet operation is noticed. The clearance is measured between valve stem and its rocker arm with valve in closed position. Correct valve tappet clearance for inlet and exhaust valves (engine hot or cold) is 0,3 mm (.012"). A special valve feeler gauge is supplied in tool box. See that the push rods are straight and undamaged.

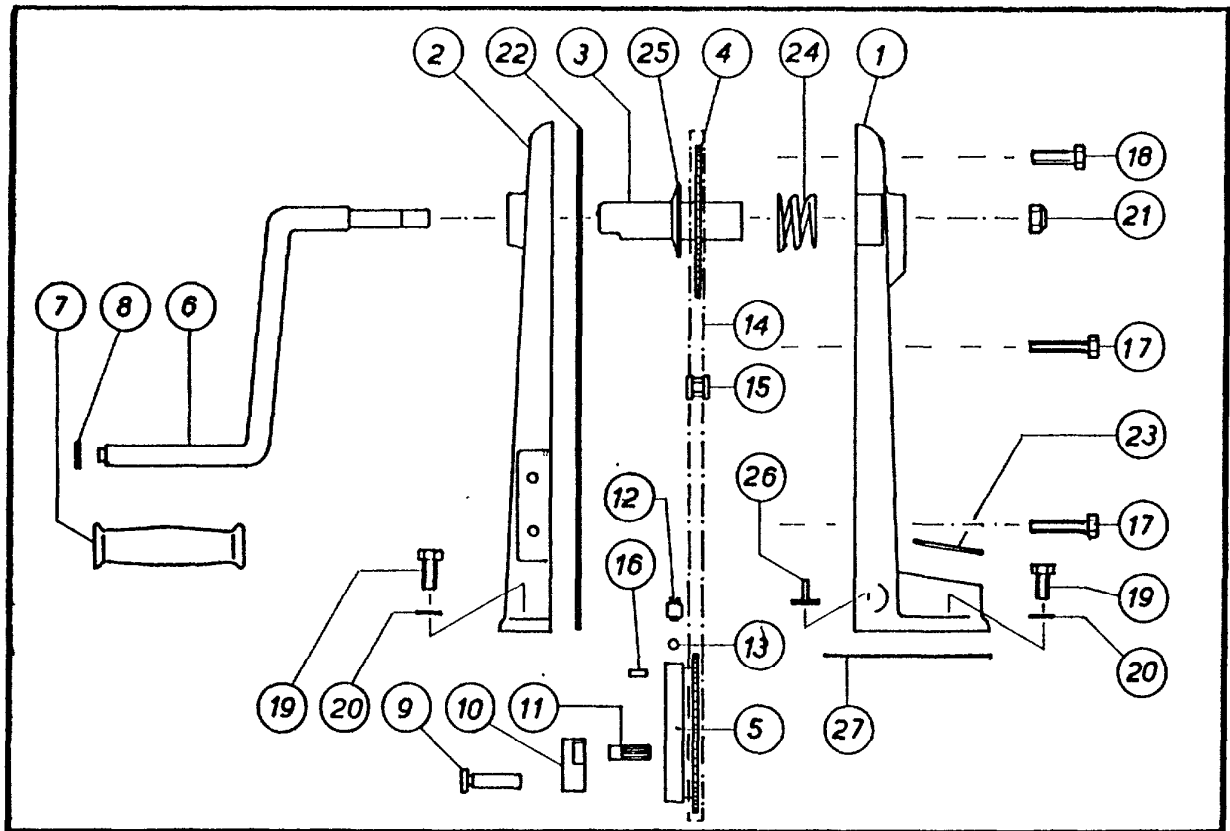
If the engine is difficult to start, the valves should be checked for proper seating. To check inlet valve, remove the cylinder head cover, turn engine by hand and listen if air leaks out through inlet port in cylinder head. To check the exhaust valve, undo the silencer or listen at the exhaust pipe outlet if air blows by. In case of leaky valves, remove the cylinder head and undo valve parts. Clean valve stems and seats. If necessary regrind or lap the valve seats, using fine grinding compound. Valve seat angle 45°.



If the valve seats in cylinder head after long use become burnt and worn due to repeated grinding, the cylinder head should be machined for inserting of replaceable valve seats. Counterbores in cylinder heads for drive-shrink fit of seats should be made in a lathe to ensure concentricity with valve guides.

*Cont. page 36.*





### Group G 35. HAND STARTING GEAR

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Starting bracket, front part . . . . .	H35Lb	15	Starting chain lock ..	935n
2	Starting bracket, rear part . . . . .	H35K	16	Grooved pin . . . . .	746e
3	Starting shaft . . . . .	H35m	17	Bolt (4 pcs.) ( $\frac{5}{16}$ " UNC $\times$ 1 $\frac{1}{2}$ ") ..	435b
4	Upper sprocket . . . . .	H35n	18	Bolt (2 pcs.) ( $\frac{5}{16}$ " UNC $\times$ 1 $\frac{1}{4}$ ") ..	482q
5	Lower sprocket . . . . .	G35H	19	Bolt ( $\frac{5}{16}$ " UNC $\times$ 1") . . .	421Lb
6	Starting crank, (R-180) . . . . .	H35p	20	Washer . . . . .	
	Starting crank compl.	S1-H35p	21	Nut (nylock) . . . . .	415i
7	Hand grip . . . . .	G35pk	22	Starter bracket rubber cord ( $\frac{3}{8}$ " $\times$ 880) . . .	835m
8	Washer . . . . .	742f	23	Air tube O-ring (OR-49,5 $\times$ 3) . . . .	811k
9	Starting pawl bolt ..	G35j	24	Starting shaft spring .	735L
10	Starting pawl . . . . .	G35i	25	Rubber washer . . . . .	835n
11	Starting pawl pin . . .	435h	26	Dice valve . . . . .	52e
12	Steel ball plug . . . . .	G35hk	27	Starting bracket gasket . . . . .	835kg
13	Steel ball ( $\frac{1}{4}$ " $\varnothing$ ) . . .	953c			
14	Starting chain (110044) . . . . .	935hg			

## **Group G 35. HAND STARTING GEAR**

The upper sprocket (4) is connected to the lower (5) with the starting chain (14). Lower sprocket which is located on a boss in the gear housing, has a pawl (10) which is operated by its own weight. *When fitting the chain see that the pawl is in its bottom dead centre when the starting crank is in the same position, otherwise the pawl will hammer on its catcher (Front clutch part, Gr. 80—1, Pos. 1), and the starting crank might "kick" if the engine turns opposite when stopping.* The lower sprocket runs on 34 balls (13) of 1/4" dia. To remove the sprocket, extract the grooved pin (16) and undo the ball plug (12). Now the balls can be poured out through the plug hole and the sprocket is loose.

If the pawl gets stuck in thick oil it should be washed with fuel oil through the clutch housing lid opening.

The engine air intake is situated at the upper front part of the starting bracket from where it passes through the air intake tube (Gr. 10—20, Pos. 8) to the cylinder head.

### **Crankcase Ventilator**

The crankcase is ventilated through the small breather disc valve (26) located inside the front starting bracket foot. Oil-vapour sucked back to engine. Normally the valve makes vacuum in the crankcase.

Check valve by removing rear half of starting bracket (2). Rinse valve with fuel oil. To fit rear bracket it is recommended to loosen the retaining bolts for the front part and tilt this forward.

### **Sump drain. Engines with automatic sump oil change system. Delivered before G.71.984.**

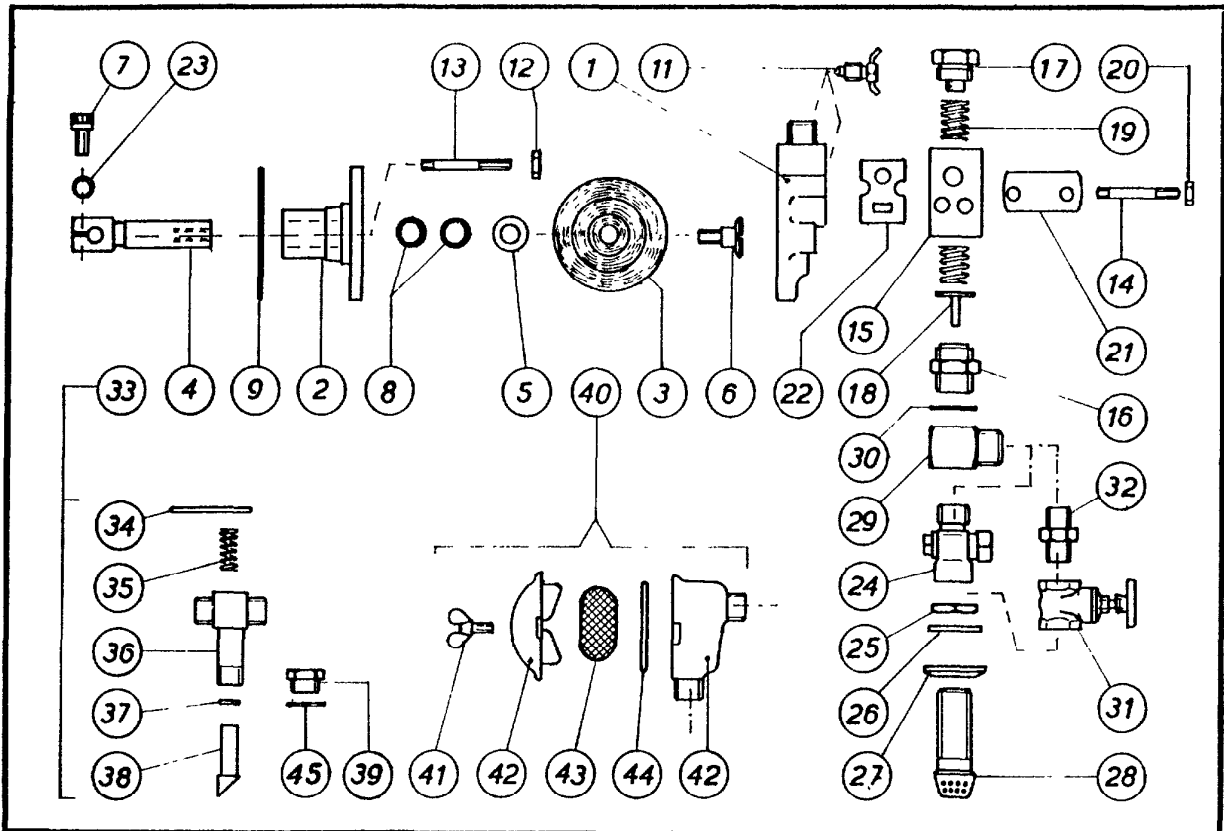
The valve (26) is controlled manually by the lub.oil draining handle. With valve in closed position pressure is built up in the crankcase, thereby the oil is pumped out of the sump. (See page 13, fig. 7.)

If sump draining becomes sluggish, check valve.

Sluggish draining is also caused by the oil seal (Gr. 30—2 Pos. 19) becoming worn or hurt, causing air leakage. The clutch housing (reverse gearbox) should be removed to replace the seal. Dismantling of the gear housing is not necessary.

### **Group G 35-2. FRONT START (Page 73)**

The starter bracket has an «eye» to take the front start axle and a bronze bush 635r.



**Group G 42-1. WATER PUMP WITH VALVES AND COCK**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Water pump housing .	G42NB	19	Spring (2 pcs.) . . . .	752b
2	Water pump flange . .	G42P	20	Nut ( <sup>5</sup> / <sub>16</sub> " ) . . . . .	415e
3	Diaphragm . . . . .	842ff	21	Water valve clamp . .	41i
4	Water pump rod . . .	G42q	22	Water valve gasket . .	841b
5	Diaphragm washer . .	742fb	23	Lock washer . . . . .	742a
6	Diaphragm screw . . .	G42r	24	Sea cock . . . . .	62c
7	Pump rod screw ( <sup>1</sup> / <sub>4</sub> "× <sup>5</sup> / <sub>8</sub> " ) . . . . .	434s	25	Strainer nut . . . . .	562b
8	O-ring (OR 14,3×2,4) . . . .	842q	26	Strainer washer, internal . . . . .	762b
9	Pump flange gasket . .	842c	27	Strainer washer, external . . . . .	62j
11	Drain cock . . . . .	52jb	28	Sea cock strainer . . .	62a
12	Nut ( <sup>3</sup> / <sub>8</sub> " UNC) . . . .	415g		Sea water inlet, compl. . . . .	S2-62a
13	Stud ( <sup>3</sup> / <sub>8</sub> " UNC×45) . .	411b	29	Elbow . . . . .	52bk
14	Stud ( <sup>5</sup> / <sub>16</sub> " UNC×45) . .	411c	30	Elbow joint washer, (21 mm) . . . . .	852b-c-d
15	Water valve housing .	52a	31	Hand wheel cock . . .	962c
	Water valve housing with elbow . . . . .	S2-52a	32	Nipple ( <sup>1</sup> / <sub>2</sub> " BSP) . . .	511a
16	Water valve seat . . .	52b	33	Two way cock, compl.	S1-G52k
17	Plug . . . . .	52c			
18	Dice valve . . . . .	52e			

*Cont. page 45.*

## **Group G 42-1. WATER PUMP WITH VALVES AND COCK**

The cooling water pump is of the diaphragm type and is located on port side of the gear housing. The rod (4) which is operated by the eccentric ring (Gr. 30—2 Pos. 3) is connected to the diaphragm (3) with the screw (6) and the washer (5). The rod slides in flange (2) which fits oiltight against the gear housing gasket (9). Annular grooves in the flange takes the two rubber O-rings (8) which seals the rod.

The diaphragm rim is clamped between the flange and the pump housing (1), its central part is moved in and out (about 4 mm) by the rod, thus producing the pump effect in the pump housing and valve housing.

### **Replacing Water Pump Diaphragm**

Inspect diaphragm at least once a year. Close sea cock and drain water from engine. Undo pipe connections to water pump and loosen the pump housing. The diaphragm screw (6) is unscrewed with a solid screw driver or coin. Fit new diaphragm with marked side facing in. The brass washer (5) is fitted with curved side against diaphragm.

### **Water Valves**

The water valves housing is a square metal casing containing the suction and pressure valves (18) with springs (19). If the cooling water pump is not working, the valves are usually clogged in the housing (15). First try to prime the pump by unscrewing plug (17) and pouring some water into the valve housing. If pump still fails to work, the valve housing must be removed for cleaning of the valves.

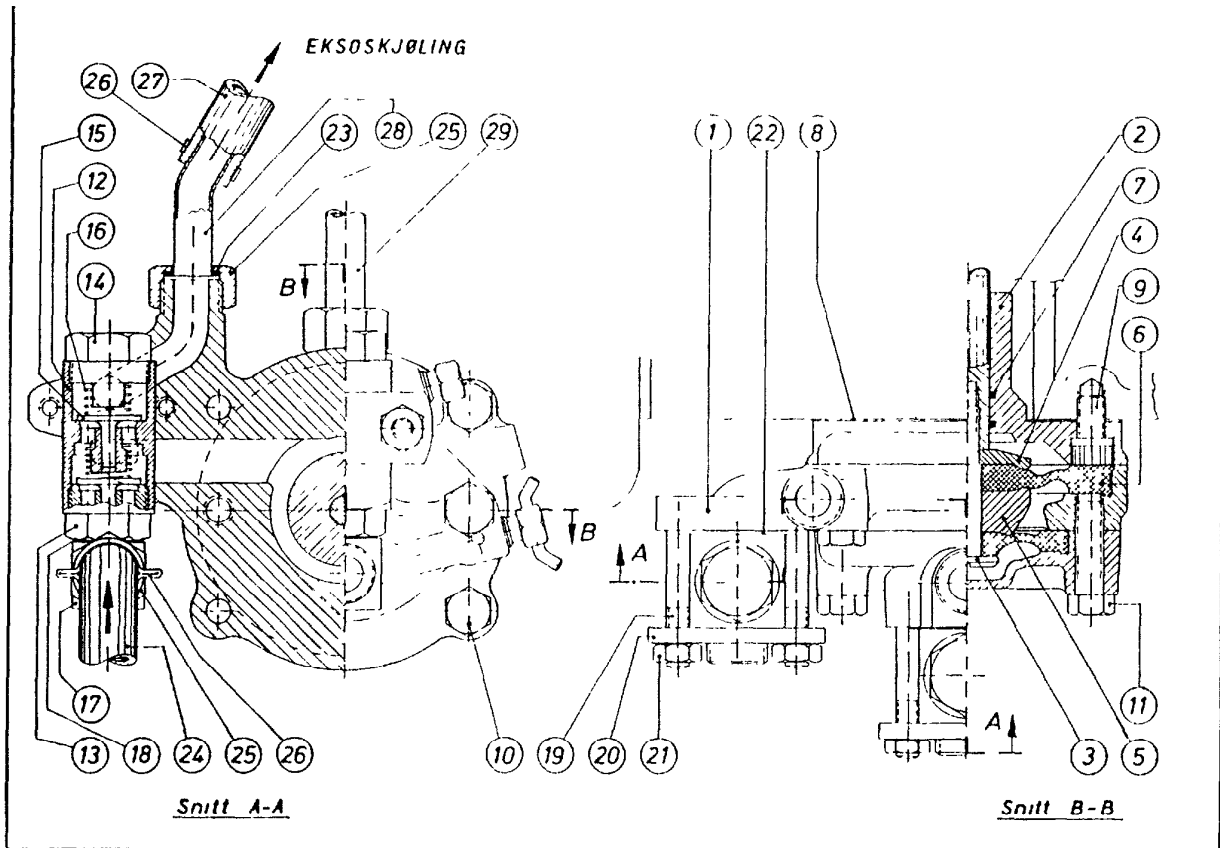
For access to the suction valve, remove the suction valve seat (16).

Constant clogging of valves may be remedied by fitting a mudbox between sea cock and pump. Supplied on request.

## **Group G 42-2. DOUBLE WATER PUMP (Page 42)**

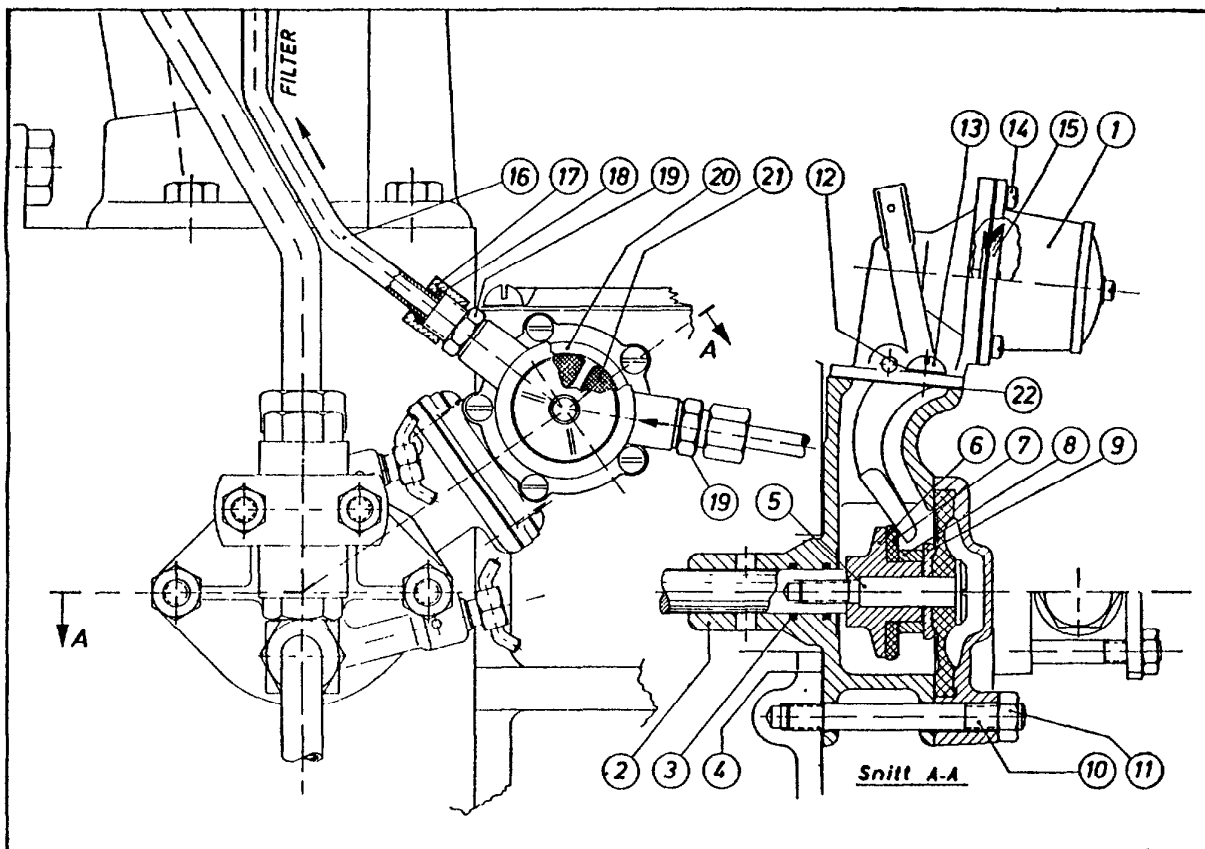
Extra diaphragm pump—for sea water cooling of exhaust pipe to engines with closed circuit cooling system—can be fitted.

Standard water pump flange G42P should be replaced by the bigger one 3G42P (2) to which the new housing G42Tb is fitted. The 100 mm dia. diaphragm (6) is fixed with the screw G42rb which also takes the original 70 mm diaphragm. The original pump housing G42NB is fixed to the big housing.



**Group G 42-2. DOUBLE WATER PUMP—FRESH WATER COOLED ENGINE**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Double water pump housing . . . . .	G42Tb	21	Nut ( $\frac{5}{16}$ " UNC) . . . . .	415e
2	Water pump flange . . . . .	3G42P	22	Water valve gasket . . . . .	841b
3	Diaphragm screw . . . . .	G42rb	23	Pipe collar . . . . .	711c
4	Diaphragm washer . . . . .	742gb	24	Suction hose ( $\frac{1}{2}$ " $\times$ 400) (see water pipe gr. 600) . . . . .	S-869d
5	Diaphragm washer . . . . .	742fc	25	Nut ( $\frac{1}{2}$ " ) . . . . .	511b
6	Diaphragm (100 mm) . . . . .	842fg	26	Hose clip (O-clip 20/23) . . . . .	969e
7	O-ring (14,3 $\times$ 2,4) . . . . .	842q		Hose nipple (not shown) . . . . .	569a
8	Pump flange gasket . . . . .	842c	27	Hose double pump exhaust ( $\frac{1}{2}$ " $\times$ 200) . . . . .	S-869db-G
9	Socket head screw ( $\frac{3}{8}$ " $\times$ $\frac{3}{4}$ " ) . . . . .	442q	28	Pipe bend . . . . .	642eb
10	Bolt ( $\frac{5}{16}$ " $\times$ $1\frac{1}{4}$ " ) . . . . .	482q	29	Pressure pipe, model G—GG (see gr. 600) . . . . .	632af
11	Bolt ( $\frac{3}{8}$ " $\times$ $1\frac{1}{4}$ " ) . . . . .	484c		Pressure pipe, model H—HG . . . . .	642c
12	Water valve housing . . . . .	52a		Sea water inlet compl. with handwheel (962c) (see gr. G42-1) . . . . .	S3-62a
	Water valve housing with elbow compl. . . . .	S2-52a		Hose nipple (exhaust) . . . . .	2G37e
13	Water valve seat . . . . .	52b		Socket Screw Hex. . . . .	
14	Plug . . . . .	52c		Wrench ( $\frac{5}{16}$ " ) . . . . .	982h
15	Dice valve . . . . .	52e			
16	Pressure spring . . . . .	752b			
17	Albow . . . . .	52bk			
18	Elbow joint washer . . . . .	852b-c-d			
19	Stud ( $\frac{5}{16}$ " UNC $\times$ 45) . . . . .	411c			
20	Water valve clamp . . . . .	41i			



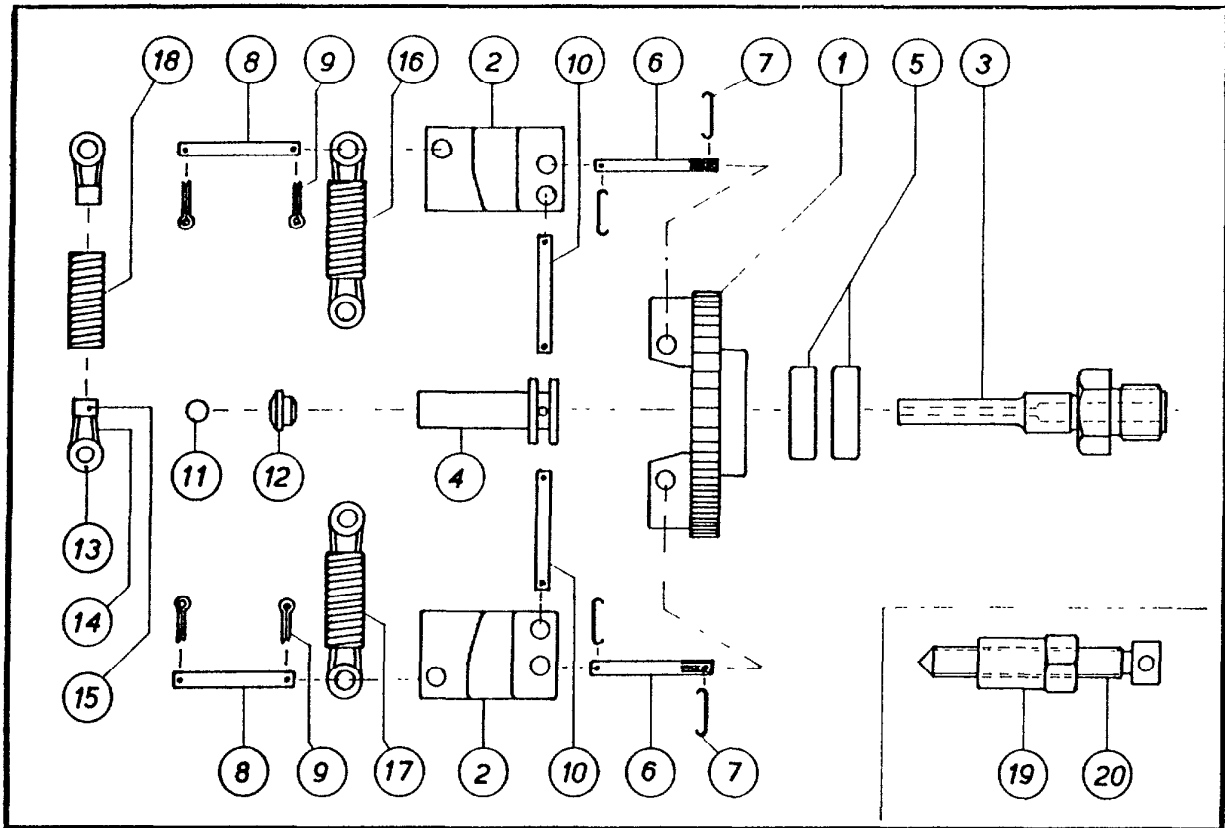
### Group G 44-2. FUEL LIFT PUMP

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Fuel-lift pump compl. (AC-795067) . . . . .	S-944k	13	Screw ( $\frac{5}{16}$ " UNC $\times$ $\frac{1}{2}$ ") ..	423L
1	Fuel-lift pump with mounting equipment .	S1-944k-G	14	Screw . . . . .	944Lk
2	Lift pump flange . . .	G44B	15	Diaphragm-lift pump	944n
3	O-ring (14,3 $\times$ 2,4) ..	842q	16	Pipe ( $\frac{5}{16}$ " $\times$ 333) . . .	S-663bL
4	Pump flange gasket .	842c	17	Nut ( $\frac{1}{4}$ " BSP) . . . . .	553b
5	Diaphragm screw . . .	G42rb	18	Solder ring . . . . .	563b
6	Pressure sleeve . . . .	G44bk	19	Nipple ( $\frac{5}{16}$ " BSP $\times$ $\frac{1}{2}$ " UNF)	563a
7	Push washer . . . . .	G44bL	20	Gasket, lift pump cover . . . . .	844L
8	Distance sleeve . . . .	644bk	21	Strainer, lift pump ..	944p
9	Diaphragm washer ..	742fd	22	Gasket, lift pump flange . . . . .	844g
10	Stud ( $\frac{3}{8}$ " $\times$ 70) . . . .	444d			
11	Nut ( $\frac{3}{8}$ " UNC) . . . .	415g			
12	Lock washer ( $\frac{5}{16}$ " ) ..	734h			

### Group G 44-2. FUEL LIFT PUMP

The fuel lift pump is fitted to the water pump (can not be used in connection with double water pump). The original water pump flange G42P is replaced by the lift pump flange G44B (2) to which the lift pump S-944k is fitted. The lift pump cover (top) has to be turned so that inlet and outlet correspond with above drawing.

Cont. page 44



### Group G 43-1. CENTRIFUGAL GOVERNOR

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Governor gear wheel .	G43K	13	Spring eye washer ..	743tb
2	Governor weight . . .	G43Lb	14	Spring eye . . . . .	743r
3	Governor spindle . . .	G43n	15	Spring eye holder ..	G43t
4	Governor sleeve . . . .	G43p	16	Govern. spring No. 1	
5	Ball bearing (6001x) .	943k		(marine engine)	
6	Governor weight pin			complete . . . . .	S1-743m
	(36 mm) . . . . .	G43sb	17	Govern. spring No. 2	
7	Lock wire (1,5Ø) . . .			(marine engine)	
8	Spring pin (36 mm) .	G43s		complete . . . . .	S1-743q
9	Split pin (1/16" X 3/8")	743w	18	Governor spring	
10	Sleeve pin (36 mm) .	G43sc		(stationary) compl. . .	S1-743L
11	Ball . . . . .	953b	19	Adjusting screw nut .	G41g
12	Governor sleeve pin .	S1-G43q	20	Adjusting screw	G41f
				Governor assy. compl.	S1-G43K

### Group G 44-2. FUEL LIFT PUMP (cont. from page 43)

The lift pump has hand priming device for bleeding of fuel system. Inspect lift pump every 600 hours or yearly. It is recommended to keep onboard repair- or maintenance kit for the pump.

- Lift pump maintenance kit AC 7950298 . . . . . 944ka
- Lift pump repair . . . kit AC 7950293 . . . . . 944kb

## Group G 43-1. CENTRIFUGAL GOVERNOR

(See cut-away view of governor, page 84.)

The function of the centrifugal governor is to maintain the predetermined engine speed on idling and on load conditions. Should the engine speed change, the governor will automatically act on fuel pump, reducing or increasing fuel supply to enable engine to keep the predetermined speed.

**The governor** is placed in the gear housing on the spindle (3). The gear wheel (1) runs in two ball bearings (5) at engine speed, driven by the camshaft flange gear wheel and carries the two governor weights (2) which are kept together by two springs (16 and 17). When the engine speeds up, the centrifugal force of the weights (2) overcomes the tension of the springs and the weights come apart. This movement of the weights causes the sleeve (4) to press on the governor arm (Gr. 43-2, Pos. 3) and through the arm link (Gr. 43-2, Pos. 6) the movement acts on the fuel pump rack.

If after long time of use the governor springs stretch, this will influence the governor function. The springs should be shortened or replaced by new ones. Spring measure, measured between spring eyes internally, unloaded, should be:

Spring 743 m:  $47 \pm 0,5$  mm

Spring 743 q:  $50 \pm 0,5$  mm

Spring 743 L:  $48 \pm 0,5$  mm

The complete governor is unscrewed by means of the 22 mm spanner supplied. The governor spindle has right hand threads.

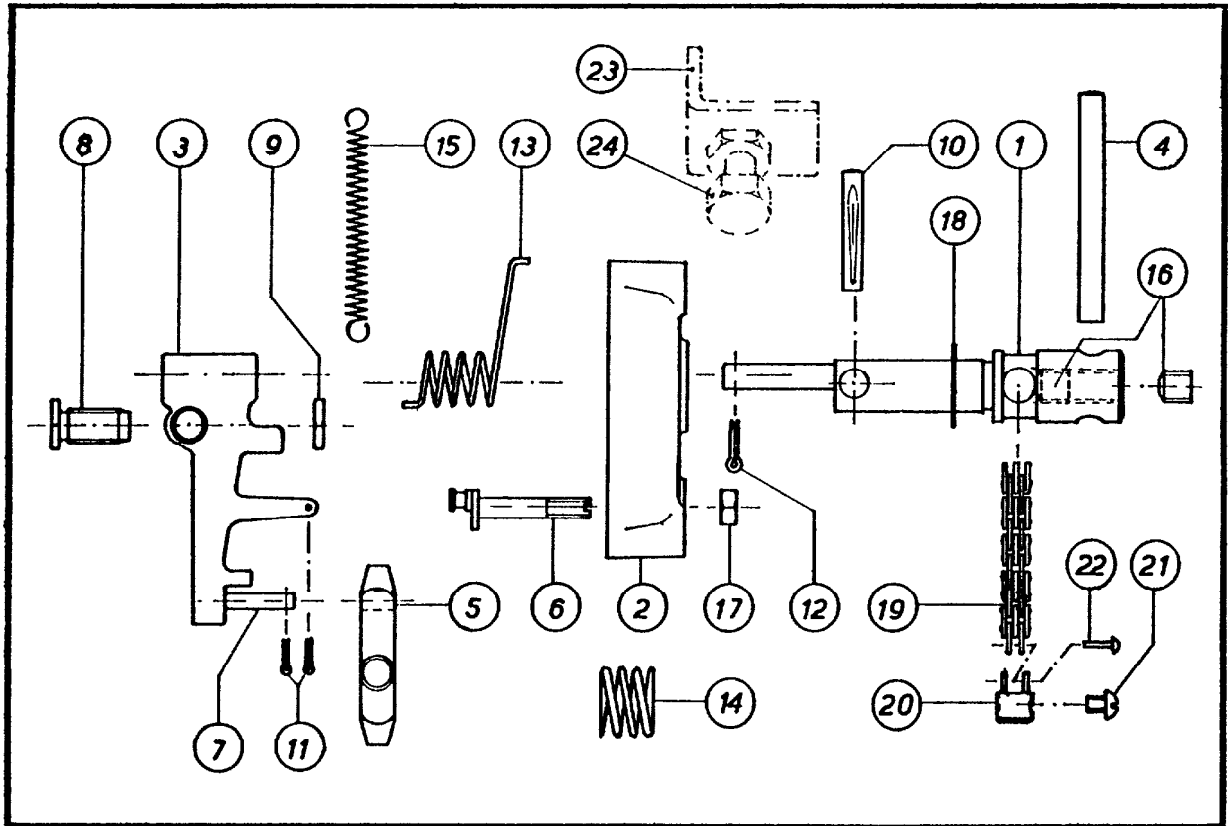
Before leaving the factory the engine is thoroughly tested and is set to develop 10 HP at 1800 by means of the adjusting screw (20). To avoid overloading and subsequent troubles the adjusting screw is sealed. Our guarantee is void if the seal is broken without our written consent. See also Gr. 43-2.

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## Group G 42-1. WATER PUMP WITH VALVES AND COCK (Cont. from p.40)

No.	Part Name	Part No.	No.	Part Name	Part No.
34	Two way cock pin .	553i	40	Cooling water filter, internal, complete . . .	S1-G62MN
35	Two way cock spring	744b	41	Wing stud (1/4" UNC×15) . . . .	462m
36	Two way cock body .	G52k	42	Water filter housing .	G62MN
37	O-ring (OR 7,66×1,78) . .	823c	43	Nylon filter . . . .	962m
38	Two way cock . . . .	G52m	44	O-ring R-5268 . . . .	862mb
39	Reducing nipple (1/2" BSP×3/8" BSP) .	511d	45	Fibre gasket . . . .	844b





### Group G 43-2. GOVERNOR PARTS

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Governor shaft . . . .	G43ub	13	Governor shaft spring	743db
2	Governor cover . . . .	G34B	15	Idling spring . . . .	743v
2	Governor cover, complete . . . . .	S1-G34B	16	Socket set screw ( $\frac{3}{8}$ " )	453b
3	Governor arm . . . .	S1-G43Mb	17	Nut ( $\frac{1}{4}$ " ) . . . . .	415d
4	Handle . . . . .	411hd	18	Rubber washer, governor shaft . . . .	811p
5	Arm link . . . . .	G43v	19	Chain (c-c 63 mm) ..	971sb
6	Idling adjusting screw	G43h	20	Chain fork . . . . .	S1-G71s
7	Governor arm bolt . .	G43wb	21	Set screw ( $\frac{3}{16}$ " $\times$ $\frac{3}{8}$ " )	472a
8	Adjusting screw . . . .	G43mL	22	Lock pin (2 $\emptyset$ ) . . . .	
9	Lock nut . . . . .	443m	23	Handle stopper GS	G43x
10	Grooved pin ( $\frac{1}{4}$ " $\times$ $1\frac{1}{4}$ " ) . . . . .	421a	24	Handle stop screw GS ( $\frac{5}{16}$ " $\times$ UNC $\times$ $1\frac{3}{8}$ " ) .	453d
11	Split pin ( $\frac{1}{16}$ " $\times$ $\frac{3}{8}$ " )	743w		Nut . . . . .	415e
12	Split pin ( $\frac{1}{8}$ " $\times$ $\frac{3}{4}$ " ) .	731c			

## Group G 43-2. GOVERNOR PARTS

(See cut-away view of governor, page 84.)

The governor shaft (1) passes the side cover (2) of the gear housing and is kept in position by the pin (10) and the spring (13).

Speed control is possible by pushing the handle (4) forward to slow down, and aft to increase speed. The governor arm (3) is fastened to the eccentric spindle end of the shaft. When the shaft is turned by hand, the arm will move about a point determined by the adjusting screw (8), and the ball (Gr. 43—1. Pos. 12) located in the governor sleeve plug, thus controlling the fuel supply.

### Adjusting Idling Speed

Lowest idling speed should be about 350 r.p.m. and is constant for about 5—10 degrees movement of speed control handle. Within this constant r.p.m.-range, the «idling range», the speed is controlled by idling spring (15) only. Tension of idling spring is adjusted by idling spring adjusting screw (6). Tighter spring gives higher idling speed.

If after long time use the idling spring stretches, it should be shortened or replaced by a new one. Spring measure, measured between spring eyes, is 53—55 mm.

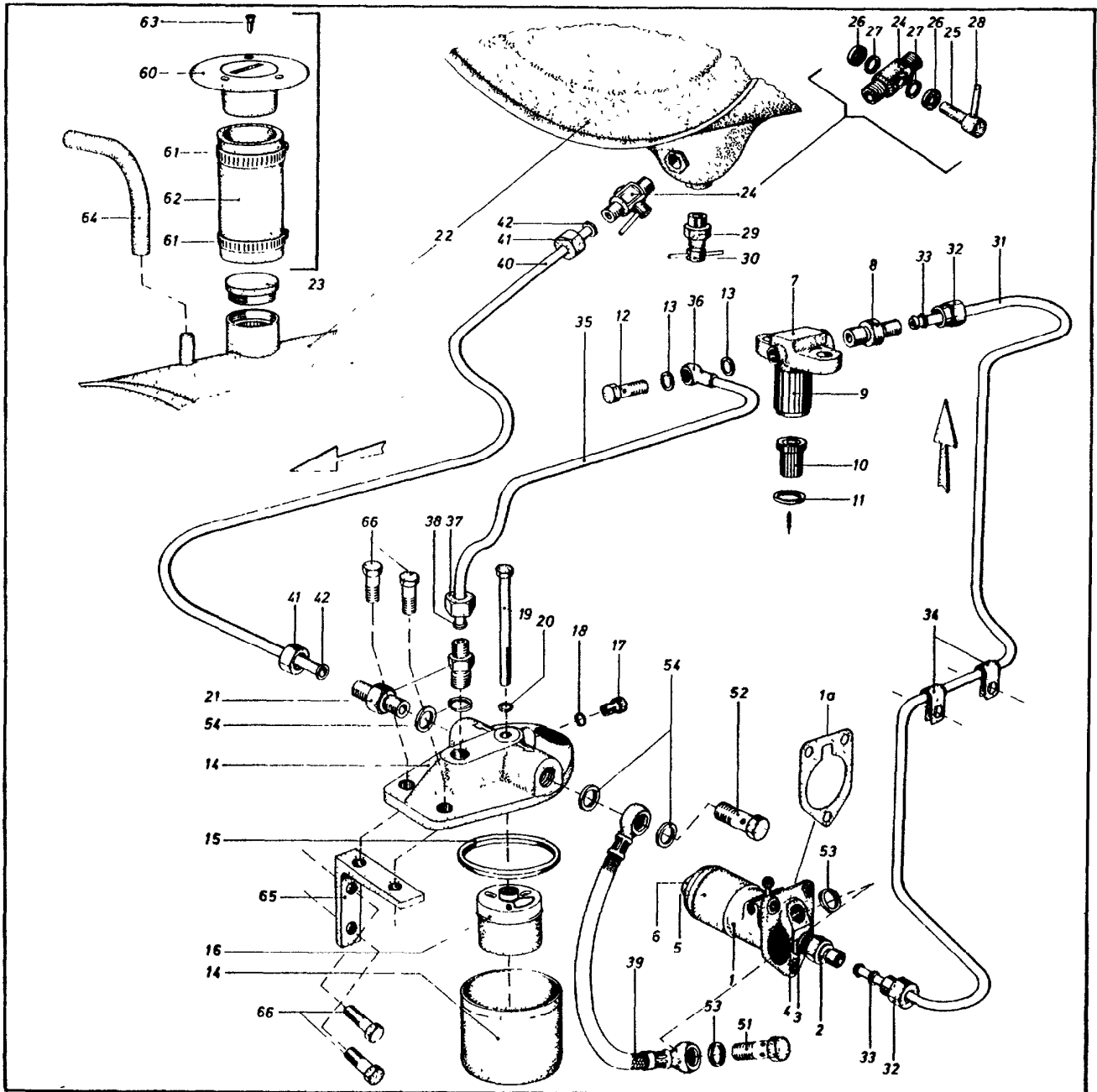
The extent of the idling range (i.e. extent of handle movement within which lowest idling speed remains constant) is adjusted by means of adjusting screw (8) in governor arm. The more forward the setting of adjusting screw, the greater the extent of idling range. However, if screw is adjusted too much forward, this will reduce engine output.

It is important for proper governor function that fuel pump rack and all moving parts of governor such as weights, springs, links etc. can work freely.

Any resistance due to sticking of governor parts or fuel pump rack will cause irregularities in speed control, engine will tend to run uneven, to "stutter". In this case governor cover should be taken off and all governor parts rinsed with clean fuel oil, removing any thick oil and dirt from governor and fuel pump rack. Cleaning and inspection of governor should preferably be carried out in connection with ordinary oil-change.

NB.! Make sure that the arm link (5) engages the ball at the fuel pump when fitting the cover.

The cover must be off before removing the fuel injection pump.



**Group G 44. FUEL INJECTION EQUIPMENT**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Injection pump, Bosch 1 414 171 007 .	S-G44A	6	Cam roller complete, Bosch 1 418 700 000 .	G44an
1a	Injection pump shim, a/0,3 ab/0,2, ac/0,5 ..	744a/ab/ac	7	Inj. holder compl., Bosch 1 431 211 005 .	S-G53d
2	Pressure valve holder	G44at	8	Inj. nipple with filter	G53dk
3	O-ring . . . . .	G44as	9	Nozzle nut . . . . .	
4	Pressure valve . . . . .	G44ap	10	Injector nozzle, Bosch 0 434 250 009 .	G53i
5	Inj. pump element, Bosch 1 418 305 004 .	G44am	11	Nozzle joint washer .	853i

## Group G 44. FUEL INJECTION EQUIPMENT

(See page 18)

The fuel injection pump (1), the injector with nozzle (7 and 10) and the fuel filter (14) are of Bosch make and not covered by the engine guarantee. **The fuel injection pump** (1) is fed with fuel oil through flexible pipe from the fuel oil filter. The pump is very robust and reliable as long as fuel oil is clean, but made with such accuracy that any repairs must be carried out by a trained man.

*Never undo pressure valve (4) when loosening suction pipe or pressure pipe. Before loosening the injection pump the governor cover must be removed.*

Under the flange of the injection pump there are some fuel pump shims (1 a) by means of which injection can be timed. The more shims, the later the injection. Fuel injection is normally timed to commence 8° before T.D.C. and end about 7° after T.D.C. Each shim of 0,1 mm under pump flange will shift injection timing about 1 degree crank angle. The factory stocks shims approx 0,2—0,3—0,5 mm.

### Injector holder

The importance of clean fuel is emphasized, because practically all injector service trouble are due to loose particles, grit or any other foreign matter which stick in nozzle. This will cause bad pulverisation, distorted spray etc., and nozzle should be cleaned. Dirty nozzle is noticeable on the metallic sound of injection; the engine will knock or smoke and is liable to have starting troubles. Cleaning or changing of nozzle can be carried out by everyone, provided proper cleanliness and caution are observed.

Disconnect fuel pipe from nozzle holder, remove holder from cylinder head, place it upside-down on its studs and reconnect fuel pipe. With speed control open (full speed) crank engine and watch fuel spray. Correct injection gives a slender spray of fine and evenly distributed particles without drops and dribble. With nozzle holder in upside-down position the nozzle may be carefully unscrewed.

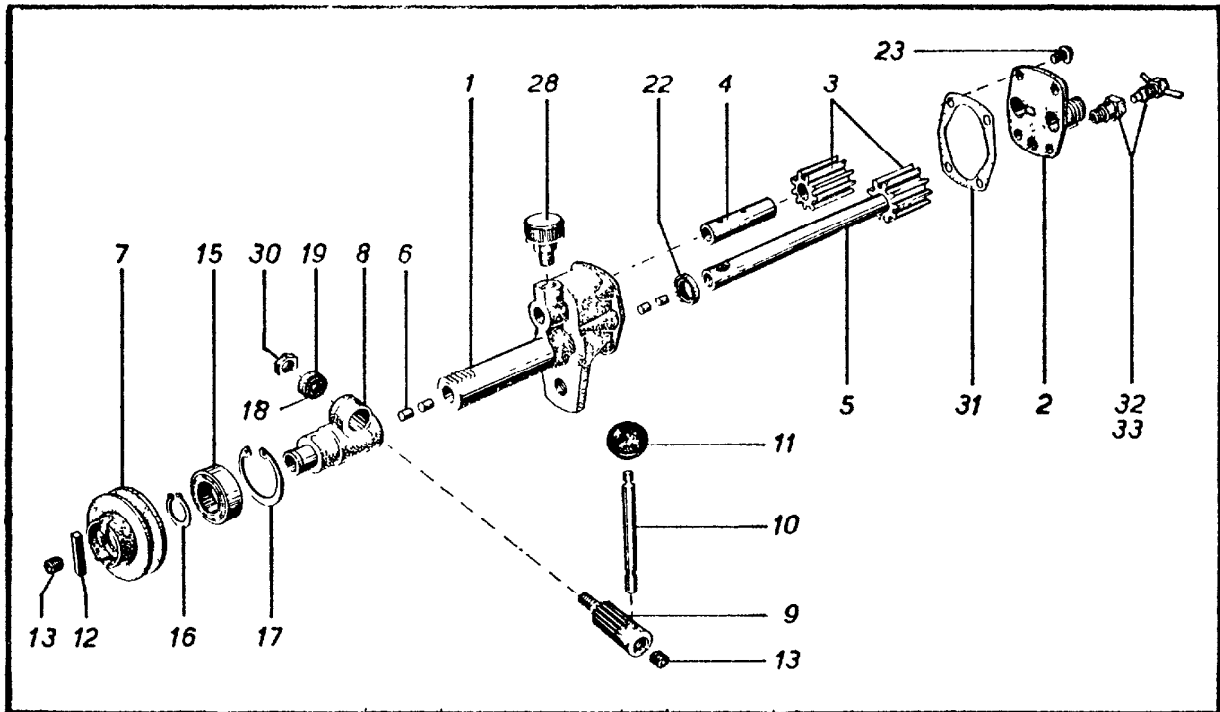
Behind the spring in the holder is a small distance washer which determines spring tension and injection pressure. The needle in the nozzle should move freely. Do not touch the needle with your fingers, but hold it in the small tap end to avoid acid from fingers. Rinse all parts in clean fuel oil. Do not use hard tools, remove dirt with a wooden stick and wipe with clean rag.

### IMPORTANT:

When reassembling nozzle the pointed end of the piece between needle and spring must point towards the spring.

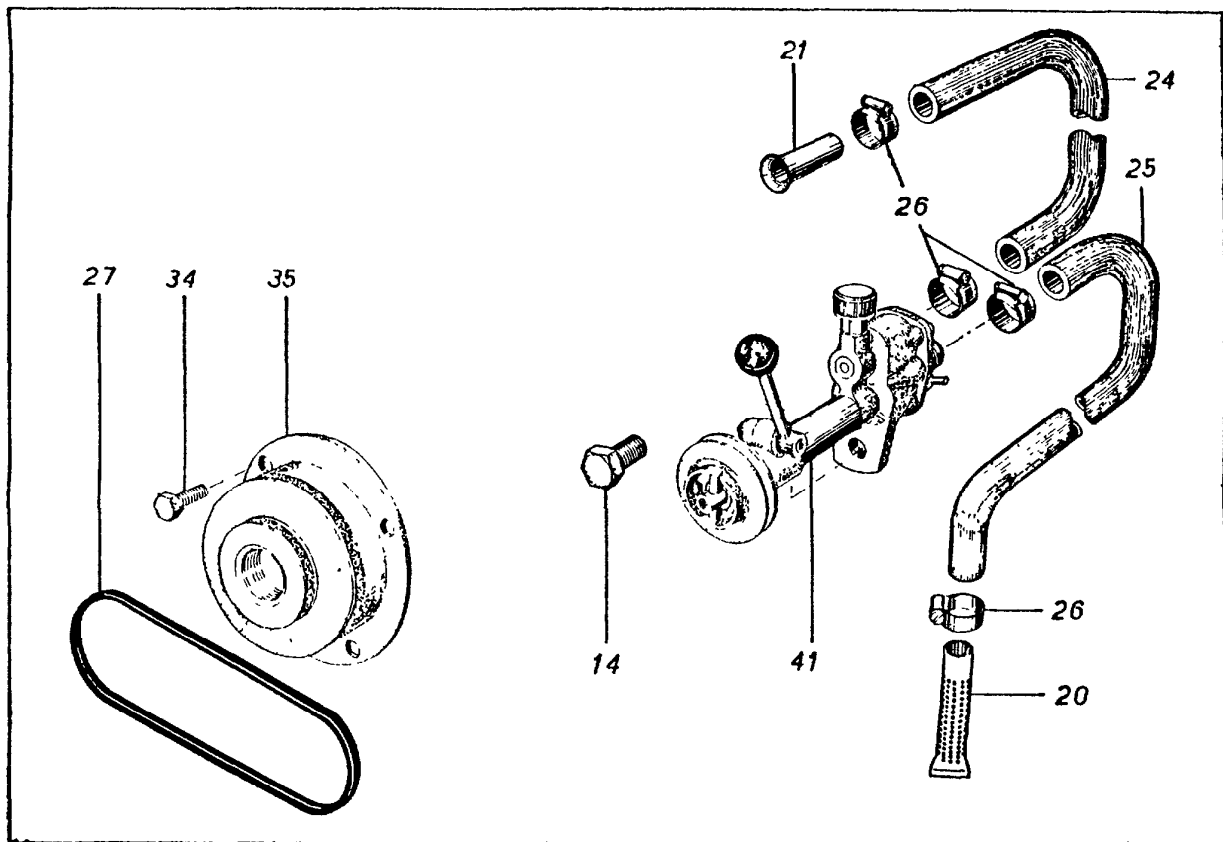
No.	Part Name	Part No.	No.	Part Name	Part No.
12	Banjo nipple plug, (M8×1) . . . . .	953h	15	Gasket, f. filter bowl	867a
13	Copper washer, 8 mm	853e	16	Fuel filter element Bosch 1 457 431 324 .	G67i
14	Fuel filter housing complete Bosch 0 450 015 003 .	S-G67a	17	Bleeder screw, fuel filter . . . . .	G67aL
			18	Fibre joint . . . . .	867j

Cont. page 79



### Group G 47. GEAR TYPE BILGE PUMP

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Bilge pump housing . . . . .	G47Q	21	Outlet tube . . . . .	647L
2	Bilge pump cover . . . . .	G47QL	22	Water seal STEFA (BD 152104 brass) . . . . .	947q
3	Gear wheel . . . . .	G47nd	23	Filister head screw, ( $1/4'' \times 3/8''$ brass) . . . . .	433d
4	Gear wheel bolt . . . . .	G47ne	24	Outlet hose ( $3/4'' \times 1,75$ ) . . . . .	847t
5	Bilge pump shaft . . . . .	G47ng	25	Suction hose ( $3/4'' \times 1$ m) . . . . .	847s
	Bilge pump shaft with gear wheel . . . . .	S1-G47ng	26	Hose clamp (No. 1A)	947L
6	Bushing ( $15\phi \times 19\phi \times 15$ ) . . . . .	647mb	27	V-belt (LT-28) . . . . .	947s
7	Bilge pump pulley . . . . .	G47R	28	Grease cup (No. 4) . . . . .	982b
8	Clutch sleeve . . . . .	S1-G47QM	30	Nut ( $5/16''$ ) . . . . .	462c
9	Clutch bolt . . . . .	G47s	31	Housing gasket . . . . .	847q
10	Clutch handle . . . . .	411hc	32	Drain cock housing . . . . .	52i
11	Handle knob . . . . .	911i	33	Drain cock . . . . .	52jb
12	Drive key . . . . .	G47t		Drain cock compl. . . . .	S1-52jb
13	Socket set screw, ( $3/8''$ ) . . . . .	453b	34	Bolt ( $3/8''$ UNC $\times 3/4''$ ) . . . . .	466b
14	Bolt ( $1/2'' \times 1$ ) . . . . .	421n	35	Flywheel pulley . . . . .	G33DL
15	Ball bearing, (SKF 6204/2RS) . . . . .	947r	41	Gear type bilge pump, complete (with bolt, pos. 14) . . . . .	S1-G47Q
16	Circlip (A-20) . . . . .	736k	41b	Gear type bilge pump with all pos. . . . .	S2-G47Q-G
17	Circlip (I-47) . . . . .	735t		Bushing (to pos. 8) . . . . .	624.001
18	Rubber ring ( $17\phi \times 8\phi \times 5$ ) . . . . .	847b			
19	Washer . . . . .	747b			
20	Bilge pump strainer . . . . .	647m			



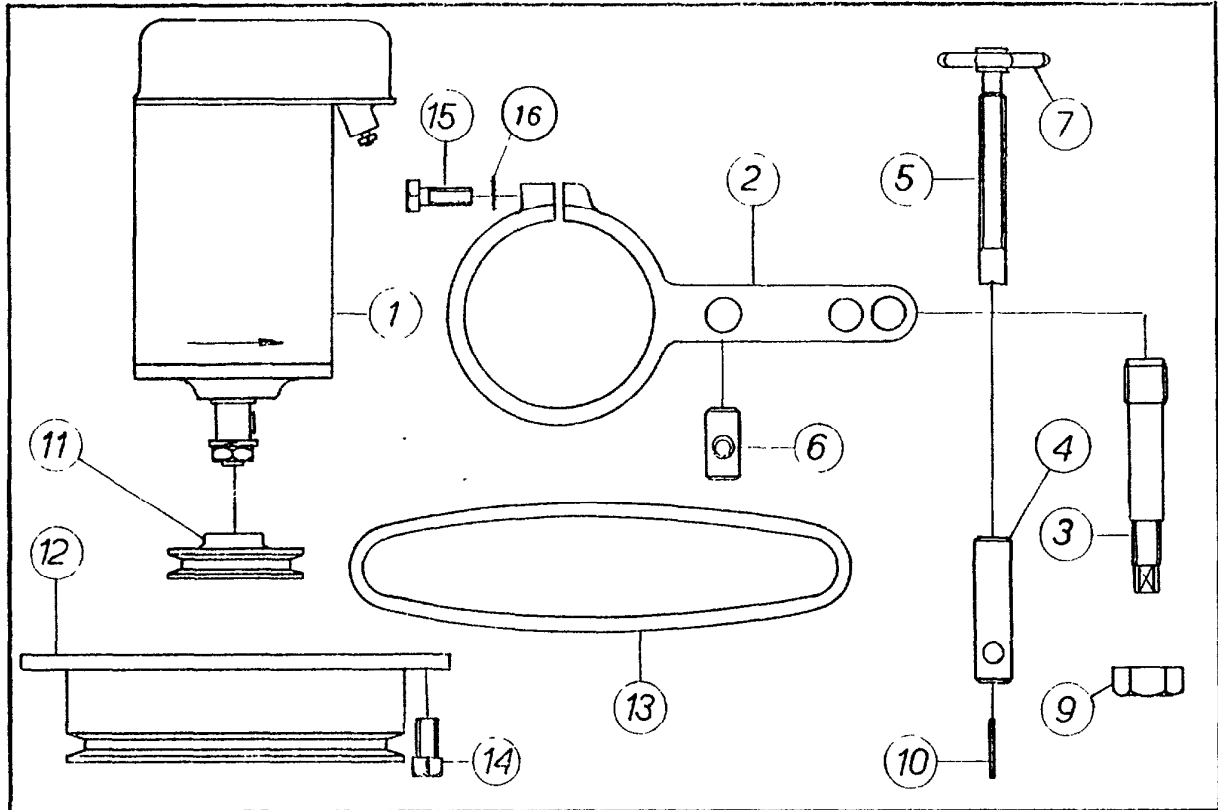
### Group G 47. GEAR TYPE BILGE PUMP ARRANGEMENT

The bilge pump holder is fitted on port hand side of the engine driven from a double groove belt pulley fastened to flywheel. The front groove is for the bilge pump V-belt. Adjust the tension of bilge pump V-belt by tilting the pump. The bilge pump is clutch operated. Always operate the clutch with moderate engine r.p.m. Manipulation of the clutch with too high r.p.m. will ruin the driving lugs in belt pulley in a short time. See that the clutch bolt nut (30) is securely tightened up, so that the clutch handle is kept in position, unaffected by engine vibration.

If worn, the drive key (12) is easily replaced by unscrewing the set screw (13) in front of the shaft. Use a piece of  $\frac{1}{4}'' \times \frac{1}{4}'' \times 34$  mild steel for the key. If the pump does not work properly or needs excessive priming the reason is usually a "short" behind the gears because of wear from sand or other particles.

Remove the housing cover (2) and check the gear end play. If necessary, file or strip the pump housing joint surface with the gears fitted and see that the gears come flush with the housing. Dress the cover and fit a thin paper gasket 0,10—0,15 mm (.004—.006"). See that the hose connections are securely tightened and inspect the intake strainer regularly.

**REMEMBER** to grease the pump regularly, to drain water in cold weather.



**Group G 68-1. GENERATOR ARRANGEMENT DC**

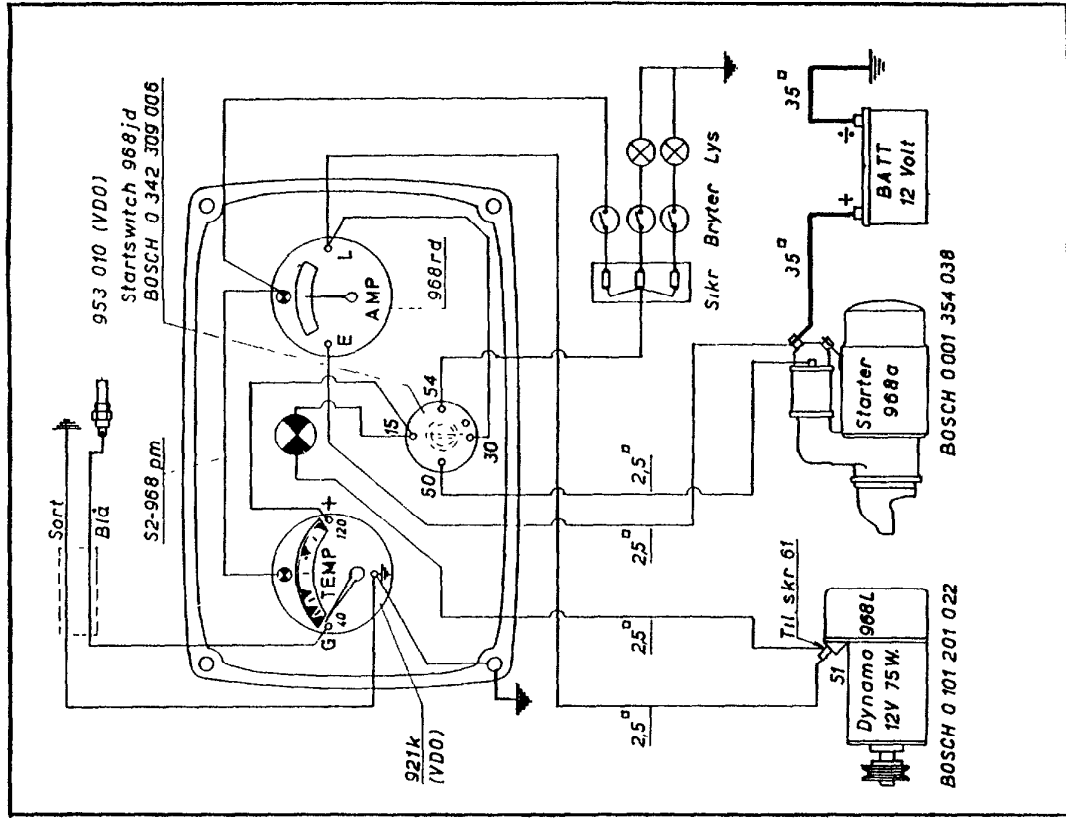
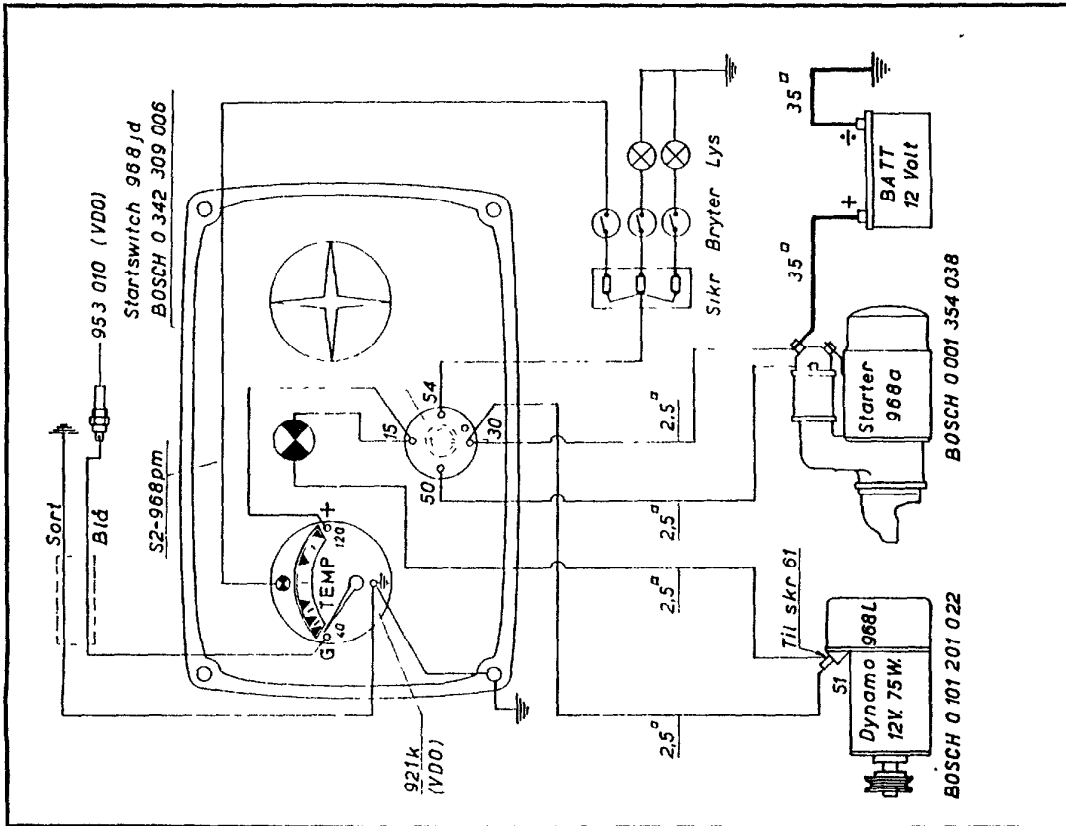
No.	Part Name	Part No.	No.	Part Name	Part No.
1	Generator, 12V 75W . . .	968L	11	Generator pulley . . .	G68G
1	Generator, 6V 75W . . .	968m	12	Flywheel pulley . . .	G33DL
2	Generator bracket . . .	68BB	13	V-belt (S-34) . . . . .	968h
3	Bracket bolt . . . . .	G68cb	14	Bolt ( $\frac{3}{8}$ " UNC $\times\frac{3}{4}$ " )	466b
4	Support bolt . . . . .	68d	15	Bolt ( $\frac{5}{16}$ " UNC $\times 1$ " )	421k
5	Tightening bolt . . . . .	68e	16	Lock washer ( $\frac{5}{16}$ " AZ) . . . . .	734h
6	Nut . . . . .	68f	17	Washer (30 $\phi$ $\times$ 17 $\phi$ $\times$ 3) . . . . .	723d
7	Handwheel . . . . .	165j			
9	Nut ( $\frac{5}{8}$ " UNC) . . . . .	415L			
10	Steel pin (3 $\phi$ $\times$ 20) . . . . .	468d			

The Bosch DC generators are supplied for 12 volts. The generators have voltage regulators.

Be careful when connecting the wires, faulty wiring could hurt the generator. See wiring diagram page 53.

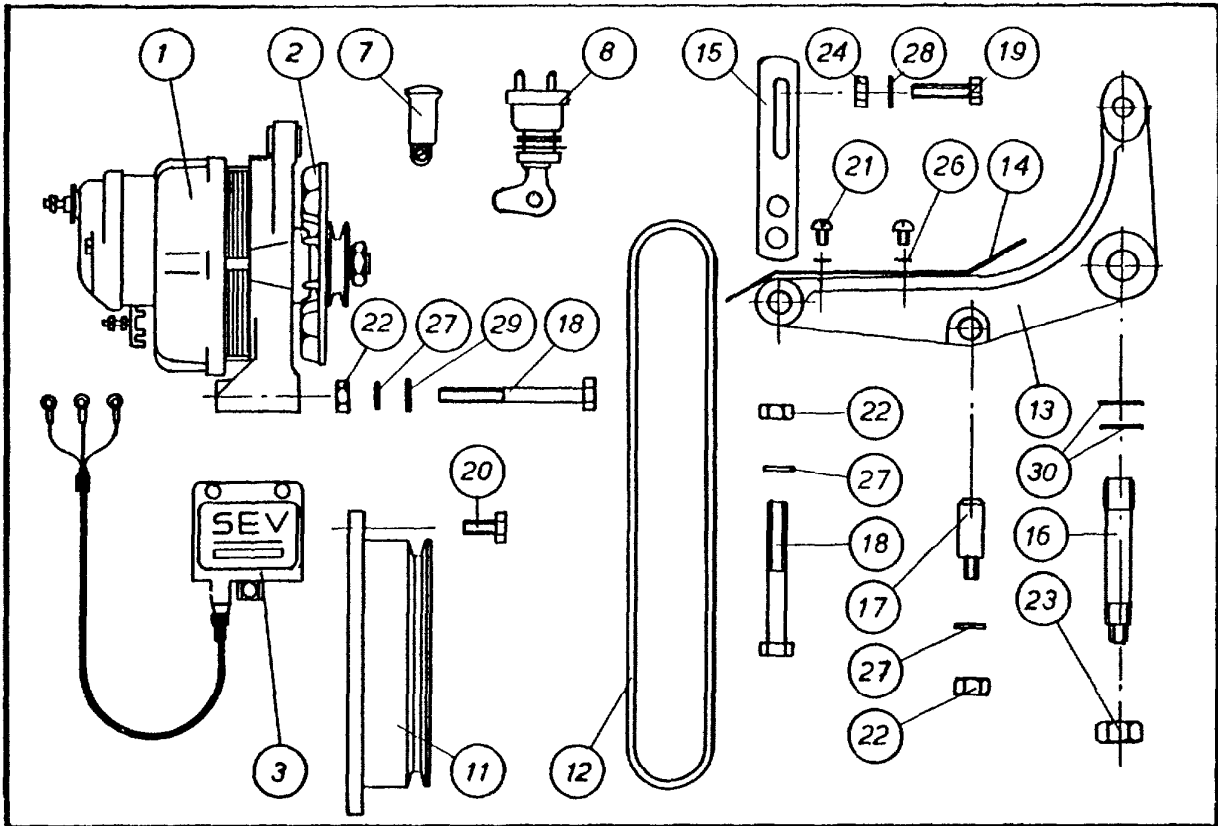
The contact points of the generator should be kept clean and dry. Dirty or oxidized points will arc and burn and thus reduce the generator output and run down battery.

Connect the charging wire to contact 51 (B+) on the generator for systems with or without battery. The contact 61 on the generator is intended for *charging control light* only. Faulty use of contact 61 will damage the generator windings. Contacts 51 and 61 are both positive (+). The minus (—) is the generator body. See page 55.



Wiring diagrams for starter and generator, 12V. 75W., with starter switch, charge control lamp, el.thermometer/feeler (VDO), without ammeter and with ammeter.





**Group G 68-2. ALTERNATOR ARRANGEMENT**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Alternator 12V, 420W (35A) S.E.V. 714 73 602) . . . . .	968zb	14	Alternator shield . . .	768e
1	Alternator arrangem. (S.E.V.) complete (EL 420) . . . . .	S1-968zb-G	15	Alternator support ..	H68aL
2	Alternator pulley (S.E.V. No. 26 322) .	968zt	16	Bracket bolt . . . . .	G68cb
3	Voltage regul. (electr.) (S.E.V. 721 150 02) ..	968zp	17	Support bolt . . . . .	H68d
7	Charge control lamp Bosch 0 310 150 003 .	S2-968pm	18	Bolt ( <sup>3</sup> / <sub>8</sub> " UNC×90 K80) .	423r
8	Starter switch Bosch 0 342 309 006 .	968jd	19	Bolt ( <sup>5</sup> / <sub>16</sub> " UNC×1 <sup>3</sup> / <sub>8</sub> ") ..	453d
8a	Glow starter switch Bosch 0 342 315 001 .	968jc	20	Bolt ( <sup>3</sup> / <sub>8</sub> " UNC× <sup>3</sup> / <sub>4</sub> ") . . .	466b
11	Flywheel pulley . . . .	G33DL	21	Cap screw ( <sup>1</sup> / <sub>4</sub> " UNC×8) . . . .	455c
12	V-belt (Rofan 2910) .	968wc	22	Nut ( <sup>3</sup> / <sub>8</sub> " UNC) . . . .	415g
13	Alternator bracket (with shield) . . . . .	G68D	23	Nut ( <sup>5</sup> / <sub>8</sub> " UNC) . . . .	415L
	Alternator bracket, complete . . . . .	S1-G68D-G	24	Nut ( <sup>5</sup> / <sub>16</sub> " UNC) . . . .	415e
			26	Lock washer ( <sup>1</sup> / <sub>4</sub> " JZ)	745d
			27	Lock washer ( <sup>3</sup> / <sub>8</sub> " AZ)	768b
			28	Washer ( <sup>5</sup> / <sub>16</sub> " . . . . .	742f
			29	Washer ( <sup>3</sup> / <sub>8</sub> " . . . . .	766b
			30	Sleeve (not washer) (1 <sup>1</sup> / <sub>8</sub> "×16×12) . . . .	768c

## **Group G 68-3. ELECTRIC EQUIPMENT**

### **Alternator Arrangement – 12V-35A (420 W) S.E.V.**

The alternator has excellent charging capacities at all engine speeds. Wear of brushes and moving parts is negligible and the absence of a commutator ensures that maintenance is kept to a minimum.

The S.E.V. alternator has a fully transistorised regulator unit which should be fitted conveniently inside the engine case or direct to the engine, but not exposed to excess heat from exhaust pipes.

**NOTE: Do not fit the alternator V-belt until all wiring is completed and battery connected.**

Here are some important points which must be observed:

1. Ascertain that the wiring is correctly according to the diagram before starting the alternator, page 54.
2. *You must never run the alternator unless both battery cables and the regulator are connected.* Take off the V-belt before removing one or both battery cables.
3. If you want to charge the battery by means of a charger, not belonging to the original equipment, remove both battery cables in advance.
4. In connection with electric welding (steel boat) the negative (—) battery cable must be removed from the battery. Further, all wires between alternator and regulator must be taken off, and see that the cable ends are not in contact with the engine or the hull.

### **Selfstarter, BOSCH**

It is very important that the starter is kept away from the sea water. The engine must not be started if the level of water in the bilge reaches up to the flywheel. Pump out the water so that the starter will not be splashed. The starter pinion (Bendix) and shaft must be greased by hand now and then to prevent rusting of the unit.

### **Starter switch**

When starting turn the switch completely to the right as well as pressing in.

### **Glow plug – Glow plug/starter switch**

This equipment is for use in cold weather to assist starting (instead of cigarettes). The glow plug switch should be held in 20—40 seconds before starting. When it is released, the current to the plugs is broken.

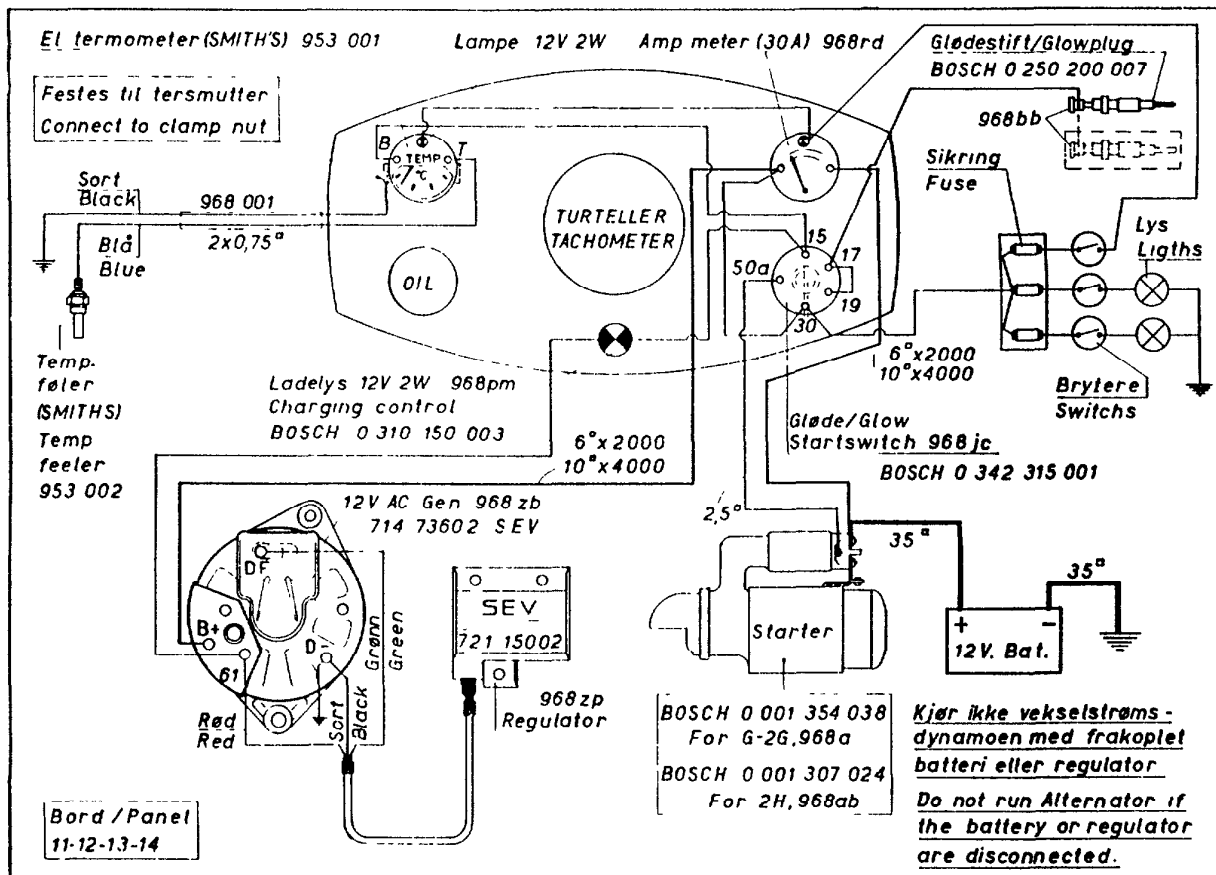
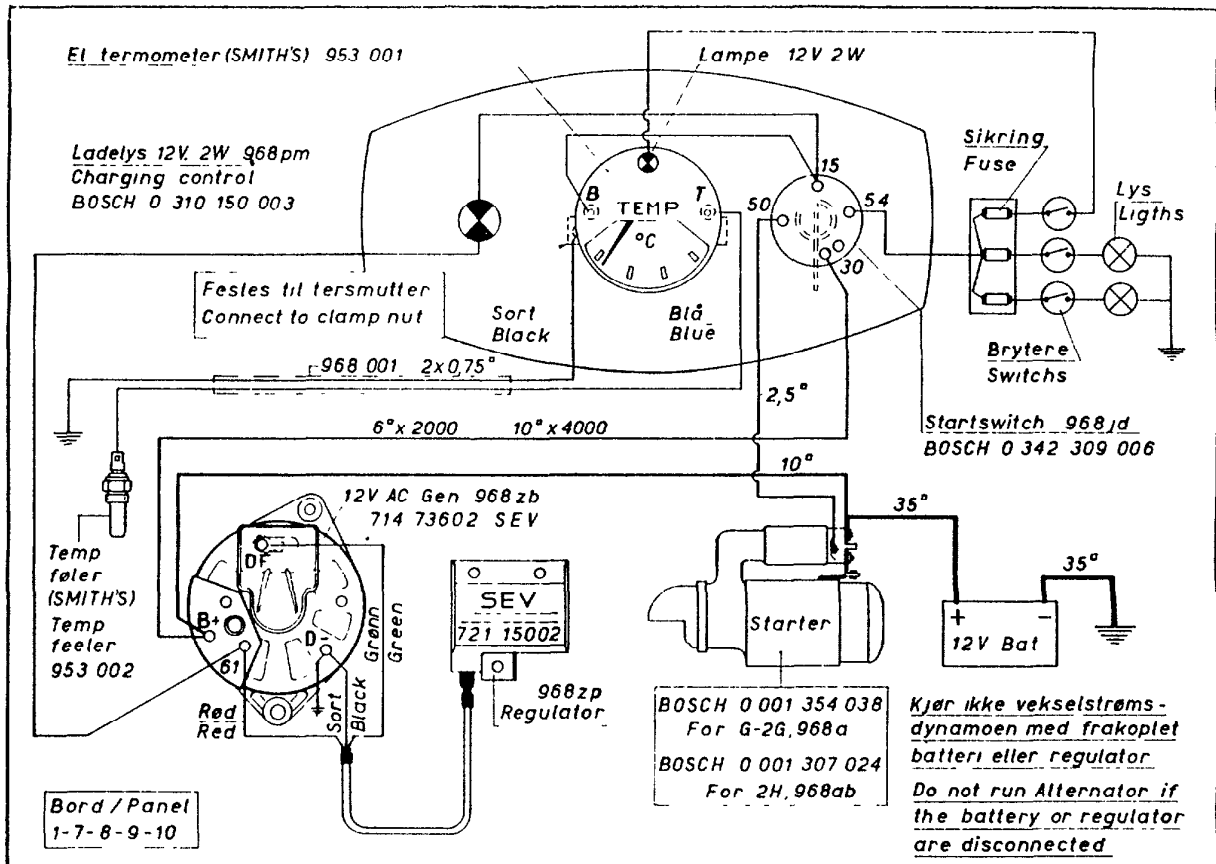
### **Battery**

Check the battery regularly.

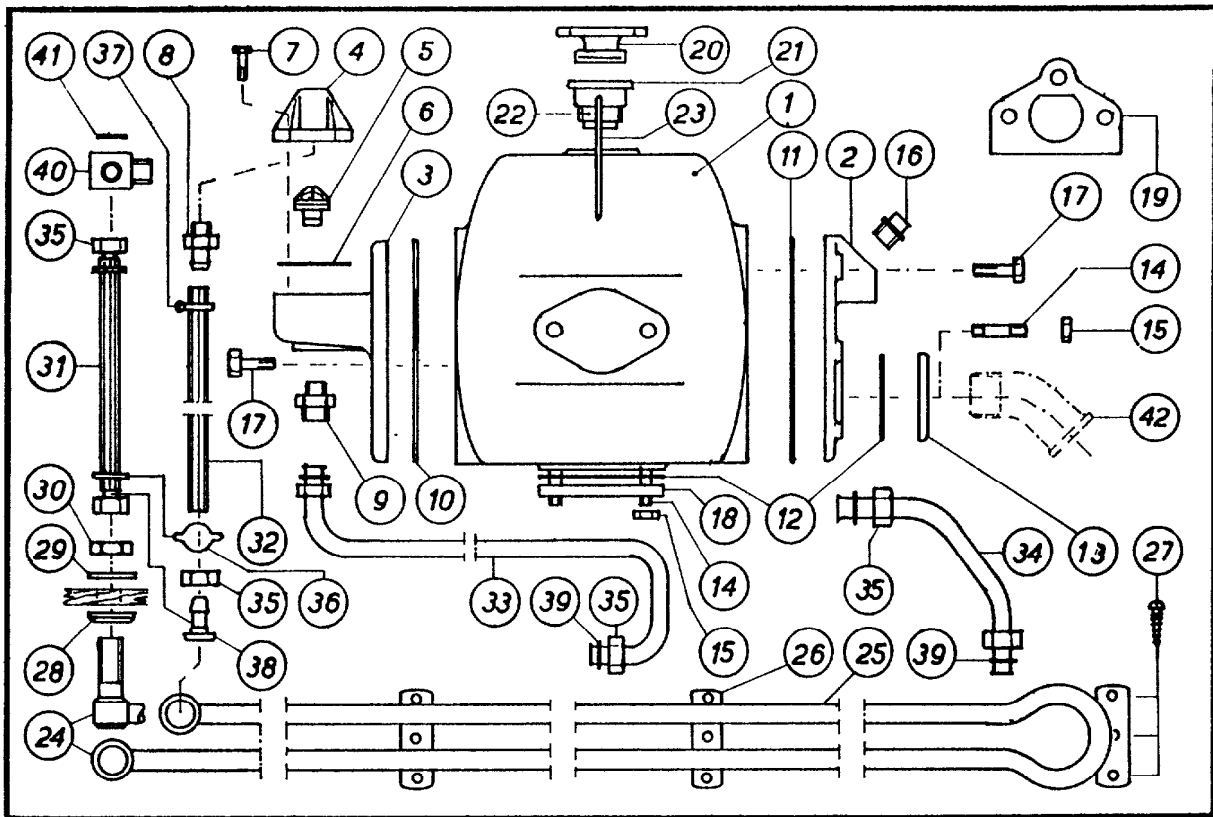
The electrolyte level should not fall below the top of the plates and only cleaned distilled water should be used for topping-up. Clean the battery top properly and keep the terminals and leads clean and tight. Coat the terminals with vaseline to prevent oxidization. Keep the terminals securely fastened.

**Electrical equipment is not covered by the engine guarantee.**



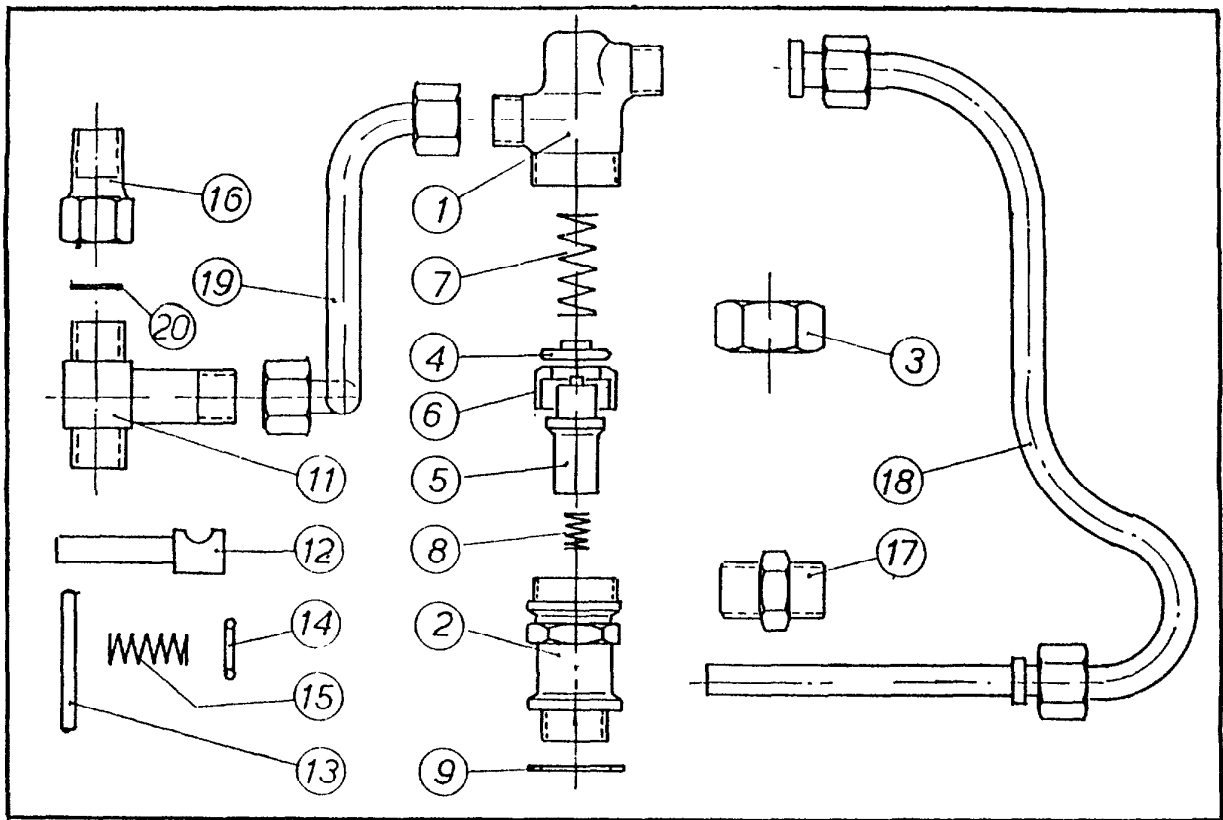


Wiring diagrams for S.E.V. alternator with Smith's el.thermometer and temp. feeler. – Upper: Without glow plug. Lower: With glow plug.



**Group G 69-1. FRESH WATER COOLING**

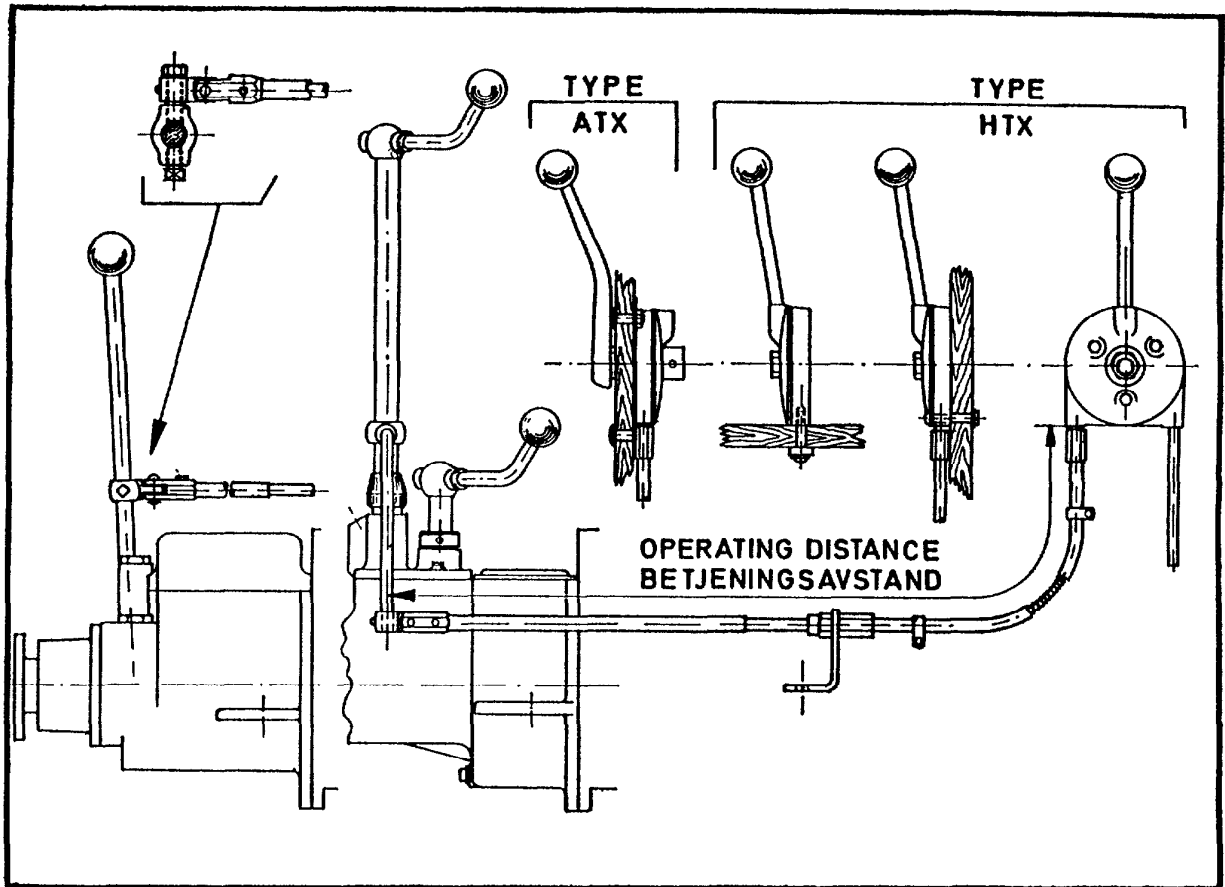
No.	Part Name	Part No.	No.	Part Name	Part No.
1	Water tank (silencer)	S1-G21CB	15	Nut (3/8" UNC)	415g
2	Silencer cover (rear)	2G21CK	16	Plug (1/2" BSP)	911a
3	Thermostat cover	2G21G	17	Bolt (3/8" UNC×25)	421Lb
4	Thermostat housing	2G69B	18	Blank flange	G21M
5	Thermostat (Behr. Thomsen ×1.100.55.100)	969L	19	Exhaust flange/ water gasket	821va
6	Thermostat housing gasket	869K	20	Pressure cap (Thermo TH2)	969d
7	Bolt (5/16" UNC×1")	421K	21	Pressure cap body	969dk
8	Hose nipple (3/8" BSP)	569e	22	Pressure cap sleeve	669L
9	Reducing nipple (3/8" BSP×1/2" BSP)	521i	23	Expansion pipe	669j
10	Thermostat strainer gasket, plane	821co	24	Cooler nipple	G62a
10b	Thermostat strainer gasket, bulge (Engines before G.71.261)	821cm	25	Cooler complete (1/2" Cu×3000)	S2-G69C
11	Cover gasket	821cL	26	Retainer plate	769a
12	Exhaust flange gasket	821v	27	Vood screw (B12×19)	469c
13	Exhaust flange	G21E	28	Washer, external	62j
14	Stud (3/8"×25 mm, stainless)	411mb	29	Washer, internal	762b
			30	Nut (1/2" BSP)	562b
			31	Suction hose (1/2"×400)	S-869d
			32	Return hose (1/2"×900)	S-869eb



**Group G 69-2. THERMOSTAT OPERATED SEAWATER-COOLING**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Thermostat housing .	G69D	11	Two way cock,	
2	Thermostat nipple ..	G69dk		complete .. . . .	S1-G52k
3	Thermostat nut . . . .	G69dm	12	Two way cock . . .	G52m
4	Thermostat valve . . .	G69dL	13	Two way cock pin .	553i
5	Thermostat (Behr-Thomsen X1.024.55.299) . . . . .	969dL	14	O-ring (7,66×1,78) .	823c
6	Thermostat valve seat	G69dn	15	Spring . . . . .	744b
7	Thermostat spring . .	769f	16	Nippel muff . . . . .	569d
8	Thermostat release spring . . . . .	769e	17	Pipe nipple (3/8" BSP)	521bb
9	Fibre gasket . . . . .	844b	18	By-pass pipe . . . . .	669dk
11	Two way cock body .	G52k	19	Two way cock pipe .	669dm
			20	Fibre gasket (13×1/4"×0,5) . . . .	844c
33	By-pass pipe (1/2"×860) . . . . .	S-669kb	38	Hose nipple . . . . .	569a
34	Pressure pipe (1/2"×250) . . . . .	S-623a	39	Pipe collar . . . . .	711c
35	Pipe nut (1/2" BSP) .	511b	40	Elbow with by-pass .	52bn
36	Hose clip (O-clip 20/23) . . . . .	969e	41	Elbow joint washer (21 mm) . . . . .	852b-c-d
37	Hose clip (No. 1A) .	947L	42	Exhaust pipe bend (1/2" BSP 45°) . . . .	973d





### Group G72-2. REMOTE PROPELLER CONTROL

This equipment is used for remote control of variable pitch propeller or reverse gear.

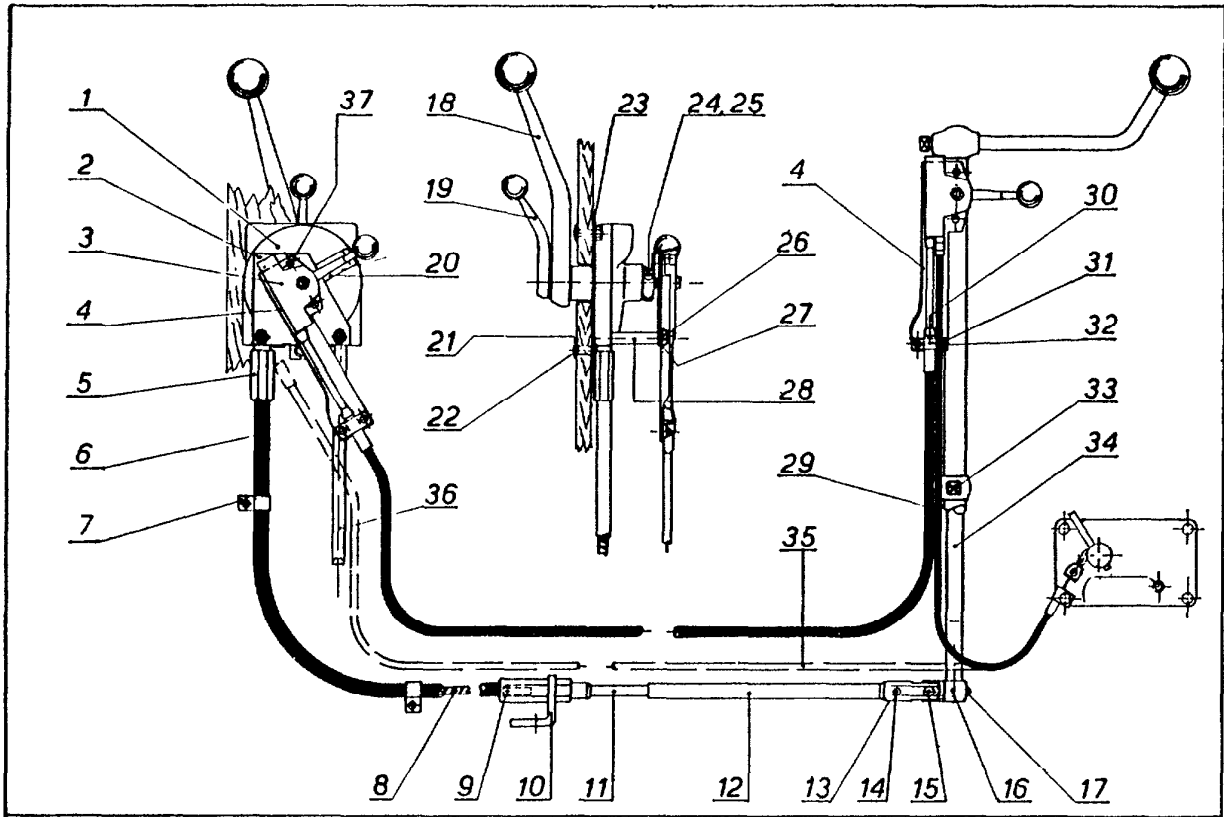
The operator can be fitted horizontally or vertically. Determine position of Operator, considering the operating distance (measured along cable run from Operator to engine control).

**For model ATX** (concealed mounting) drill through sideboard or console with 35 mm ( $1\frac{3}{8}$ " ) drill. Insert Operator and mark the three retainer plate fixing holes. Use 8 mm ( $\frac{5}{16}$ " ) drill for fixing screws. Fit operator handle. The angular support bracket should be fitted preferably to fore engine foundation bolt.

Check that handle movement of the Operator corresponds to forward/reverse positions of engine control, if not interchange cable inlet and outlet at the Operator. Lay the blue conduit the easiest run under flooring from Operator to angular support. Remember that few bends with large bend radii give easiest operation. Fix conduit with clips spaced approx. 40 inches apart.

*Cont. page 63.*





**Group G 72-3. REMOTE PROP.CONTROL WITH SINGLE OR DOUBLE GOVERNOR CONTROL**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Operator unit, ATX, complete . . . .	S-72LB	8	Prop. contr. cable, (5/16") . . . . .	972v
1	Operator unit, HTX, complete . . . .	S-72L	9	Sleeve . . . . .	631.002
2	Handle retainer plate for "Sabb" gov. handle . . . . .	72vL	10	Support . . . . .	G71ub
3	Governor handle complete . . . . .	S1-72v	11	Guiding pipe with flex. link . . . . .	S-72qc
4	Cable hose retainer plate for Morse cable	72vk	12	Teleskopic tube with fork . . . . .	S-73q
5	Conduit nipple . . . .	72a	13	Split pin (3/32"×1") .	782g
6	Prop. control conduit 15Ø, operat. distance: 2 m	S-972zb	14	Bolt (8Ø×22) . . . .	473e
	operat. distance: 3 m	S-972zf	15	Bolt (1/4" UNC×15)	445c
	operat. distance: 5 m	S-972zd	16	Block . . . . .	G71tb
7	Clamp . . . . .	753jb	17	Grease nipple . . . .	934r
			18	Big operator handle .	72Rc
			19	Small operator handle	72Sb
			20	Governor contr. lever	72øk
			21	Washer . . . . .	772j
			22	Cap screw (5/16"×1 1/4") . . . . .	471b

Cont. from page 61.

Undo block (G71tb) and screw it on the control lever. Insert steel cable in conduit and cover entirely with grease (i.e. Esso Beacon 300 EP) while inserting. Attach telescope fork to block (G71tb) and secure with split pin.

**Engines with reverse gearbox** for solid propeller have special connector link (see group G 72—2) to which the block (G71tb) is fitted. Unscrew lever lock screw and take off lever from its shaft. Put on connector link and fix in position wanted.

The pitch control lever should be adjusted 90 degrees to the engine axis when in neutral position. In this neutral position the telescope tube and angular support bracket must be as straight as possible. This is very important in order to avoid undue bend in the flexible joint of the telescope. If necessary, twist or bend the support bracket to reduce deflection at the joint. Fit support firmly and use lock washer under nut. Check that engine control lever, telescope support etc. are securely fastened.

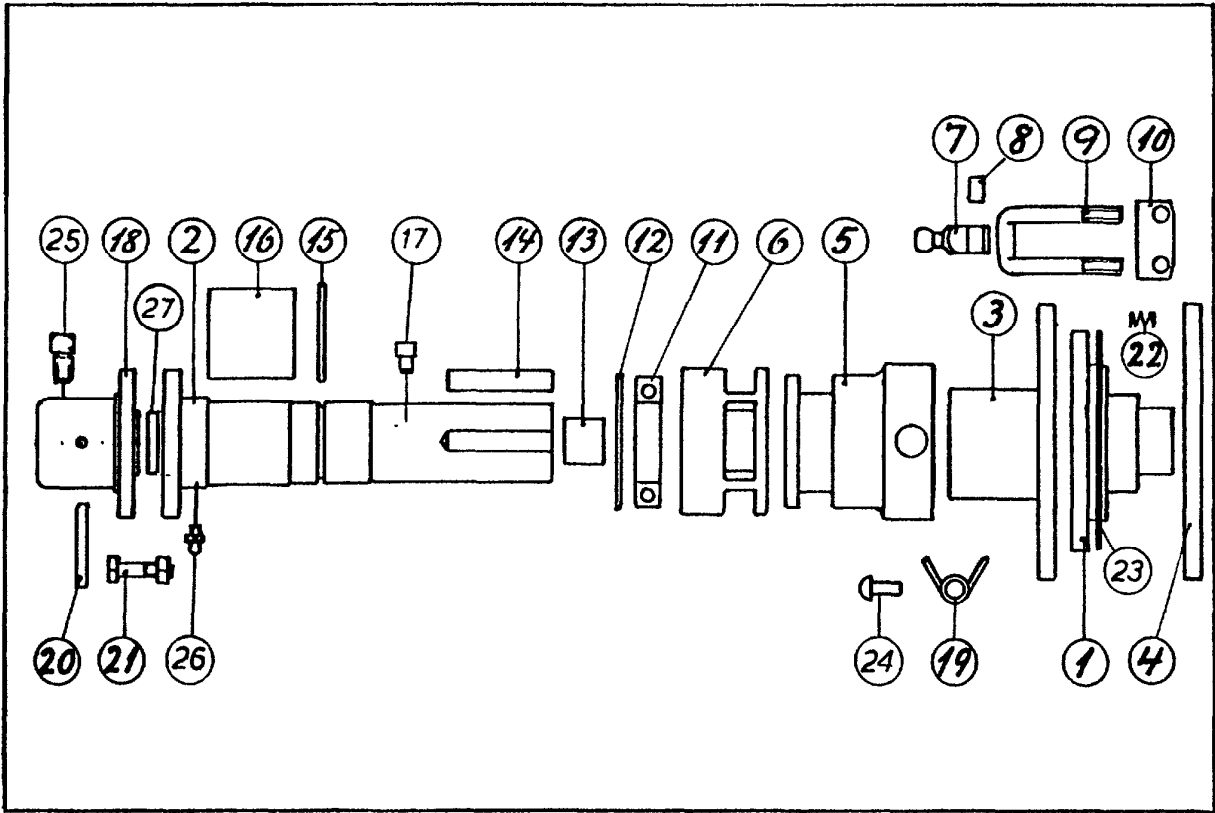
With propeller in neutral the 3 set bolts in operator cover (ATX) should be loosened 1/2 turn, and operator handle turned to its neutral position, preferably up. Tighten the bolts again.

**The operator type HTX** (visible mounting) has a central nut in the cover, by means of which the internal friction is controlled. Loosen the nut to see that the cable runs freely in the conduit and tighten it to the required brake effect is obtained.

Detailed information on request.

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23	Retainer (and templet) plate ..	72Lq	30	Clamp for M-cable ..	G72j
24	Cap screw (1/4" UNC×1") .. ..	472e	31	Lock washer .. . . .	771q
25	Nut (1/2" UNC) .. ..	415d	32	Cap screw . . . . .	472b
26	Bolt (5/16 UNC×2,5")	447c	33	Set screw (1/2") .. ..	471mL
27	Washer (5/16" AZ) ..	734h	34	Pitch control arm . . .	G71t
28	Spacer .. . . . . .	72øL	35	Govern. contr.: 2,5 m	G72gc
29	Morse cable, type 33M, operat. distance: 2 m	G72gg		Govern. contr.: 3,5 m	G72gp
	operat. distance: 3 m	G72gk		Govern. contr.: 5,5 m	G72ge
	operat. distance: 5 m	G72gi	36	Cable end tube (with plastic plug) ..	672d
			37	Nut . . . . .	415e



**Group G 80-1. CLUTCH AND PROPELLER CONTROL**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Front clutch member	G82A	16	Sleeve . . . . .	682r
2	Rear clutch member .	G82B	17	Dowel . . . . .	22ck
3	Friction flange . . . .	B82C	18	Coupling flange,	
4	Clamp ring . . . . .	S1-B82D		(25 mm) . . . . .	2H84R
5	Clutch sleeve . . . . .	B82E	19	Lock spring . . . . .	782d
6	Propeller contr. sleeve	G83D	20	Lock pin (6Ø×60) . .	784v
7	Clutch arm . . . . .	B82hc	21	Flange coupling bolt	
8	Roller . . . . .	82mb		( <sup>5</sup> / <sub>16</sub> " UNC×1") . . . .	421k
9	Clutch clamp . . . . .	B82i	22	Spring . . . . .	782c
10	Wear shim . . . . .	82j	23	Friction disc. . . . .	G85e
11	Ball bearing (6010) . .	983d	24	Grooved stud . . . . .	482g
12	Circlip (80i) . . . . .	783d	25	Squarehead set screw .	482i
13	Bush . . . . .	682d	26	Grease nipple . . . . .	934r
14	Sliding bolt . . . . .	82Ld	27	Plug (1") . . . . .	711p
15	Circlip . . . . .	782b			

## Group G 80-1. CLUTCH AND PROPELLER CONTROL

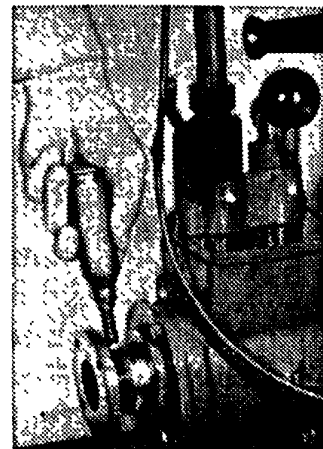
The clutch and the propeller control are enclosed in the clutch housing (Gr. 80—2. Pos. 1).

The clutch is of the single plate type and can be operated by foot. Front clutch member (1) is fastened to the camshaft end (Gr. 30—2. Pos. 6). The clutch sleeve (5) is moved by the crank (Gr. 80—2. Pos. 10) with its clutch control handle. The sleeve moves the clutch arms (7) which, with the help of clamps (9), press front clutch member between clamp ring (4) and friction flange (3).

### Adjustment of Clutch

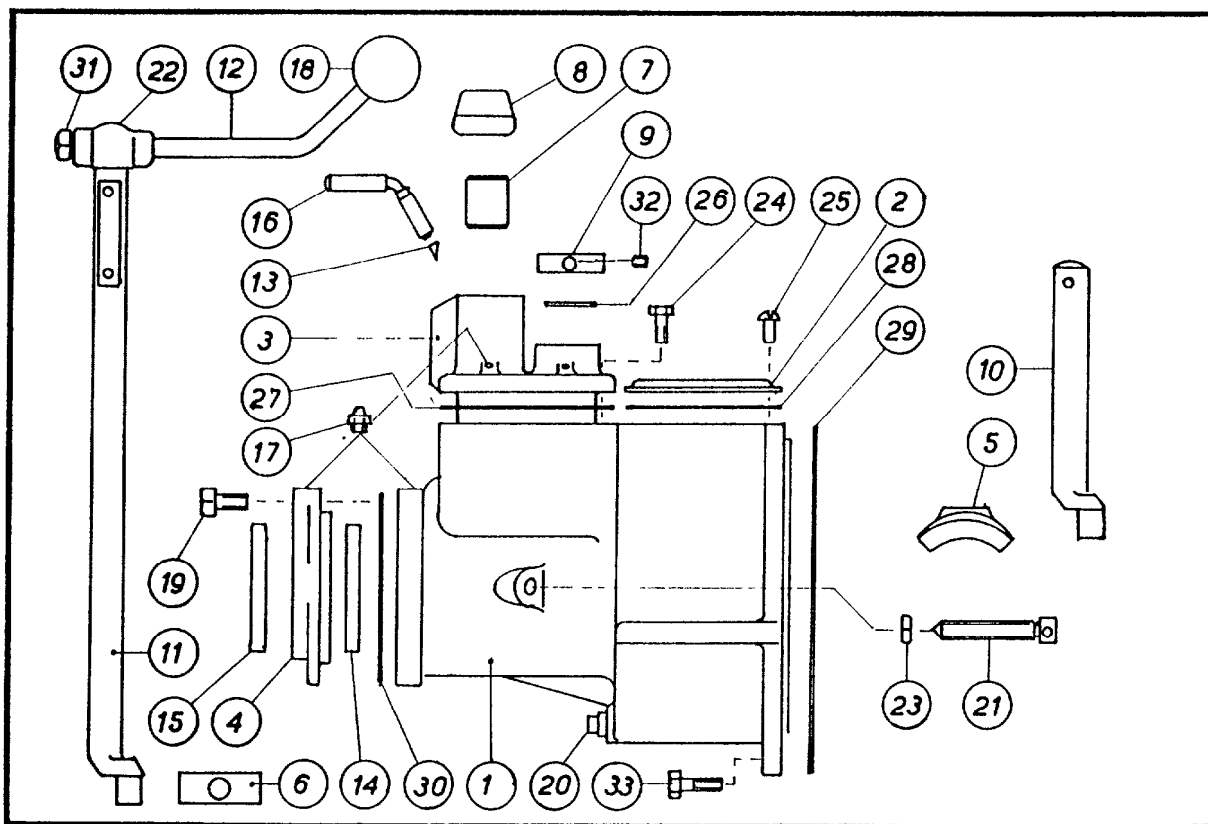
Firstly check that the clutch handle is in its very foremost position. Remove clutch housing cover No. 12, page 5. It is easier to adjust clutch correctly when engaged. Usually it is enough to tighten *one* nut 1/6 turn on each of the two clamps. Tighten *corresponding* nuts on the two clamps. Next time the clutch is adjusted the remaining two nuts are tightened. In that way the clutch will be equally set.

The clutch nuts are locked by springs (19) against the flats and will not move or work loose during operation.



The torque of the engine is transferred from friction flange (3) to the rear clutch member (2) by the four sliding bolts (14). The rear clutch member is piloted on the end of the camshaft. The bushes (13) and the sliding bolts are lubricated by the grease nipple on the rear clutch member. It is important not to overlook this nipple as lack of grease will cause quick wear of the bushes. See picture.

Dismantling of clutch, page 67.



### Group G 80-2. CLUTCH HOUSING

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Clutch housing . . . .	G82Q	17	Grease nipple . . . .	934r
2	Housing cover . . . .	G82qL	18	Knob . . . . .	971b
3	Control bracket (Low) . . . . .	2H83A	19	Head screw ( <sup>5</sup> / <sub>16</sub> " UNC×1") . . .	421k
4	Flange . . . . .	G82R	20	Plug ( <sup>1</sup> / <sub>4</sub> " BSP) . . .	965c
5	Clutch control shoe .	G82F	21	Max pitch stop screw	G41f
6	Pitch control shoe ..	G83e	22	Handle head . . . .	71mL
7	Bushing . . . . .	683a	23	Nut ( <sup>3</sup> / <sub>8</sub> " UNC) . . .	415g
8	Rubber cuff . . . . .	883c	24	Bolt ( <sup>5</sup> / <sub>16</sub> " UNC×20)	434c
9	Lock washer . . . . .	483kb	25	Head screw ( <sup>5</sup> / <sub>16</sub> " UNC× <sup>1</sup> / <sub>2</sub> ") . .	423L
10	Clutch shaft . . . . .	G81f	26	Rubber washer . . . .	881f
11	Pitch control shaft ..	G83f	27	Contr. bracket gasket	883a
12	Handle for clutch and pitch contr. with knob	S1-71nc	28	Cover gasket . . . .	882t
13	Friction taper . . . .	G83ak	29	Clutch housing gasket	882q
14	Oil seal (5580) . . . .	982r	30	Flange gasket . . . .	882s
15	Oil seal with dust lip (5580) . . . . .	982rb	31	Set screw ( <sup>1</sup> / <sub>2</sub> ") . . .	471mL
16	Hand screw . . . . .	471c	32	Set screw ( <sup>3</sup> / <sub>8</sub> ") . . .	453b
			33	Bolt ( <sup>3</sup> / <sub>8</sub> " UNC×1") .	421L

## **Group G 80-2. CLUTCH HOUSING**

The clutch housing (1) contains all clutch- and pitch control parts (Gr. 80—1).

The control bracket (3) takes both clutch- and propeller pitch cranks (10—11).

The hand screw (16) locks pitch control shaft in position wanted, and must be loosened before manoeuvring.

The max. pitch stop screw (21) located on right side of clutch housing should be set to stop propeller control sleeve (Page 64, Pos. 6) in forward position where the engine runs at the wanted full speed r.p.m. (1500—1800). See page 9.

### **Replacing Rear Oil Seal**

To replace the oil seal (14 and 15) at rear end of the clutch housing it is necessary to dismantle the clutch. Undo the flange coupling screws.

Loosen the foundation bolt nuts so that the engine can be tilted forwards. Remove control bracket and cover (2). Unscrew the 4 nuts at the clutch clamps and remove clamps with arms, rollers and shims. Also remove the two control shoes (5—6).

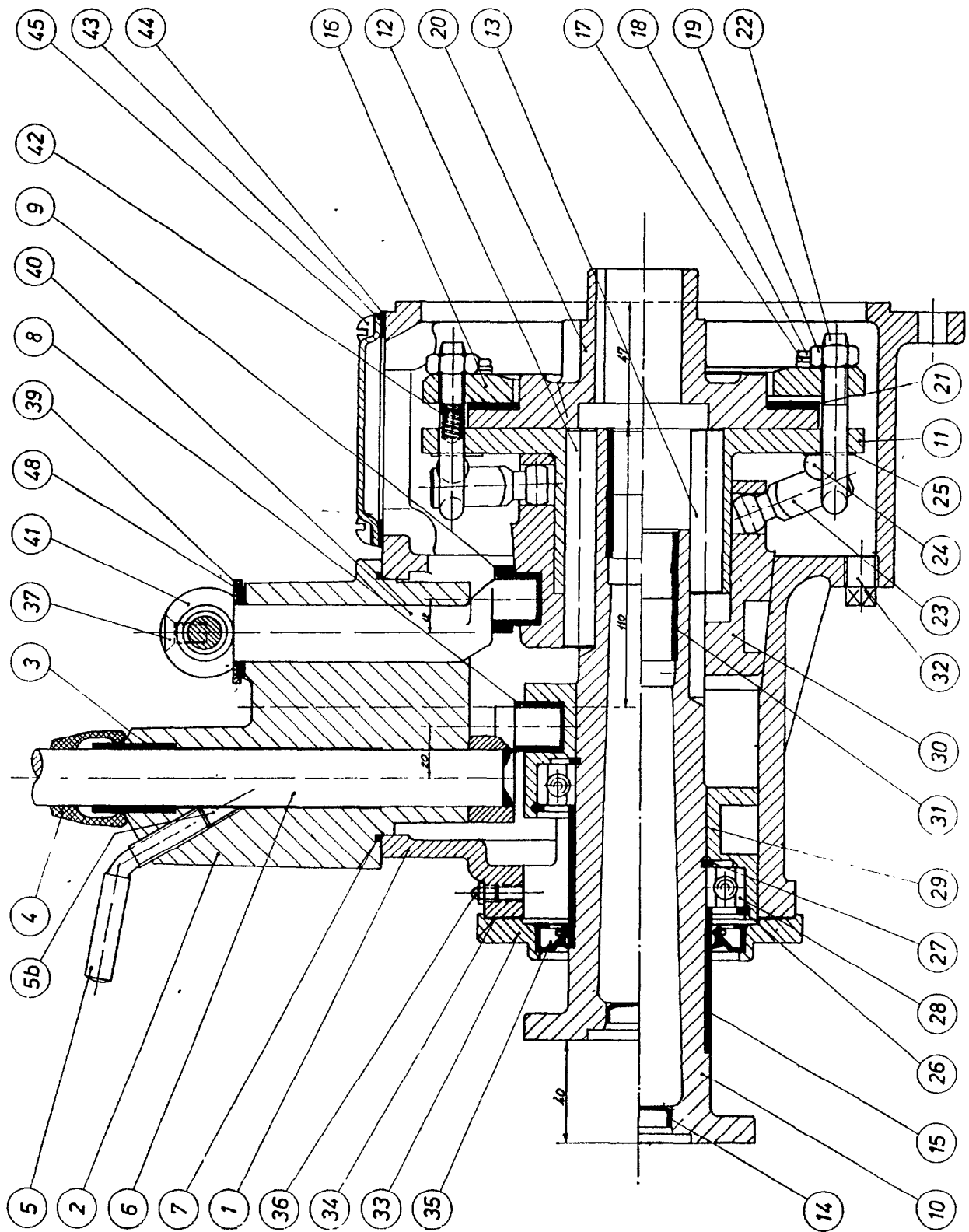
Unscrew the five clutch housing fixing bolts and pull off the housing. The friction flange (Gr. 80—1), with sliding bolts and clutch sleeve are pulled forward out of the housing and the rear clutch part is pulled backwards after the flange (4) has been taken off. Remove the two circlips (12 and 15) and pull off the reversing sleeve and the ball bearing. The flange (4) is now free and the oil seals are replaced. Apply some oil to the seal before fitting. Rear oil seal (15) of the twin lip type (dust lip) should be packed with grease between the two lips.

To refit the clutch parts: Reverse the procedure.

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### **Adjustment of Gear-Operating Lever Movement (cont. from page 72).**

If, after long time of use, the ahead clutch lining (8) becomes worn, this will increase forward movement of the operator lever. The movement can be adjusted by fitting shims in front of the ahead clutch cone (7) against ball bearing (Gr. 30—2, Pos. 17) on the camshaft. Correspondingly, the astern movement of lever is reduced by removing shims (47 or 48) from fore end of bearing (43) in the coupling sleeve (42).



**FULLY FEATHERING PROPELLER CONTROL**

## Group GSP 80. FULLY FEATHERING PROPELLER CONTROL

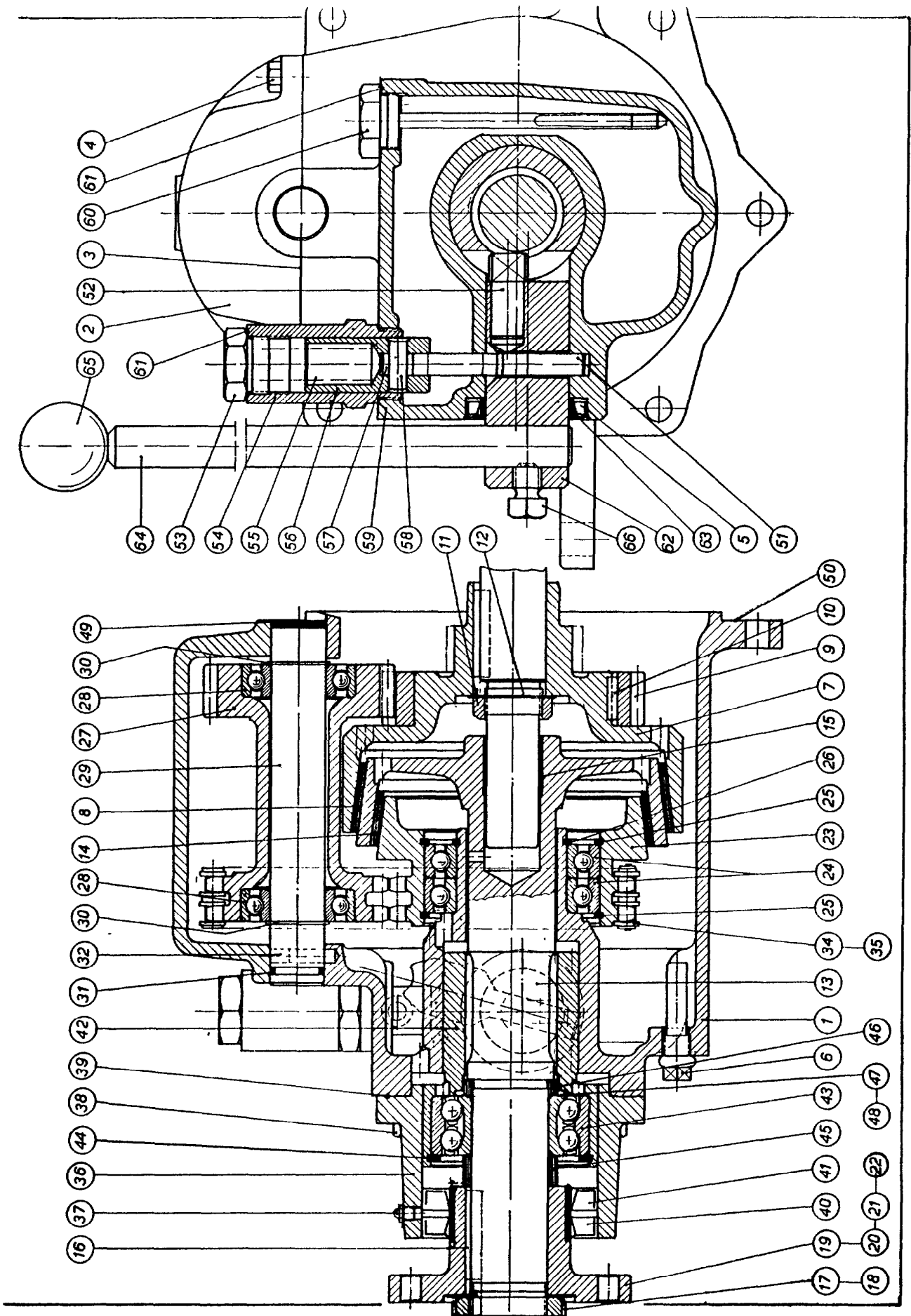
No.	Part Name	Part No.	No.	Part Name	Part No.
1	S.P. Clutch housing ..	G82QB	24	Clutch arm roller . . .	82mb
2	Control bracket . . . .	G83AC	25	Wear shim . . . . .	82j
3	Bushing . . . . .	683a	26	Circlip (80i) . . . . .	783d
4	Rubber cuff . . . . .	883c	27	Circlip (50a) . . . . .	782b
5	Hand screw . . . . .	471c	28	Ball bearing (6010X) .	983d
5b	Friction taper . . . . .	G83ak	29	Propeller contr. sleeve	G83D
6	Pitch control shaft ..	G83fd	30	Clutch sleeve . . . . .	G82EC
7	O-ring (OR-94,5×3) .	821p	31	Bushing . . . . .	682d
8	Pitch control shoe ..	G83e	32	Plug (1/4" BSP) . . . .	965c
9	Clutch control shoe .	G82Fb	33	Seal flange . . . . .	G82RB
10	Rear clutch part . . .	G82BC	34	Seal flange gasket ..	882s
11	Friction flange . . . .	B82C	35	Oil seal (5580)	
12	Sliding bolt			with dust lip . . . . .	982rb
	(87 mm) (1) . . . . .	82Lf	36	Grease nipple (1/4") .	934r
13	Sliding bolt		37	Lens head screw	
	(65 mm) (3) . . . . .	82Ld		(5/16"×16) . . . . .	471n
14	Steel plug (1") . . . .	711p	38	Washer . . . . .	783f
15	Sleeve . . . . .	682r	39	Rubber washer . . . . .	881f
16	Clamp ring . . . . .	S1-B82D	40	Clutch crank . . . . .	2H81f
17	Lock spring . . . . .	782d	41	Clutch lever . . . . .	S1-71nf
18	Grooved stud		42	Clutch spring . . . . .	782c
	(1/4"×1/2") . . . . .	482g	43	Clutch housing cover .	G82QL
19	Nut (3/8") . . . . .	415g	44	Clutch housing cover	
20	Front clutch part . . .	G82A		gasket . . . . .	882t
21	Friction dice . . . . .	G85e	45	Cap screw	
22	Clutch clamp . . . . .	B82i		(5/16" UNC×1/2") ..	423L
23	Clutch arm	B82hc			

## Group SP 91. FULLY FEATHERING PROPELLER (Cont. from page 74)

### Special parts for Model GSP

No.	Part Name	Part No.	No.	Part Name	Part No.
1	SP. Propeller boss, with boss screws . . . .	S1-2H91AB-G	6	SP. Driving block . .	2H91db
2	SP. Propeller blade, 450 mm dia., normal .	2H91BE		SP. Driving block tap	G91dk
3	SP. Propeller blade, 394 mm dia., short ..	2H91BD	7	SP. Propeller shaft	2HSP91eb
				(norm) 1,75 m, stainless steel . . . . .	
			15	SP. Blade tap block .	2H91mb





REVERSE GEAR -- Model H -- 1971

### Group GG 84. REVERSE GEARBOX (Modell H-1971)

No. Part Name	Part No.	No. Part Name	Part No.	No. Part Name	Part No.
1 Gearbox . . . . .	H84Qb	22 Sleeve . . . . .	682re	43 Angular-contact bearing . . . . .	984h
2 Gearbox cover . . . . .	H84qL	23 Lower chain wheel . . . . .	H84T	44 Circlip (72I) . . . . .	784t
3 Gasket, gearbox cover	884n	24 Ball bearing (SKF 6010Z) . . . . .	983db	45 Spacer . . . . .	684b
4 Bolt (5/16" X 1") . . . . .	421k	25 Circlip (80i) . . . . .	783d	46 Spacer . . . . .	684c
5 Oil seal (Gaco 4256) . . . . .	934e	26 Circlip (50A) . . . . .	782b	47 Shim (Seeger PS 35 X 45 X 0,1) . . . . .	741 006
6 Magnet plug . . . . .	584bb-2	27 Intermediate gear . . . . .	H84ub	48 Shim (Seeger PS 35 X 45 X 0,3) . . . . .	741 007
7 Ahead clutch cone . . . . .	S1-H84m	28 Ball bearing (SKF 6205Z) . . . . .	935mb	49 Rubber washer . . . . .	884a
8 Ahead clutch lining . . . . .	H84mk	29 Intermediate shaft . . . . .	H84L	50 Gasket, gearbox front	882q
9 Driving gear . . . . .	H84sb	30 Circlip (25A) . . . . .	784L	51 Lock bolt . . . . .	H84nc
10 Key (7 X 8 X 20) . . . . .	436a	31 O-ring (Sor 10) . . . . .	884L	52 Operating shaft dowel	H84rL
11 Lock nut (3/4" BSP) . . . . .	484t	32 Grooved pin (1/4" X 3/4") . . . . .	422f	53 Plug . . . . .	522dc
12 Lock washer . . . . .	784b	34 Chain, 19 links (114046) . . . . .	984c	54 Lock sleeve retainer . . . . .	H84z
13 Gear shaft . . . . .	S1-H84db	35 Chain lock . . . . .	984n	55 Spring . . . . .	784i
14 Astern clutch cone lining . . . . .	H84dk	36 Rear support flange . . . . .	H84w	56 Lock sleeve . . . . .	H84pc
15 Bush . . . . .	682d	37 Grease nipple . . . . .	934r	57 Lock sleeve roller : . . . . .	H84y
16 Key (7 X 8 X 40) . . . . .	434e	38 Bolt (3/8" UNC X 1" K80) . . . . .	421L	58 Lock sleeve pin . . . . .	484h
17 Ring nut . . . . .	486c	39 Rear support flange gasket . . . . .	884w	59 Gasket . . . . .	836j
18 Lock washer . . . . .	786c	40 Oil seal (5580) with dust lip . . . . .	982rb	60 Dipstick . . . . .	H84x-2
19 Coupling flange, . . . . .		41 Oil seal (5580) . . . . .	982r	61 Gasket . . . . .	882d
19b front part . . . . .	S1-H84vb	42 Operating sleeve . . . . .	H84ec	62 Operating shaft . . . . .	H84rb
20 Coupling flange, rear part . . . . .	2H84RG			63 Operat. shaft sleeve . . . . .	684r
21 Bolt (3/8" UNC X 1 1/2" k80) . . . . .	435a			64 Gear operating lever . . . . .	H71m
22 Nut (3/8 UNC) . . . . .	415g			65 Knop . . . . .	971b
				66 Set screw . . . . .	471ml

## **Group GG 84. REVERSE GEAR (Model H-1971)**

The reverse gear works on the principle with self-adjusting cone clutches for ahead and astern drive. When moving the operating lever (64) the entire propeller shaft and gear shaft (13) with its double conical clutch linings are pulled in and out thus engaging the ahead and the astern clutch cones respectively. The clutches are kept in position by the propeller thrust and the lock spring (55).

Note that the operating lever must be free to move, and not hitting against engine case or flooring.

*Perfect alignment of the engine and propeller shaft is essential, otherwise the clutches might slip.*

If the bilge water is high in the boat, avoid repeated manipulating of clutches until water is pumped out. This is in order to avoid water being sucked into the gearbox at the rear, which would possibly hurt the angular-contact ball bearing (43). Damaged bearings is noticed by lever movement becoming longer, and the bearing should be replaced.

Double oil seals in rear end of reverse gear.

### **Dismantling of Reverse Gear:**

Replacement of rear oil seals (40—41) can be carried out by dismantling the flange couplings (19—19b). Push propeller shaft back. Unlock the nut (17) and unscrew nut and remove lock washer. With operator lever in rearmost position, place two 1" chocks something similar between flange coupling and rear support flange (36), and press operating lever carefully forward to loosen the coupling.

### **Further dismantling:**

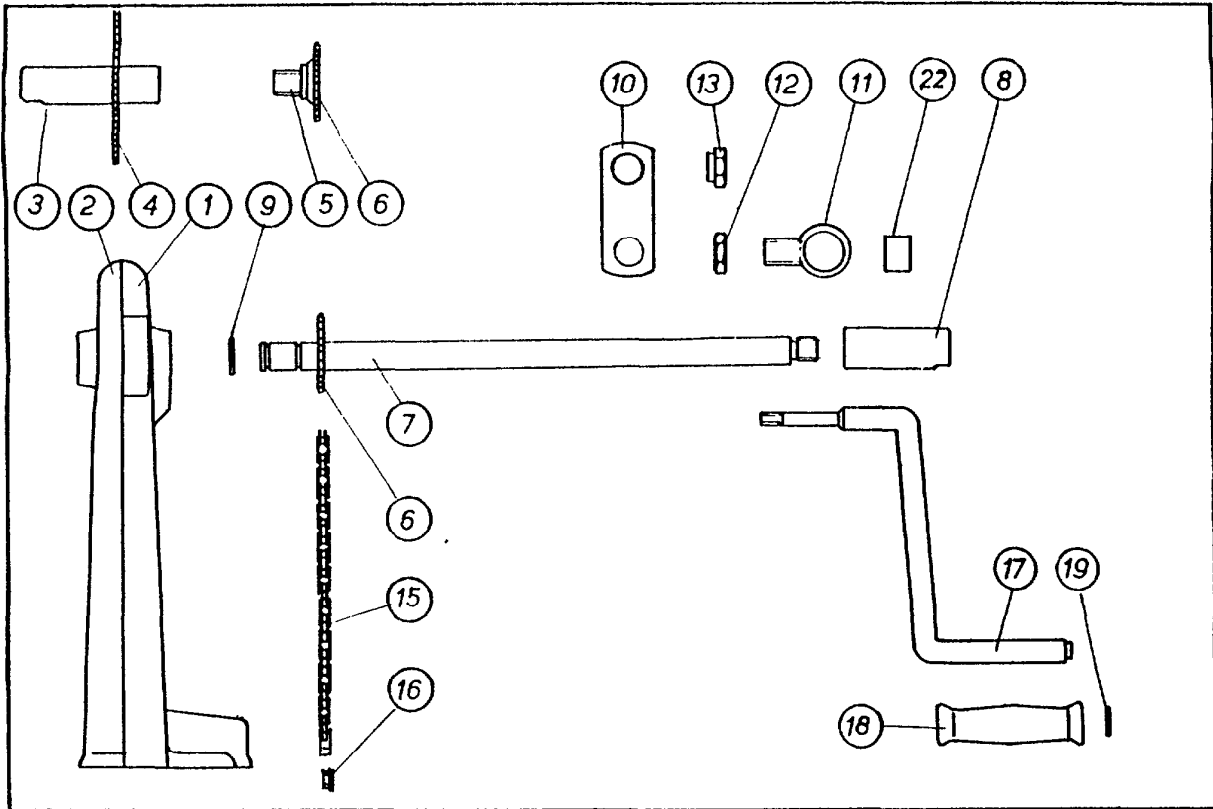
For further dismantling drain lub.oil. Unscrew plug (53) and remove the spring, sleeve (56) and lock bolt. The latter has a 3 mm hole and can be pulled up with a 2 mm dia. wire bent at an angle. Operating shaft (62) and operating shaft dowel (52) pulled out.

Undo the engine foundation bolts so that the engine can be tilted forwards enough for the complete gearbox to be removed. Take off gearbox cover (2), open chain lock, remove chain and the complete intermediate gear (29). Unscrew the five gearbox fixing bolts and pull off the gearbox.

Take off the key (16) from the gear shaft and press out the shaft from rear. To assemble: Reverse the dismantling procedure.

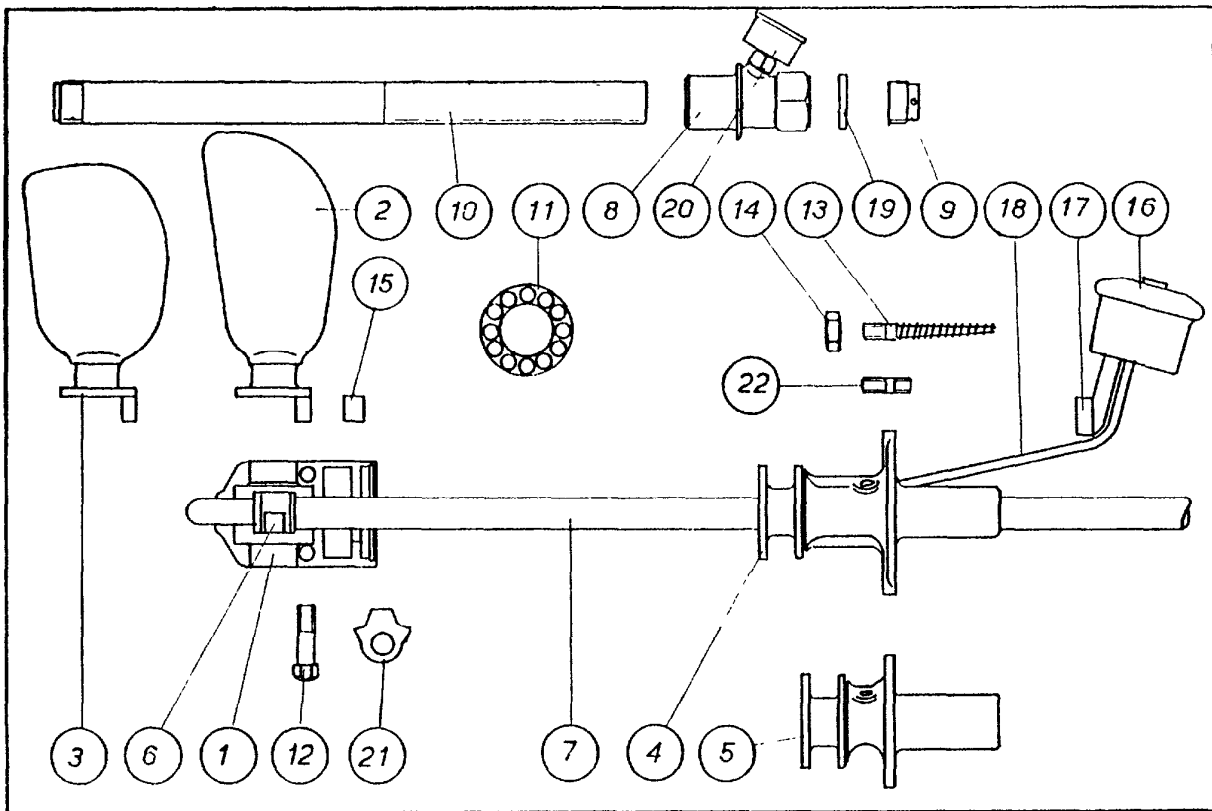
Set with "O-rings and Oil seals" for engine: Code 0—14.

*Cont. page 67.*



**Group G 35-2. FRONT START**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Starting bracket, front part . . . . .	H35Lb	11	Front start axle bearing . . . . .	S1-G35kr
2	Starting bracket, rear part . . . . .	H35K	12	Nut (1/2" BSP) . . . . .	562b
3	Starting shaft threaded . . . . .	H35mb	13	Nut (5/8") . . . . .	435L
4	Upper sprocket . . . . .	H35n	15	Front start chain (110044—394 mm) . . . . .	935hd
5	Front start sprocket tap . . . . .	S1-H35mk	16	Starting chain lock . . . . .	935n
6	Front start sprocket . . . . .	G35nk	17	Starting crank (180 R) . . . . .	S1-H35p
7	Front start axle . . . . .	S1-H35ru		Starting crank (150 R) . . . . .	S1-H35pb
8	Starting crank socket . . . . .	G35md	18	Hand grip . . . . .	G35pk
9	Circlip (22A) . . . . .	735r	19	Washer . . . . .	742f
10	Front start bearing support . . . . .	G35kq	22	Front start axle bushing (Glacier 14 DU 12) . . . . .	635r



**Gr. G 91. VARIABLE PITCH PROPELLER (Prop. shaft 25 mm after G.71.569)**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Propeller boss (with boss screws) ..	S1-2H91A	9	Stuffing box gland ..	B91g
2	Propeller blade, normal 450 mm dia. .	B91B	10	Stern tube, 45 cm ..	B91h
3	Propeller blade, short 394 mm dia. .	B91BB	11	Thrust ring .. . . .	B91i
4	Stern bearing, normal	2H91C	12	Boss screw . . . . .	B91k
5	Stern bearing w/gre- ase nipple for life boat	2H91CB	13	Stern wood screw . . .	91L
6	Driving block . . . . .	2H91d	14	Nut . . . . .	491c
7	Propeller shaft 1,75 m stainless steel . . . . .	2H91eb	15	Wing tap block .. . .	2H91m
	Propeller shaft with driving block ..	S1-2H91eb	16	Propeller greaser . . .	64A
8	Stuffing box . . . . .	2H91FB	17	Prop. greaser bracket	64B
			18	Greaser tube . . . . .	664a
			19	Stuffing box packing .	841e
			20	Stuffing box grease cup No. 4 . . . . .	982b
			21	Lock washer . . . . .	791e
			22	Stern stud (for steel boats) . . . .	91Lb

**Group G 91. VARIABLE PITCH PROPELLER**

On a SABB variable pitch propeller the blades are turned by axial movement of the entire propeller shaft. Parallel R. H. threads (M22×1,5) on the propeller shafts take a block (6) with two functions: to transmit the engine torque and to adjust the pitch.

The thrust bearing is in the forward part of the propeller boss (1) and consists of 3 nylon rings (11), two for ahead and one (the middle one) for astern thrust.

When assembling the propeller boss (1) make sure that all parts are correctly placed according to marks on the blades (2) and the boss. Do not forget to lock boss screws (12), or the propeller may get lost. If the propeller should happen to strike bottom or any floating matter, the blades should be inspected and straightened. Any difference between the blades may wear out propeller shaft in a short time.

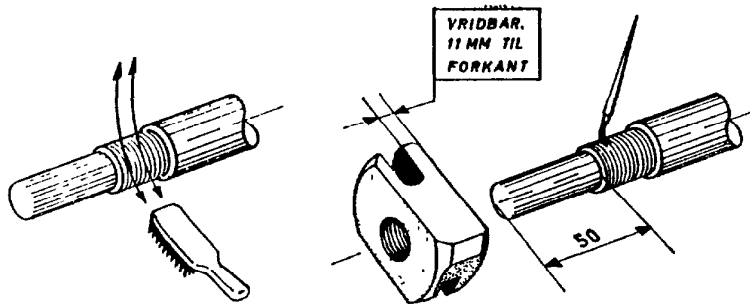
### Sluggish Propeller Control:

If the propeller control is hard to move it may be caused by misalignment of shaft and engine or by the driving block being tight in the boss. Check alignment by using a feeler gauge between the shaft couplings, and afterwards check propeller control with flanges disconnected, when it should move freely. If so, and the alignment is in order, the boat must be taken out of water to check the propeller boss. If the engine is just installed a sluggish propeller control may be due to incorrect assembly of blades, boss and block. Check control marks in these parts. If sluggishness appears after some time of operation, the propeller may have struck something or been entangled in a rope. Check the driving block for cracks, if there are no cracks the sluggishness may be cured by careful filing of the block until it moves freely. If the block (6) is cracked or loose on its threads it must be renewed.

The stainless steel propeller shaft — 25 mm. dia. — has parallel threads to take the driving block. Locking by means of Loctite. For lack of Loctite, tin solder is applicable.

### Replacing Driving Block:

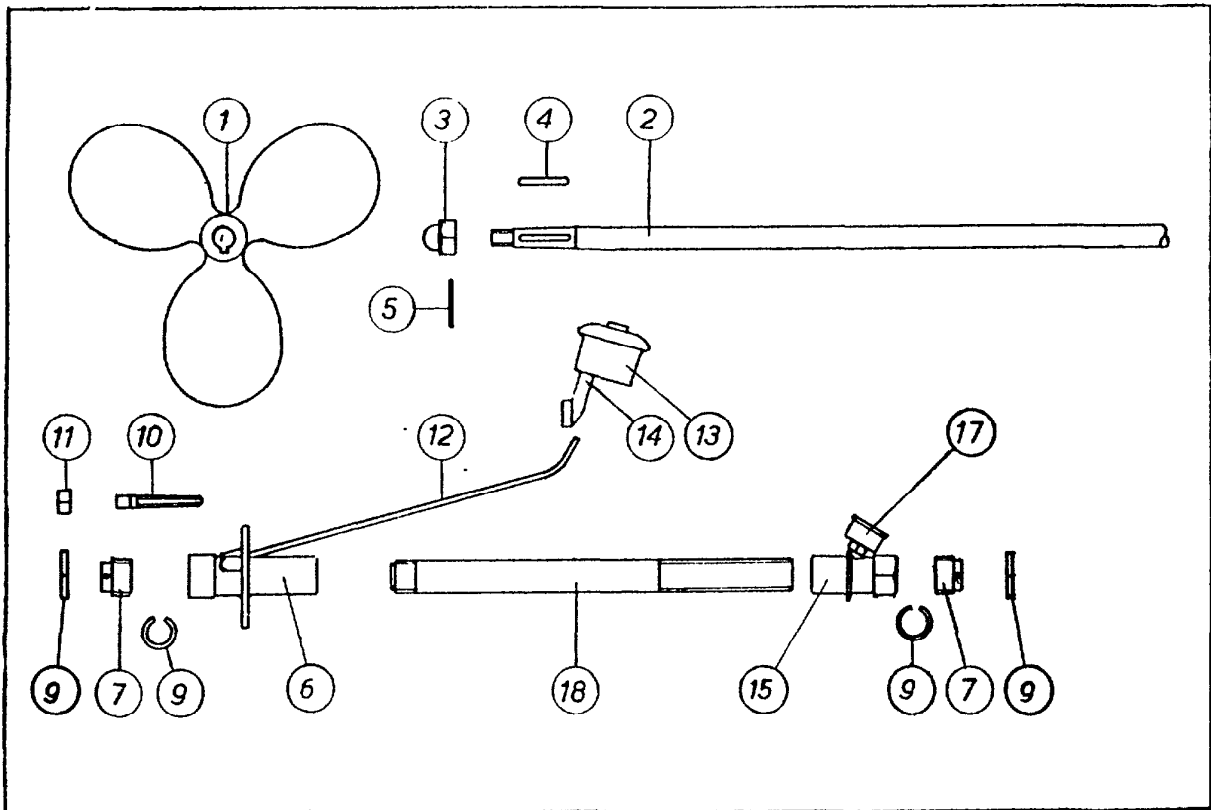
1. Degrease the shaft threads by using Loctite Activator T or triethylchloride. Remainers of Loctite can be removed after heating shaft end carefully with blow lamp. Use a wire brush to clean the threads. Wipe off.



2. Correct type of resin is LOCTITE ADHESIVE 307, the activator is LOCTITE ACTIVATOR T.

*Cont. page 79.*

**Group SP 91. FULLY FEATHERING PROPELLER. See page 69**  
**Special parts for Model GSP**



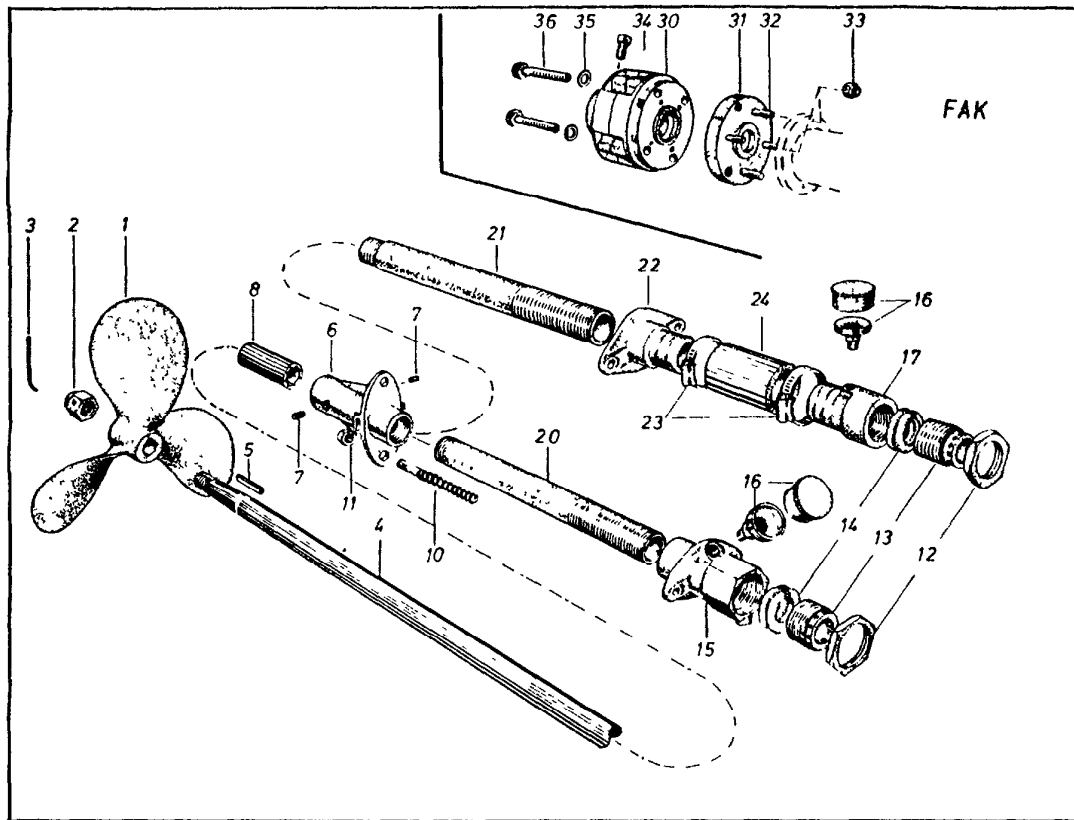
**Group G 92. SOLID PROPELLER (Propeller shaft 25 mm, after GG.71.620)**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	3-blade propeller (16"×14"×25V) . . .	2H92B	9	Stuff. box packing (6)	841e
2	Propeller shaft 1,75 m stainless steel . . . . .	2H92eb	10	Stern wood screw . .	91L
3	Shaft nut . . . . .	2H92d	11	Nut (1/2") . . . . .	491c
4	Key . . . . .	492bb	12	Greaser tube . . . . .	664a
5	Nut lock pin . . . . .	792d	13	Greaser . . . . .	64A } 64B }
6	Stern bearing . . . . .	2H92c	14	Greaser bracket . . .	
7	Gland . . . . .	B92g	15	Stuffing box . . . . .	2H91FB
8	Lock nut . . . . .	592g	17	Stuffing box greaser cup No. 4 . . . . .	982b
			18	Stern tube . . . . .	B91h

**Group G 92. SOLID PROPELLER**

Engine with reverse gear has as solid three blade bronze propeller. The propeller sits on a metric cone 1:10, held in place by a key (4) and a shaft nut (3). A brass pin secures the nut. The stern bearing is provided with a stuffing box, which should be serviced of regular intervals. The stuffing box also provides a bearing for the shaft, but if the free shaft length from stuffing box to engine exceeds 1,5 m the shaft should be supported by a babbitt lined bearing which we supply on request.

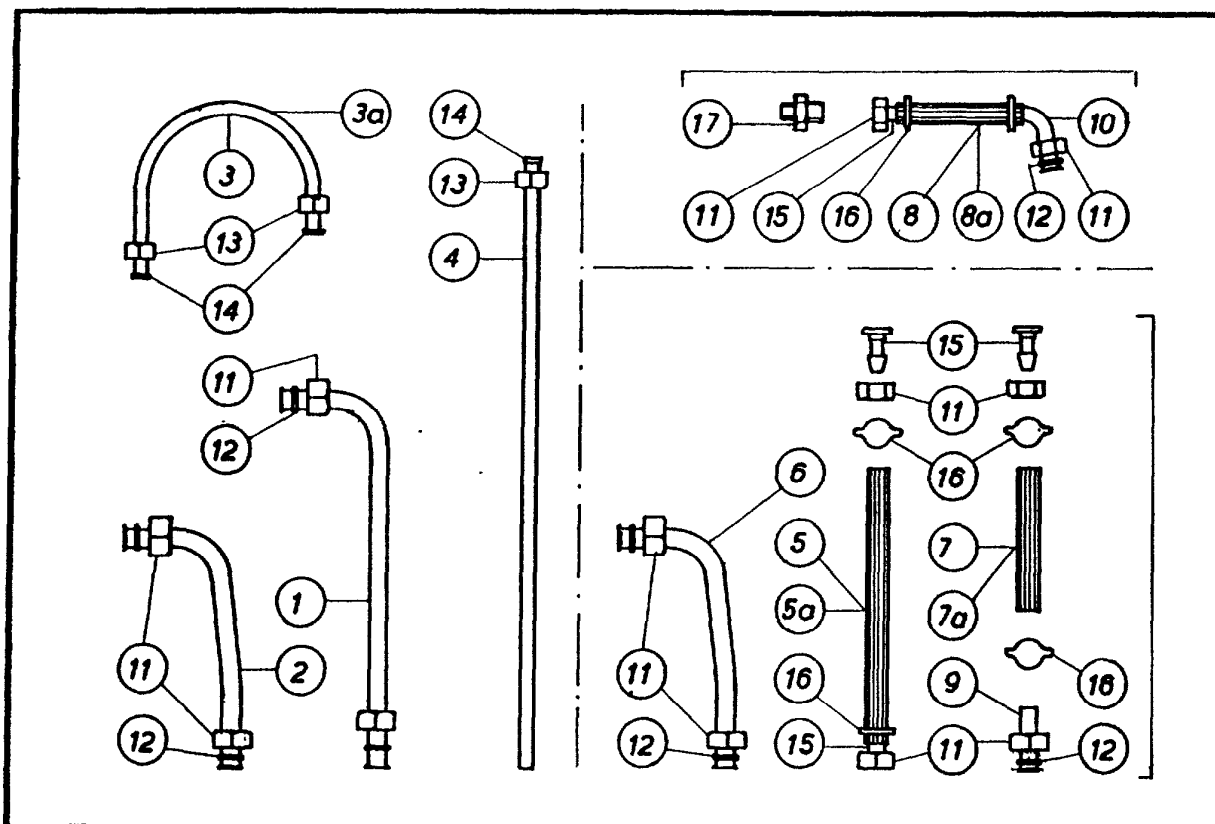
**Greasing:** *The greaser* (13—14) lubricates the stern bearing. Give greaser 1/2—1 turn daily. Stuffing box, greases from stuffing box greaser (17).



**Group G 92. SOLID PROPELLER, WATER LUB. STERN BEARING (VSL), FLEXIBLE STUFF.BOX (GUP), FLEXIBLE SHAFTS COUPLING (FAK)**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	3-blade propeller (16"×14"×25) . . . .	2H92B	17	Flexible stuffing box (GUP) . . . . .	2H91FC
2	Shaft nut . . . . .	2H92d	20	Stern tube (45 mm) .	B91h
3	Nut lock pin . . . . .	792d	21	Stern tube for flexible stuffing box (GUP) .	S1-C91hb
4	Propeller shaft 1,75 m stainless steel . . . . .	2H92cb	22	Stern tube flange . . .	G91FK
5	Key . . . . .	492bb	23	Hose clamp (45—58) .	962gd
6	Water lubricated stern bearing w/rubber bearing . . . . .	S1-2H92H-25	24	Stuffing box hose 1½"×150, oil resist .	891jb
7	Set screw (5/16"×10) .	491a	30	Flexible thrust coupl.	982w
8	Cutless rubber bearing (25 mm) . . .	992a	31	Coupl. adaptor (GG)	2G82w
10	Stern wood screw . . .	91L		Coupl. adaptor (G) .	G82w
11	Nut (1/2") . . . . .	491c	32	Bolt (1973-GG) (3/8" UNC×1½") . . .	435a
12	Lock nut . . . . .	592g		Bolt (G) (5/16" UNC×1") . . .	421k
13	Gland . . . . .	B92g	33	Lock nut (3/8" Nyloc)	415i
14	Stuffing box packing (1/4") . . . . .	841e	34	Set screw (1/2") . . . .	482i
15	Stuffing box . . . . .	2H91FB	35	Lock washer . . . . .	735b
16	Stuffing box greaser cup No. 4 . . . . .	982b	36	Bolt (7/16" UNF×70)	





**Group 600. WATER PIPES (See fuel oil pipe, page 48 and 79)**

No.	Part Name	Part No.	No.	Part Name	Part No.
1	Water suction pipe, complete . . . . .	S-662b	8	Hose, cylinder head-silencer ( $\frac{1}{2}$ " $\times$ 150) ..	869dd
2	Water pressure pipe, complete . . . . .	S-623a	8a	Hose, cylinder head-silencer, uncooled silencer . . .	S1-869dd-G
3	Wet exhaust pipe, compl. Danm./UK ..	S-621c	9	Pipe bend . . . . .	642eb
3a	Water pipe, cylinder head-silencer, compl. .	S-621d	10	Pipe bend . . . . .	642e
4	Water discharge pipe ( $\frac{3}{8}$ " ) . . . . .	S-662e	11	Pipe nut . . . . .	511b
5	Water suction hose ( $\frac{1}{2}$ " $\times$ 400) . . . . .	869d	12	Pipe collar . . . . .	711c
5a	Water suction hose, complete . . . . .	S1-869d	13	Pipe nut ( $\frac{3}{8}$ " BSP) .	553c
6	Water pressure pipe, complete . . . . .	S-623af	14	Solder ring . . . . .	565c
7	Hose, double pump-exhaust ( $\frac{1}{2}$ " $\times$ 200) .	869db	15	Hose nipple ( $\frac{1}{2}$ " ) ..	569a
7a	Hose, double pump-exhaust . . . . .	S1-869db-G	16	Hose clip (O-Clip 20/23) . . . . .	969e
			17	Reducing nipple ( $\frac{1}{2}$ " BSP $\times$ $\frac{3}{8}$ " BSP) .	521i
				(NOTE! 5a, 6 and 7a are for extra water pump Gr. G 42—2.)	

**SPARES FOR FUEL FILTER (engines before January 1988)**

<b>78</b>	54 Bolt, filterhouse	942042	58 Filter house gasket	826020
	55 Copper washer	831025	59 Filter element G67I	001454
	56 Bleeder plug	942041		
	57 Gasket, bleeder plu	825036		

## SUPPLEMENTARY

### Group G 44. FUEL INJECTION EQUIPMENT (cont. from page 49)

No.	Part Name	Part No.	No.	Part Name	Part No.
19	Fuel filter bolt . . . .	G67ak	35	Leak-off pipe injector-filter, complete starboard . . . . .	S-653fc
20	Gasket, filter bolt . . .	867i	36	Banjo nipple (NW3 NR V 61/2x) .	953g
21	Fuel filter nipple (1/4" BSP×M14) . . .	545db	37	Pipe nut (1/4" BSP) ..	553b
22	Fuel tank, stainless steel, without cocks (42 litres) . . . . .	S1-B63bb	38	Solder sleeve . . . . .	522c
23	Fuel tank cap . . . . .	63hk	39	Filter inj. pump hose (starboard) . . . . .	844ae
24	Fuel tank cock, compl.	S-61a	40	Fuel tank pipe, compl. (5/16"×1700) . . . . .	S-663b
25	Fuel tank cock . . . . .	61b	41	Pipe nut (1/4") . . . . .	553g
26	Fuel tank cock washer . . . . .	61c	42	Solder ring . . . . .	563b
27	O-ring . . . . .	861a	60	Deck filler with cap .	S1-63G
28	Pin . . . . .	552b	61	Slangeklemme (45—48 mm) . . . . .	962gd
29	Fuel drain cock, complete . . . . .	S-52ib	62	Hose (1 1/2"×300) . . .	891j
30	Fuel drain cock . . . . .	52jb	63	Screw . . . . .	
31	Injection pipe, compl.	S-653d	64	Bleeder hose (2,5 m) .	842.002
32	Injection pipe nut . . .	453m	65	Filter holder . . . . .	2H67c
33	Injection pipe collar .	453n	66	Bolt (5/16" UNC×20)	434c
34	Inj. pipe clamp and rubber . . . . .	753jb			

### Group G 91. VARIABLE PITCH PROPELLER

#### Repleacing Driving Block (cont. from page 75)

Apply ACTIVATOR T to the clean threads on shaft and in block. Wait until activator has evaporated and apply a thin cover of LOCTITE 307 evenly to the threads on shaft and in block. Use a clean brush.

Fit the driving block at once. (Note: Correct way, see sketch, measures 11 mm. to fore edge), and tighten firmly with a big spanner.

The driving block for fully feathering propeller is fitted (Note: Correct way, measures 14 mm. to fore edge) without its two taps G91dk. When the block has been fitted, broach through holes (3/8" dia.) and insert the taps.

Allow to cure for 1—4 hours at room temperature. Careful heating of the shaft end to max. 120°C (248°F) for 10 minutes will speed up cure. Allow longer cure at lower temperatures.

If the shaft is fitted in the boat immediately after the block has been glued, and the boat is launched, permit the resin to cure for 4 hours before starting the engine.

## IRREGULAR ENGINE OPERATION

### Faults Location Chart

#### 1. THE ENGINE WILL NOT START

- a. Fuel control not wide open (in full speed position).
- b. Too low cranking speed.
- c. Humid or defective starting cigarette, or dry cylinder. Squirt some lub.oil into cylinder through lub.oil starting tube 4—6 shots with the squirt can. Page 22.
- d. Water in fuel oil.
- e. Injection not good. Page 21. Check nozzle, page 49.

#### 2. LACK OF COMPRESSION

- a. Check valve tappet clearance, page 37.
- b. Valve sticking. To loosen, squirt mixture of lub.oil and fuel through springs to lubricate valve stem. Check valve movement by hand.
- c. Valve leaking. Listen for leakage while turning engine by hand. If blow-by, remove cylinder head to clean and lap valve seats. Page 37.
- d. Check adjustment of decompressor. Page 27.
- e. Check cylinder and piston ring wear. Page 29.

#### 3. THE ENGINE IS HARD TO CRANK

- a. Too heavy lubricating oil. Page 13.
- b. Bent propeller shaft. Check flange coupling. Page 9.

#### 4. LACK OF POWER

- a. Fuel oil filter clogged. Change element. Page 17.
- b. Air in fuel system. Page 18.
- c. Dirty injector nozzle. Page 49.
- d. Clutch slipping. Page 65.
- e. Incorrect valve tappet clearance. Page 37.
- f. Exhaust pipe clogged.  
Rubber exhaust pipe collapsed due to overheating.
- g. Lack of compression. See above.

#### 5. ENGINE STOPS

- a. Lack of fuel. Fuel tank cock closed. Fuel filter clogged.
- b. Air or water in the fuel system. Page 18.
- c. Injection pipe leaking.
- d. Rope in propeller.
- e. Lack of lubricating oil.
- f. Seized piston due to overheating or lack of lub.oil. Let the engine cool down before turning to check compression. Start again and slowly load the engine.

## 6. SMOKY EXHAUST

- a. Injector nozzle choked. Page 49.
- b. Worn piston rings and poor compression.
- c. Engine overloaded with too heavy propeller pitch Page 9.
- d. Valves leaking. Page 37.
- e. Air intake clogged.
- f. Unsuitable fuel or lubricating oil. Page 17 and 13.

## 7. UNEVEN RUNNING (GOVERNOR "STUTTERING")

- a. Fuel pump rack or governor parts sticking. Remove the governor cover and clean internal parts. Page 47.

## 8. ENGINE STOPS WHEN IDLING

- a. Leaky valves. Page 80, 2c.
- b. Injector nozzle clogged. Page 49.
- c. Remote governor control wire too slack at engine side.
- d. Idling spring too weak. Page 47.
- e. Fuel filter clogged. Page 18
- f. Fuel tank pipe long and narrow or tank located too low.

## 9. EXCESSIVE LUBRICATING OIL CONSUMPTION

- a. Test first the breather valve in starting bracket foot. Page 39.
- b. Defect oil seal. Check vibration damper oil seal and clutch housing oil seal. Page 31 and 67.
- c. Defect oil control ring on piston. Replace. In difficult cases a "super oil control ring" could be fitted. Contact the factory or the Service Shop.
- d. If oil level sinks in crankcase and rises in clutch housing, the reason could be blow-by in cylinder. Check cylinder and piston rings. Page 29. A leaky oil seal in the gear housing (Gr. 30—2, Pos. 19).

## 10. ENGINE KNOCKING

- a. Injector nozzle clogged or leak-off pipe not open. Page 49.
- b. Engine cold. Check water temperature.
- c. Mechanical defects. Check valves, big-end bearings and crankpins.

## 11. ENGINE HOT OR WATER PUMP NOT IN ORDER

- a. Water inlet or water valves clogged. Clean.
- b. Defective water pump diaphragm. Replace.
- c. Engine compartment too hot.
- d. For fresh water cooled engine. See page 19—20.

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- d. For fresh water cooled engine. See page 19—20.

## 12. KNOCKING SOUND FROM CLUTCH OR PROPELLER

- a. Lack of grease for sliding bolts. Page 65.
- b. Lack of grease in propeller. Page 16.
- c. Shaft coupling loose. Check bolts and pinching screws.
- d. If stern is too thick, propeller rotates air in deadwater. The stern post should be sharpened to allow free flow of water to propeller.

## 13. PITCH CONTROL HEAVY TO OPERATE

- a. Lack of grease in propeller. Page 16.
- b. Bent propeller shaft.
- c. Propeller hurt.
- d. Propeller shaft wear at stuffing box.
- e. Propeller thrust rings worn. Replace.

## 14. CLUTCH SLIPPING

- a. Clutch not properly engaged. Press clutch handle *fully* forward.
- b. Clutch needs adjustment. Page 65.

## 15. REVERSE GEAR CLUTCH SLIPPING

- a. Gear operating lever not free to move, stops against engine case, flooring etc.
- b. Propeller shaft bent. Check alignment of engine. Page 9 and 75.
- c. Too much lub.oil in reverse gear. Page 16.
- d. Shaft coupling set screws not properly tightened.

SNITTEGNING AV REGULATUR. SABB DIESEL, TYPE G  
CUT AWAY VIEW OF GOVERNOR

REGULATORHENDEL BEVEGELSE  
 GOVERNOR HANDLE MOVEMENT

REGULATORLODD  
 GOVERNOR WEIGHT

REGULATORFJÆR  
 GOVERNOR SPRING

FULL KRAFT STILLING  
FULL LOAD SETTING

TOMGANGSFJÆREKSENTER  
 IDLING SPRING ECCENTRIC

ANSLAGSSKRUE  
 GOVERNOR ADJUSTING SCREW

TOMGANGSFJÆR  
 IDLING SPRING

BRENNSTOFFPUMPEMELLOMLEGG  
 INJECTION PUMP WASHERS

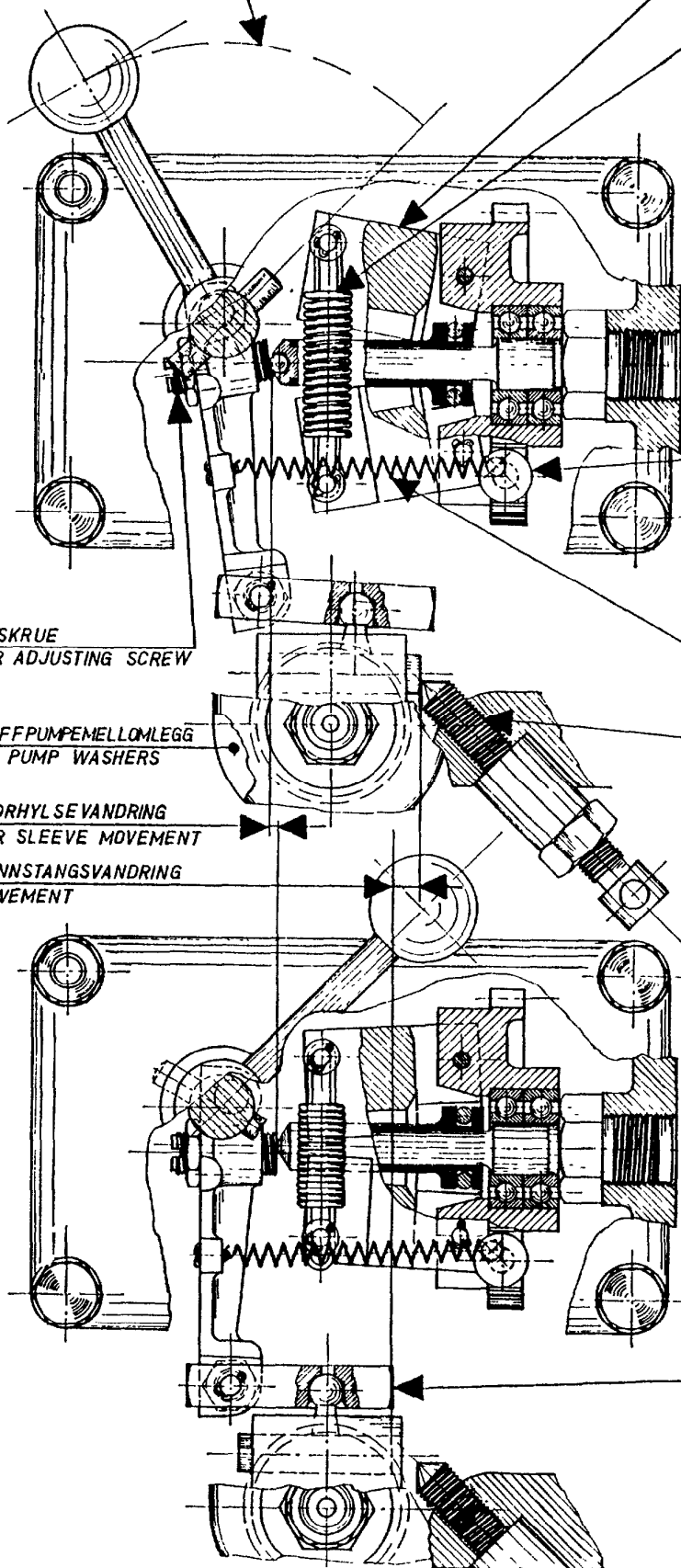
STILLSKRUE  
 STOP SCREW

REGULATORHYLSEVANDRING  
 GOVERNOR SLEEVE MOVEMENT

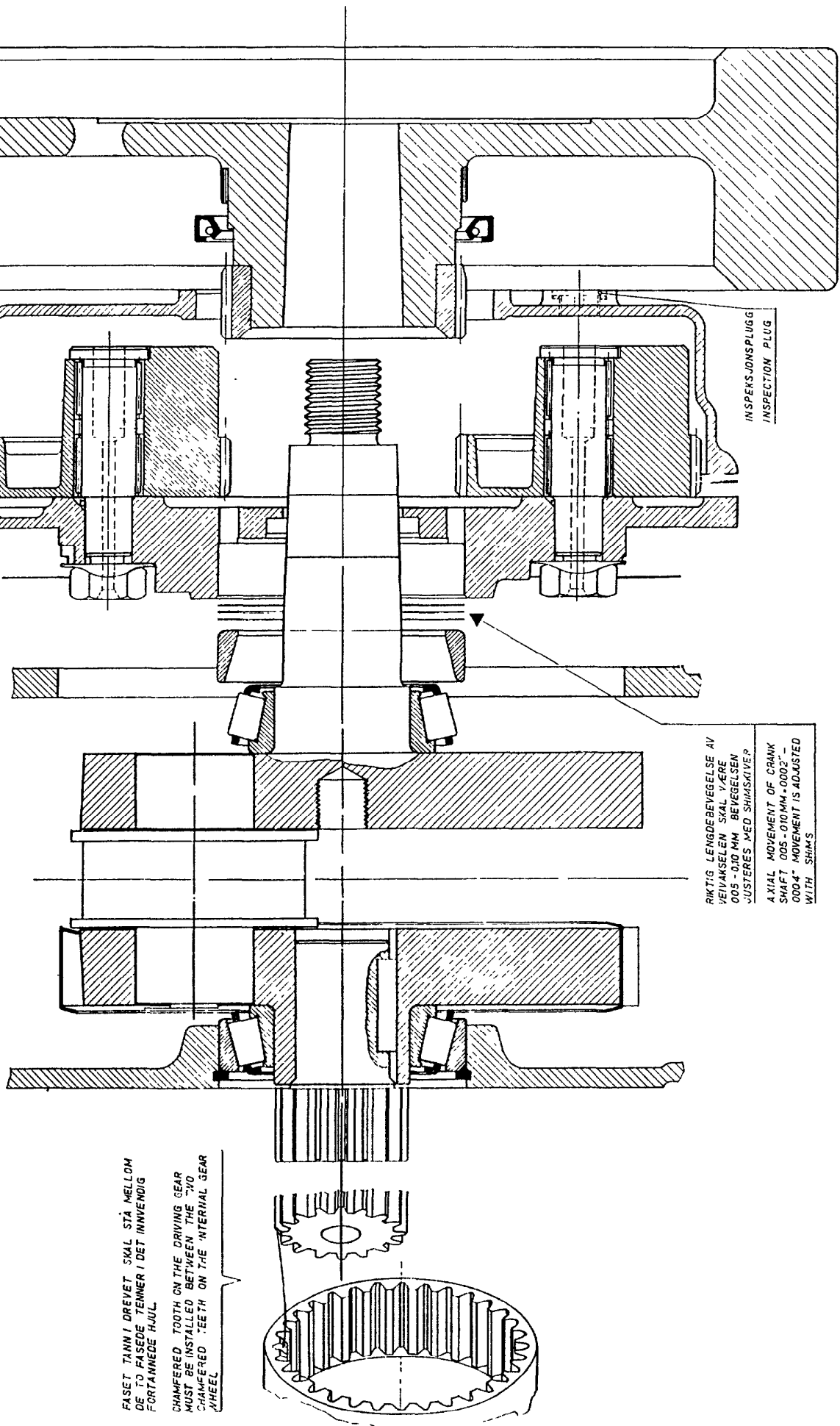
PUMPE TANNSTANGSVANDRING  
 RACK MOVEMENT

TOMGANGSTILLING  
IDLING SPEED SETTING

ARMLEDD  
 ARM



SNITT AV DRIVERKSDLELER  
EXPANDED VIEW OF DRIVING COMPONENTS  
SABB DIESEL TYPE G

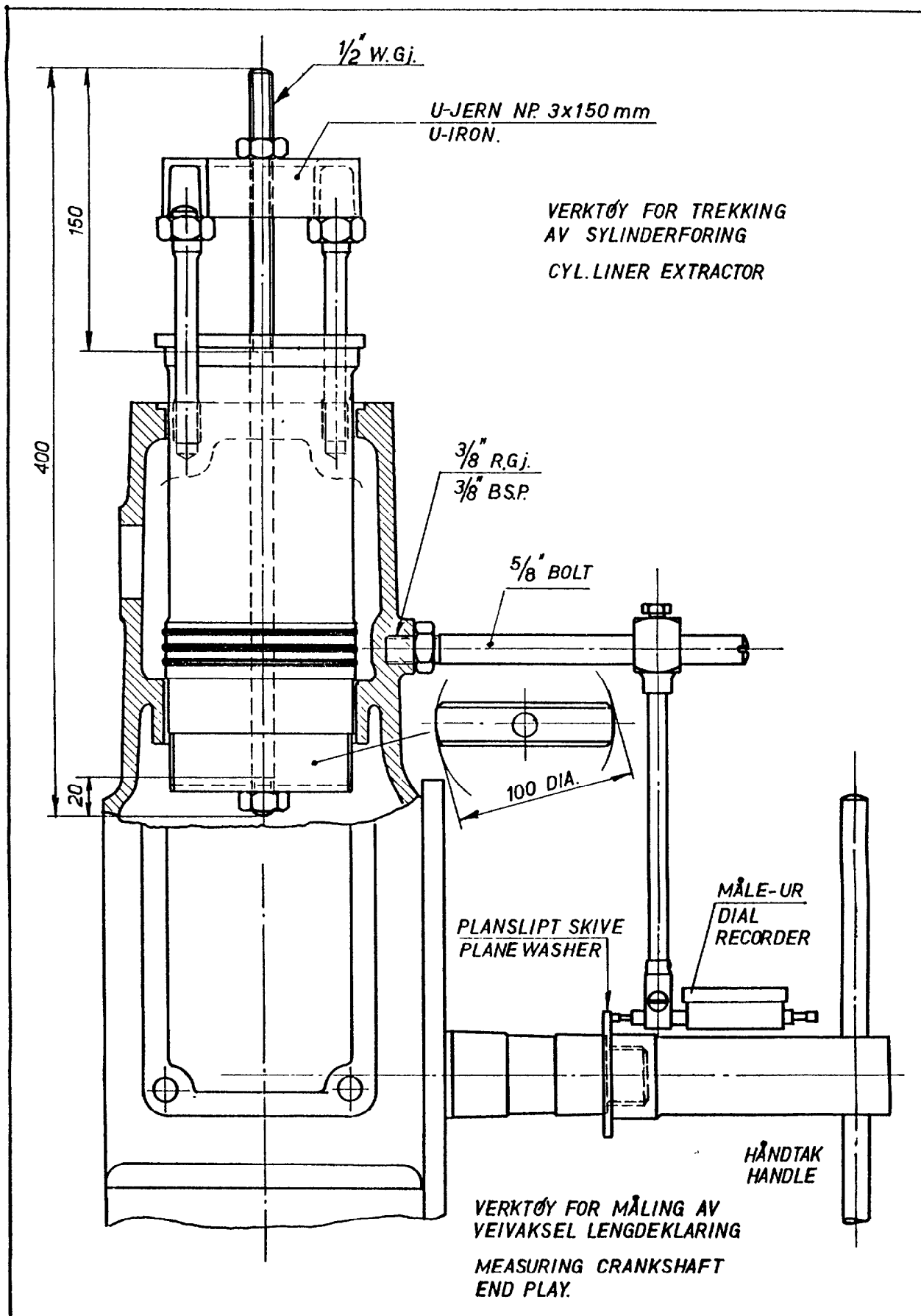


FASET TANN I DREVET SKAL STA MELLOM DE TO FASEDE TENNER I DET INNVENDIG FORTANNEDE HJUL.  
 CHAMFERED TOOTH ON THE DRIVING GEAR MUST BE INSTALLED BETWEEN THE TWO CHAMFERED TEETH ON THE INTERNAL GEAR WHEEL.

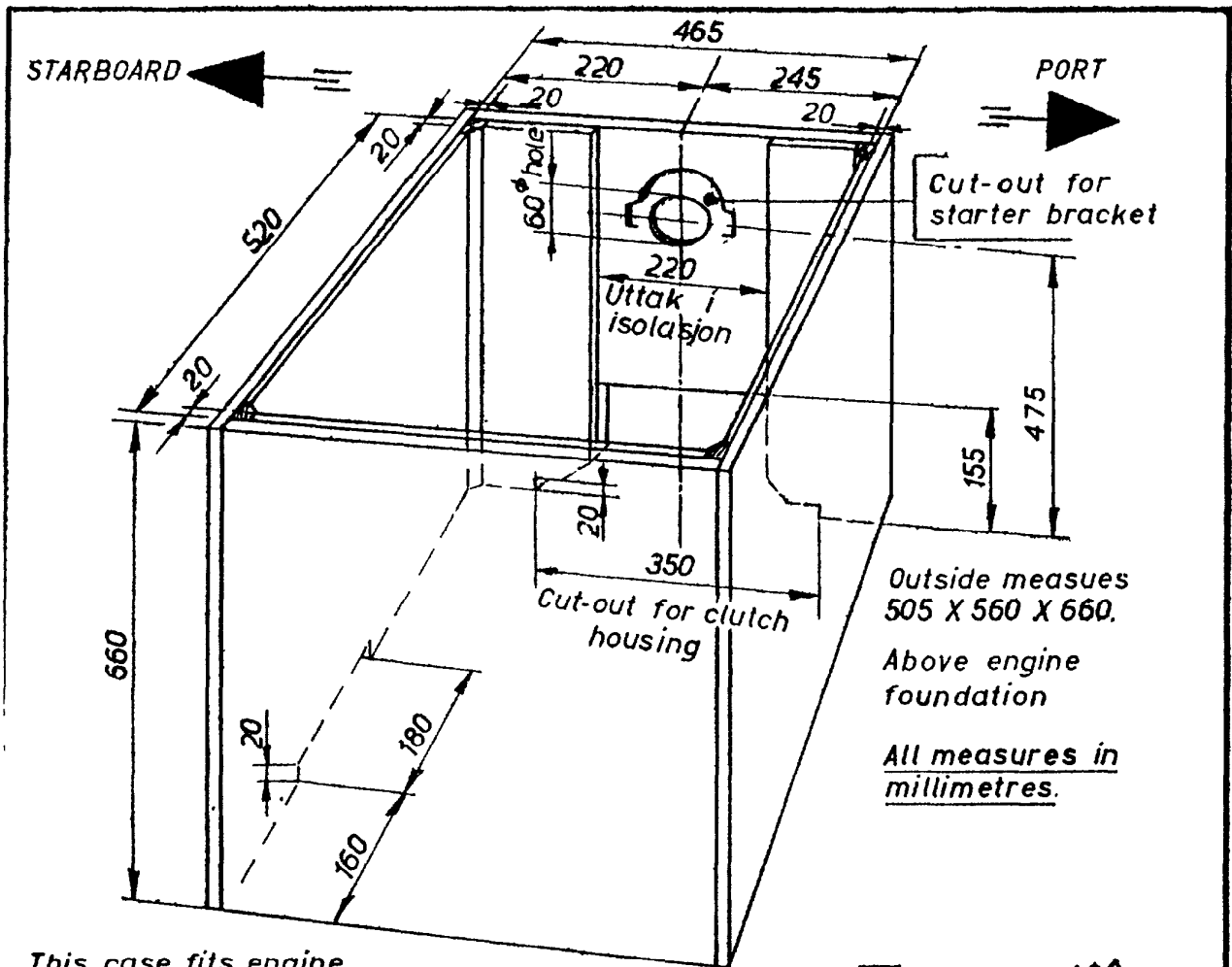
RIKTIG LENGDEBEVEGELSE AV VEIVAKSELEN SKAL VÆRE 005 - 010 MM BEVEGELSEJUSTERES MED SHIMS/SHIMMER.  
 A XIAL MOVEMENT OF CRANK SHAFT 005 - 010 MM - 0003" - 0004" MOVEMENT IS ADJUSTED WITH SHIMS.

INSPESJONSPLUGG  
 INSPECTION PLUG



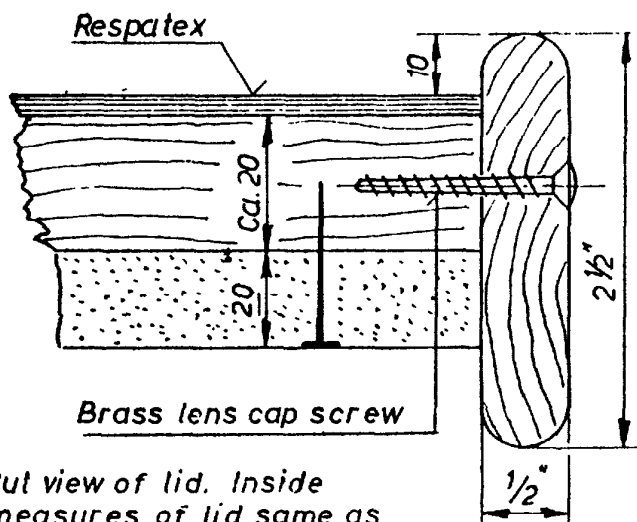


**SPECIAL TOOL (millimetres). Scale 1:3**



This case fits engine with alternator. If bilge pump, increase width (to port) by 35 mm, and length by 35 mm.

1" Heavy wood, oak, teak or mahogany

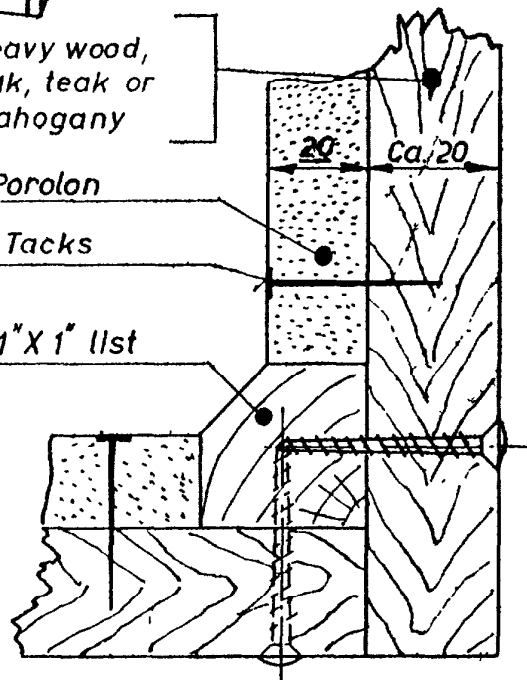


Cut view of lid. Inside measures of lid same as outside measure of case

Porolon

Tacks

1" X 1" Ilst



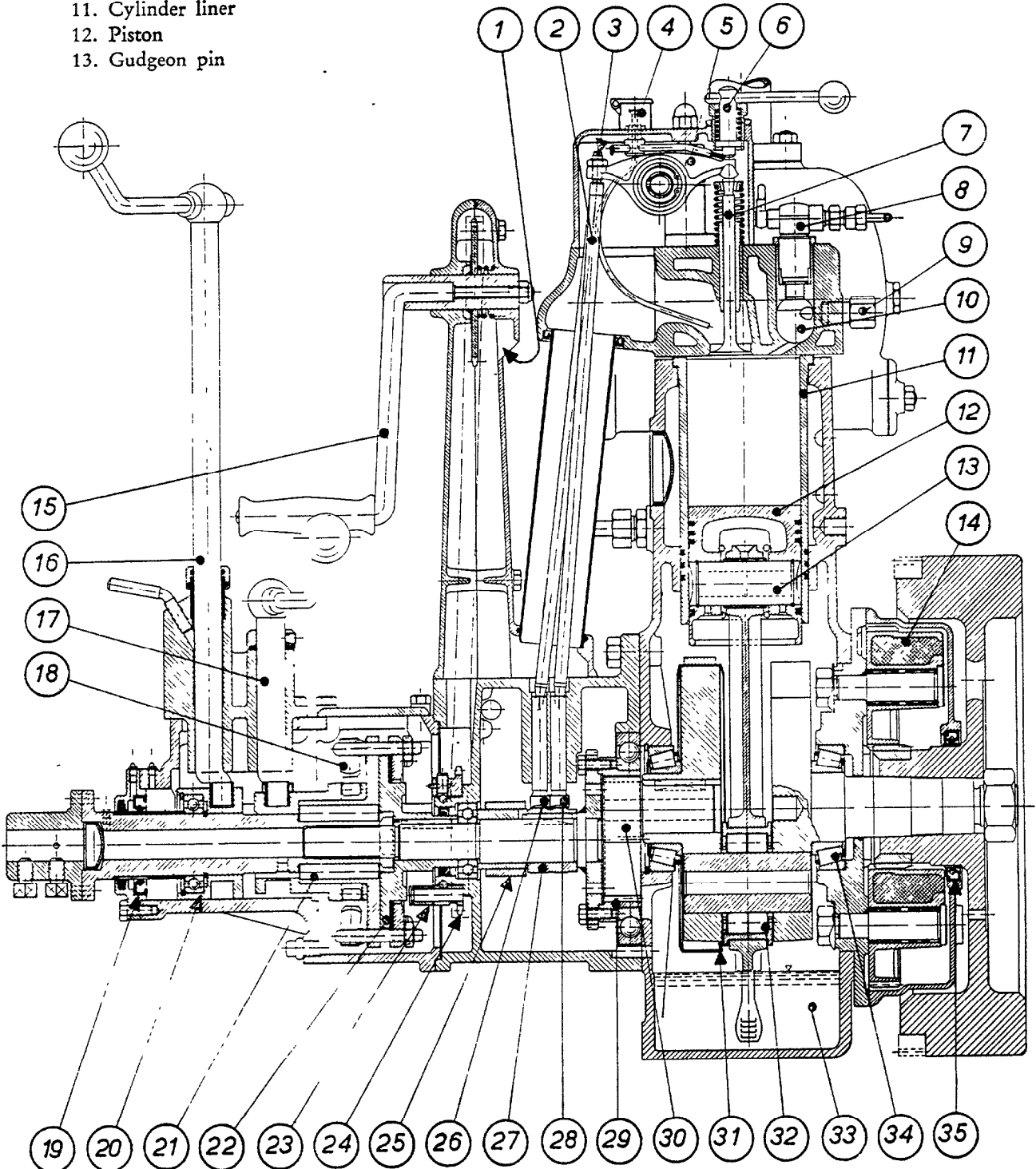
Cut view of corner

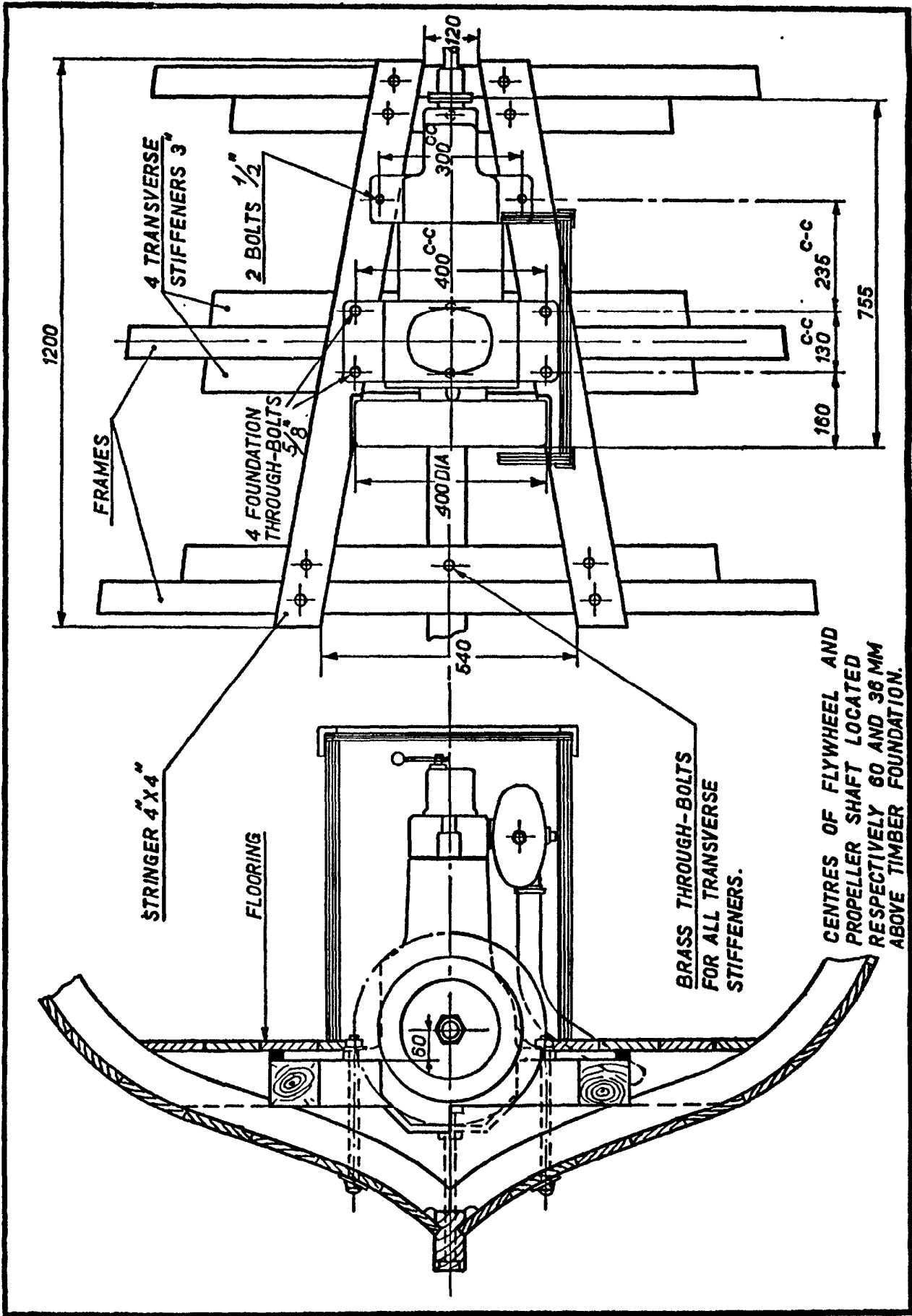
### NOISE DAMPENING ENGINE CASE



## LONGITUDINAL SECTION OF SABB DIESEL, 10 HP MODEL G

- |                                      |                                |                             |
|--------------------------------------|--------------------------------|-----------------------------|
| 1. Air inlet                         | 14. Vibration damper           | 25. Water pump eccentric    |
| 2. Push rod                          | 15. Starting crank             | 26. Valve lifter, exhaust   |
| 3. Rocker arm, adj. screw            | 16. Propeller control crank    | 27. Cam                     |
| 4. Valve lub. cup and start oil tube | 17. Clutch control crank       | 28. Valve lifter, inlet     |
| 5. Rocker arm                        | 18. Clutch arm                 | 29. Internal gear wheel     |
| 6. Decompressor                      | 19. Rear seal (double)         | 30. Crankshaft pinion       |
| 7. Inlet valve                       | 20. Pitch control ball bearing | 31. Centrifugal filter      |
| 8. Injector                          | 21. Sliding bolt               | 32. Big end roller bearing  |
| 9. Starting cigarette plug           | 22. Clutch                     | 33. Sump                    |
| 10. Swirl chamber                    | 23. Starting pawl              | 34. Tapered roller bearings |
| 11. Cylinder liner                   | 24. Starting sprocket          | 35. Front oil seal          |
| 12. Piston                           |                                |                             |
| 13. Gudgeon pin                      |                                |                             |





# **SABB MOTOR A.S**

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### **GREAT BRITAIN:**

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