

U.S.C.G. Merchant Marine Exam  
Third Assistant Engineer, Unlimited  
Q532 Motor Plants II  
(Sample Examination)

**Choose the best answer to the following Multiple Choice Questions.**

1. Which operating parameter may need to be decreased when running a large main propulsion diesel engine at low load conditions?

- (A) Cooling water flow through after coolers
- (B) Control air supply pressure
- (C) Lube oil temperature
- (D) Fuel injection pressure

*If choice A is selected set score to 1.*

2. What prevents the thrust bearing blocks shown in the illustration from rotating within the housing?  
Illustration MO-0120

- (A) The bearing blocks are massive and their weight provides sufficient force to prevent rotation.
- (B) Found within the thrust bearing cap or cover are extended protrusions to position the thrust shoe segments and maintain minimum clearance.
- (C) The bearing assembly is specifically designed to allow for rotation, permitting the transmittal of axial forces across a greater surface area and minimizing loading densities.
- (D) The thrust shoes are dovetailed into the collar.

*If choice B is selected set score to 1.*

3. Surface irregularities, such as erosion and pitting on injection pump plungers, will \_\_\_\_\_.

- (A) increase ignition delay
- (B) affect fuel oil metering
- (C) affect engine performance at low-speed only
- (D) disappear due to fuel oil abrasion

*If choice B is selected set score to 1.*

4. Why should the main steam stop valve of an auxiliary boiler be eased off its seat and then gently closed before lighting off?

- (A) To examine the valve stem for scars or nicks.
- (B) To check for a tight bonnet seal.
- (C) To ensure that the valve will not be seized shut when hot.
- (D) To check the valve packing.

*If choice C is selected set score to 1.*

5. As shown in the illustration, the component labeled "F" would be identified as a \_\_\_\_\_.  
Illustration MO-0128

- (A) main condensate pump
- (B) fuel oil service pump
- (C) boiler water feed pump
- (D) waste heat boiler circulating pump

*If choice C is selected set score to 1.*

6. Some diesel engines are fitted with a thermometer in the cooling water outlet from each cylinder. If the cooling water temperature from all cylinders begins to rise above normal, you should suspect \_\_\_\_\_.

- (A) insufficient fuel delivery to all cylinders
- (B) increased blow-by in all cylinders
- (C) incomplete combustion in all cylinders
- (D) overloading in all cylinders

*If choice D is selected set score to 1.*

7. The governor, shown in the illustration, will have its preset speed droop altered whenever \_\_\_\_\_. Illustration MO-0092

- (A) the compensating lever fulcrum is changed
- (B) the speed droop lever fulcrum is changed
- (C) the speeder spring tension is changed
- (D) all of the above

*If choice B is selected set score to 1.*

8. Which of the following statements describes the operation of the circuit shown in the illustration?  
Illustration MO-0114

- (A) The output of "2" will always be less than the input at "1" by 0.35 bar (35 kPa), to prevent engine damage due to operation in the critical speed range.
- (B) A gradual rise of the input signal to "1" will cause a multiple stepped output from "2" proportional to the input signal.
- (C) The output signal from "2" will be equal to the set point of "17A" only when the input is less than the set point of "17B", permitting the transition signal to become modulated.
- (D) The output from "2" is equal to the input to "1" except when the input of "1" is between the set points of "17A" and "17B", when it will remain at the value of "17A".

*If choice D is selected set score to 1.*

9. When would the available energy of the exhaust gases of a two-stroke cycle diesel engine be insufficient to drive an exhaust gas turbocharger, resulting in the incorrect amount of air for combustion?
- (A) During acceleration
  - (B) During operation at low load and speed
  - (C) During operation at rated speed, but low power output
  - (D) All of the above

*If choice D is selected set score to 1.*

10. The device used to limit engine torque at various engine speeds is called a \_\_\_\_\_.

- (A) speed limiting governor
- (B) variable speed governor
- (C) constant speed governor
- (D) load limiting governor

*If choice D is selected set score to 1.*

11. After removing the bowl hood of the device shown in the illustration, excessive quantities of sludge are visible. Which of the following statements represents the approach to rectify the situation?  
Illustration MO-0112

- (A) Disassemble the entire unit, clean all components, replace all defective discs and use the proper lubricant where required.
- (B) Steam clean the components in place, check for proper alignment, using the match marks provided, reassemble and restart the unit.
- (C) Remove only the disc stack, separate all the discs, clean with steel wool and solvent, replace the disc stack ensuring it is located by use of the dowel pin shown.
- (D) Disassemble the entire unit, clean all components, replace any defective gaskets and use the proper lubricants where required.

*If choice D is selected set score to 1.*

12. White smoke issuing from the exhaust of an auxiliary diesel engine could mean \_\_\_\_\_.

- (A) the engine is overloaded
- (B) the engine is cold
- (C) there is too much lube oil in the cylinders
- (D) the turbocharger is fouled

*If choice B is selected set score to 1.*

**13.** The rate of heat transfer in a water-tube auxiliary boiler can be increased by \_\_\_\_\_.

- (A) operating the boiler at less than normal water level
- (B) installing fins on the firesides of water-tubes
- (C) increasing the amount of excess air to the burners
- (D) treating the boiler water with chemical oxygen scavengers

*If choice B is selected set score to 1.*

**14.** Which of the turbo charging systems listed operates with the least average back pressure in the exhaust manifold?

- (A) Constant volume
- (B) Constant pressure
- (C) Pulse pressure
- (D) Radial flow

*If choice C is selected set score to 1.*

**15.** What occurs within the tubes of the device labeled "23" shown in the illustration? Illustration MO-0111

- (A) The feed water flowing through the inside of the tubes is being heated by the jacket water on the outside of the tubes.
- (B) The heat from the jacket water passing within the tubes is being transferred to the feed water on the outside of the tubes.
- (C) The heat of combustion from the engine is being transferred azeotropically, adding latent heat to the entering jacket water.
- (D) The heat being transferred is subliminal; therefore expansion is taking place within the tubes.

*If choice A is selected set score to 1.*

**16.** In the common rail system, excessive pressure in the header may be caused by \_\_\_\_\_.

- (A) improper adjustment of the bypass valve
- (B) a dribble in the fuel injection nozzle
- (C) insufficient leak off through injection nozzle packing
- (D) a malfunctioning injection nozzle

*If choice A is selected set score to 1.*

**17.** Before being shut down, a diesel engine should idle a few minutes in order to \_\_\_\_\_.

- (A) prevent governor surging at shutdown
- (B) make sure the fuel nozzles are flushed clean
- (C) prevent pressure buildup in the fuel lines
- (D) prevent damage from localized overheating

*If choice D is selected set score to 1.*

**18.** Adjustments to the compensating needle valve in a hydraulic governor should be made with the engine at \_\_\_\_\_.

- (A) maximum power at a normal load
- (B) maximum power and load under normal conditions
- (C) half-speed and normal temperature
- (D) normal operating temperature without a load

*If choice D is selected set score to 1.*

**19.** The outlet from an expansion tank of a closed fresh water cooling system should be piped to the \_\_\_\_\_.

- (A) cylinder jacket inlet main
- (B) heat exchanger inlet connection
- (C) jacket water pump suction line
- (D) cylinder head water outlet header

*If choice C is selected set score to 1.*

**20.** Control of the fuel oil metering valve in an automatically fired auxiliary boiler is accomplished by a \_\_\_\_\_.

- (A) pressure magnifying device in the steam coil outlet
- (B) steam pressure sensing device with linkage to the damper air vanes
- (C) metering device in the air supply line
- (D) signal from the feed water electrode

*If choice B is selected set score to 1.*

**21.** Auxiliary boilers are divided into several classifications, one of which is \_\_\_\_\_.

- (A) water-tube supercritical circulation
- (B) water-tube forced circulation
- (C) fire-tube controlled circulation
- (D) fire-tube express circulation

*If choice B is selected set score to 1.*

**22.** A variable capacity, pressure atomizing, fuel oil burner functions to \_\_\_\_\_.

- (A) maintain a constant fuel temperature
- (B) provide a wide range of combustion
- (C) provide a constant fuel return pressure
- (D) maintain smokeless fuel oil atomization

*If choice B is selected set score to 1.*

**23.** Load control on a diesel engine is accomplished by \_\_\_\_\_.

- (A) regulating the speed of the turbocharger
- (B) regulating the amount of fuel admitted to the engine
- (C) regulating the speed of the fuel oil transfer pump
- (D) changing engine timing

*If choice B is selected set score to 1.*

**24.** Combustion gas venting through the expansion tank can be caused by a \_\_\_\_\_.

- (A) leaking oil cooler
- (B) cracked cylinder head
- (C) worn piston ring
- (D) leaking exhaust valve

*If choice B is selected set score to 1.*

**25.** While operating the fuel oil centrifuge shown in the illustration, the bowl fails to open for sludge ejection. The probable cause is that \_\_\_\_\_. Illustration MO-0012

- (A) one or more of the sludge ports is partially clogged
- (B) the operating water pressure is too high
- (C) the bowl disk set is clogged
- (D) the seal ring on the operating slide is defective

*If choice D is selected set score to 1.*

**26.** Which type of pump is typically used to supply fuel to a unit type auxiliary boiler?

- (A) Centrifugal
- (B) Propeller
- (C) Reciprocating
- (D) Rotary

*If choice D is selected set score to 1.*

**27.** In a two-stroke cycle diesel engine, a Roots-type blower is usually \_\_\_\_\_.

- (A) gear driven by the engine
- (B) driven by an exhaust gas turbine
- (C) actuated by the intake valves
- (D) driven by separate motor

*If choice A is selected set score to 1.*

**28.** Which of the following effects will excessively cold lube oil have on the operation of a diesel engine?

- (A) The engine will crank slowly and may fail to start.
- (B) The engine will over speed when started.
- (C) The fuel oil supply will become diluted resulting in rough running.
- (D) The cooling system will overheat causing the engine to stall.

*If choice A is selected set score to 1.*

**29.** If the relief valve on a diesel engine cylinder lifts, the cause could be due to \_\_\_\_\_.

- (A) liquid in the cylinder
- (B) low compression in the cylinder
- (C) high exhaust temperature
- (D) poor fuel penetration

*If choice A is selected set score to 1.*

**30.** If a tube ruptures in a water-tube auxiliary boiler due to low water, you should \_\_\_\_\_.

- (A) secure the fires and maintain feed water to boiler to keep up the water level
- (B) not secure the fires until water level falls out of sight in the gage glass
- (C) secure both the fires and the feed inlet valve
- (D) secure the fires when the pressure drops to 50% of the maximum allowable working pressure

*If choice C is selected set score to 1.*

**31.** Item labeled "R" as shown in section 6 of the illustration is identified as the \_\_\_\_\_. Illustration MO-0025

- (A) after cooler
- (B) non-return scavenge valve
- (C) air filter
- (D) exhaust manifold

*If choice A is selected set score to 1.*

**32.** Which of the following actions takes place in the control circuit of an automatically fired auxiliary boiler when the desired steam pressure is obtained?

- (A) A temperature sensing device opens the circuit breaker in the burner motor.
- (B) The high limit control secures power to the entire oil firing system.
- (C) The stack relay actuates the low limit control which breaks the ignition circuit.
- (D) The stack relay secures power to the high voltage side of the ignition transformer.

*If choice B is selected set score to 1.*

**33.** Which of the following statements describes the approximate relation between the feed water entering the unit shown in the illustration and brine being removed? Illustration MO-0111

- (A) Seventy-five percent of the feed water entering the unit is removed as brine.
- (B) The brine will be removed at a faster rate than feed water entering to prevent the possibility of flooding.
- (C) Twenty-five percent of the feed water entering the device is removed as brine.
- (D) The amount of feed water entering the distiller is dependent upon the condition of device "7", while the amount of brine leaving is dependent upon the condition of device "21".

*If choice A is selected set score to 1.*

**34.** The principal characteristic of an isochronous governor is it will \_\_\_\_\_.

- (A) slow the machine down as the load is increased
- (B) shut down the engine if it over speeds
- (C) display excessive speed droop
- (D) maintain a constant speed with variations of load

*If choice D is selected set score to 1.*

**35.** In an auxiliary diesel engine, one reason for knurling the piston skirt is to \_\_\_\_\_.

- (A) improve skirt lubrication
- (B) allow for heat expansion
- (C) transmit forces evenly
- (D) improve the piston seal

*If choice A is selected set score to 1.*

**36.** In the engine shown in the illustration, the part labeled "W" is cooled by \_\_\_\_\_. Illustration MO-0003

- (A) lube oil
- (B) convection
- (C) air
- (D) sea water

*If choice D is selected set score to 1.*

**37.** Exhaust pipes for separate main propulsion diesel engines can be combined only when \_\_\_\_\_.

- (A) space limitations prevent separately run pipes
- (B) the engines are small auxiliary units
- (C) they are arranged to prevent gas backflow to each engine
- (D) a waste heat boiler is installed

*If choice C is selected set score to 1.*

**38.** A waste heat boiler is installed on some diesel propelled vessels to \_\_\_\_\_.

- (A) provide steam for emergency propulsion
- (B) provide steam for the turbo-generator
- (C) provide steam for heating waste water tanks
- (D) provide steam for warming engines

*If choice B is selected set score to 1.*

**39.** Cooling the intake air supplied to a diesel engine will \_\_\_\_\_.

- (A) reduce mean effective pressure
- (B) decrease average compression ratio
- (C) decrease air charge density
- (D) increase peak power output

*If choice D is selected set score to 1.*

**40.** Which of the following statements would apply when checking the valve clearance of the unit shown in the illustration? Illustration MO-0074

- (A) Tappet clearance is measured between points "A" and "B".
- (B) Cold valve clearance is measured between components "C" and "D".
- (C) The valve is mechanically adjusted at point "D".
- (D) The valve is mechanically adjusted at point "E".

*If choice B is selected set score to 1.*

**41.** The power consumed during the scavenging process of a diesel engine is known as the \_\_\_\_\_.

- (A) compression loss
- (B) valve loss
- (C) back pressure loss
- (D) pumping loss

*If choice D is selected set score to 1.*

**42.** The insertion of shims between the foot of a marine type connecting rod and a bearing box would result in \_\_\_\_\_.

- (A) increased compression ratio
- (B) decreased compression ratio
- (C) increased bearing clearance
- (D) decreased bearing clearance

*If choice A is selected set score to 1.*

**43.** Which of the following statements is correct regarding a turbocharged four-stroke cycle diesel-generator?

- (A) At zero load the intake manifold pressure is greater than the exhaust manifold pressure.
- (B) At full load the intake manifold pressure and exhaust manifold pressure are equal.
- (C) At full load the intake manifold pressure is less than the exhaust manifold pressure.
- (D) At full load the intake manifold pressure is greater than the exhaust manifold pressure.

*If choice D is selected set score to 1.*

**44.** If a hydraulic governor has been refilled with oil, the engine should be operated until it reaches normal temperature, then the air should be purged, and the \_\_\_\_\_.

- (A) rack position should be adjusted
- (B) compensating needle valve should be opened fully
- (C) compensating needle valve should be adjusted to stabilize operation
- (D) speed limiting device should be adjusted

*If choice C is selected set score to 1.*

**45.** After a long period of operation, a wear ridge, caused by piston ring action, will develop near the top of the cylinder liner. This ridge must be removed during maintenance in order to prevent \_\_\_\_\_.

- (A) excessive ring wear during the seating period
- (B) excessive lubrication of the top ring
- (C) improper coating of lubrication on the cylinder wall
- (D) breaking of the rings, ring lands, or both during piston removal

*If choice D is selected set score to 1.*

**46.** The most common cause of scale formation in an auxiliary boiler is \_\_\_\_\_.

- (A) concentrations of calcium sulfate in the boiler water
- (B) fuel oil in the feed water
- (C) improper treatment of the feed water with calcium sulfate
- (D) excessive feed water alkalinity

*If choice A is selected set score to 1.*

**47.** The direct acting mechanical governor used with some small diesel engines, controls fuel flow to the engine by \_\_\_\_\_.

- (A) governor flyweight action on a pilot valve which controls fuel injection
- (B) governor flyweight motion acting on fuel controls through suitable linkage
- (C) positioning a butterfly valve in the fuel delivery system
- (D) positioning a servomotor piston attached to the fuel controls

*If choice B is selected set score to 1.*

**48.** Which of the following statements represents the two major functions provided by the item labeled "20" shown in the illustration? Illustration MO-0111

- (A) The pump supplies the motive force to the ejectors and removes the excess distillate.
- (B) The pump is used to drain the shell when the unit is secured, in addition to powering the ejectors.
- (C) The pump provides for venting of associated equipment while also powering the ejectors.
- (D) The pump supplies the motive fluid to the ejectors in addition to supplying the feed water to the distiller.

*If choice D is selected set score to 1.*

**49.** Where is the latent heat obtained to create vapor from the feed water in the illustrated distiller? Illustration MO-0111

- (A) During its contact period with heat exchanger "3".
- (B) Only as it passes through device "20".
- (C) From having passed through "23".
- (D) While it is in contact with device "24".

*If choice C is selected set score to 1.*

**50.** When checking for the presence of sulfite in the feed water of an auxiliary boiler, you are in essence checking \_\_\_\_\_.

- (A) the hardness of the makeup feed water
- (B) to ensure the compound additions are adequate for control of pH
- (C) to ensure the compound additions are adequate for controlling dissolved oxygen
- (D) to ensure the automatic or manual blow down rate and frequency is adequate for control of total dissolved solids

*If choice C is selected set score to 1.*

**51.** Air is normally bled from a diesel engine fuel system by \_\_\_\_\_.

- (A) blowing down the air tanks
- (B) loosening the compression nuts at the injectors
- (C) changing fuel filters
- (D) pumping down the day tanks

*If choice B is selected set score to 1.*

**52.** In a coil-type forced circulation auxiliary water-tube boiler, \_\_\_\_\_.

- (A) steam demand response is comparatively rapid
- (B) steam is recirculated through heating coils in the boiler
- (C) unevaporated feed water is discharged through the skim tube
- (D) steam demand response is slow

*If choice A is selected set score to 1.*

**53.** One advantage of electromagnetic slip couplings is \_\_\_\_\_.

- (A) torsional vibrations are reduced
- (B) torque increases with a decrease in excitation current
- (C) the coupling rapidly responds to sudden changes of load
- (D) excitation and induction power losses appear as a change in torque instead of rotational speed between the primary and secondary elements

*If choice A is selected set score to 1.*

**54.** Diesel engine automated control systems may utilize sensing devices of dual function, with sensing ranges providing both alarm and engine shut down capability. Which of the key points listed would only require an alarm sensor?

- (A) Lube oil pressure and temperature
- (B) Jacket water pressure and temperature
- (C) Engine over speed
- (D) Lube oil sump level

*If choice D is selected set score to 1.*

**55.** What is the best way of stopping an over speeding diesel engine?

- (A) Disconnect the battery cables from the starting motor.
- (B) Drain the hydraulic fluid from the governor sump.
- (C) Block the flow of cooling air to the radiator.
- (D) Secure the fuel supply and block the air intake.

*If choice D is selected set score to 1.*

**56.** After cooling of a turbocharged diesel engine will result in \_\_\_\_\_.

- (A) higher torque but lower brake horsepower
- (B) lower torque but higher brake horsepower
- (C) higher torque and higher brake horsepower
- (D) lower torque and lower brake horsepower

*If choice C is selected set score to 1.*

**57.** The function of the synchronizing motor on the generator governor illustrated is to \_\_\_\_\_.  
Illustration MO-0092

- (A) drive the terminal shaft at a set speed
- (B) turn the governor drive shaft during start-up
- (C) provide remote control for speed adjustment
- (D) power the generator synchronizing lamps

*If choice C is selected set score to 1.*

**58.** As shown in the illustration, if the vessel was operating at full sea speed, the area labeled "A" would be used to \_\_\_\_\_. Illustration MO-0128

- (A) preheat the feed water to the waste heat boiler
- (B) collect stack gas
- (C) collect the saturated steam generated in area "1" by the engines exhaust gases
- (D) superheat the steam generated by the oil fired mechanical burner

*If choice C is selected set score to 1.*

**59.** The over speed trip installed on most diesel engines will stop the engine by shutting off the \_\_\_\_\_.

- (A) water supply
- (B) fuel and/or air supply
- (C) lube oil supply
- (D) exhaust damper

*If choice B is selected set score to 1.*

**60.** A three-way thermostatic control valve regulates the diesel engine cooling water temperature by passing a portion of the water \_\_\_\_\_.

- (A) around the cooler
- (B) around the engine
- (C) overboard
- (D) to the expansion tank

*If choice A is selected set score to 1.*

**61.** When a nozzle tester is being used to test a "closed" type fuel injection nozzle, a clogged nozzle orifice will be indicated by a \_\_\_\_\_.

- (A) distorted spray pattern
- (B) chattering sound when the nozzle closes
- (C) squealing sound mid-way in the pump stroke
- (D) popping sound when the nozzle opens

*If choice A is selected set score to 1.*

**62.** A diesel engine with a full speed of 1000 RPM drives a propeller at 300 RPM. What is the speed reduction ratio?

- (A) 0.3 to 1
- (B) 3.33 to 1
- (C) 33 to 1
- (D) 300 to 1

*If choice B is selected set score to 1.*

**63.** A diesel-generator governor is hunting. After changing the oil, the governor is flushed and the compensation needle valve is adjusted, but the hunting persists. You should NOW \_\_\_\_\_.

- (A) check air intake manifold pressure
- (B) calibrate the fuel pump rack settings
- (C) set the speed droop adjustment to zero
- (D) carefully check for binding in the governor linkage

*If choice D is selected set score to 1.*

**64.** The main engine thrust bearing shown in the illustration contains how many thrust shoes? Illustration MO-0121

- (A) 6
- (B) 10
- (C) 12
- (D) 20

*If choice C is selected set score to 1.*

**65.** A large, low-speed, main propulsion diesel engine uses sea water to directly cool the \_\_\_\_\_.

- (A) cylinder heads
- (B) exhaust valves
- (C) scavenging air
- (D) injectors

*If choice C is selected set score to 1.*

**66.** One of the factors limiting the amount of load which can be put on a modern marine diesel engine is the \_\_\_\_\_.

- (A) governor sensitivity
- (B) exhaust temperature
- (C) fuel injection pressure
- (D) speed of the camshaft

*If choice B is selected set score to 1.*

**67.** When an additional load is applied to a diesel engine which is using an air bladder clutch unit that is inadequately inflated, you can expect \_\_\_\_\_.

- (A) chipped reduction gear teeth
- (B) overheating because of slipping shoes
- (C) pneumatic seizure
- (D) excessive wear on the thrust bearings

*If choice B is selected set score to 1.*

**68.** Compared to a naturally aspirated diesel engine, a supercharged diesel engine has \_\_\_\_\_.

- (A) a cylinder air charge of higher pressure
- (B) reduced cylinder mean effective pressure
- (C) less valve overlap
- (D) reduced blow-by

*If choice A is selected set score to 1.*

**69.** If an auxiliary diesel engine equipped with an electric starting system cranks very slowly after repeated attempts to start, the cause could be a/an \_\_\_\_\_.

- (A) low lube oil viscosity
- (B) low compression pressure
- (C) ring gear with broken teeth
- (D) overheated motor windings

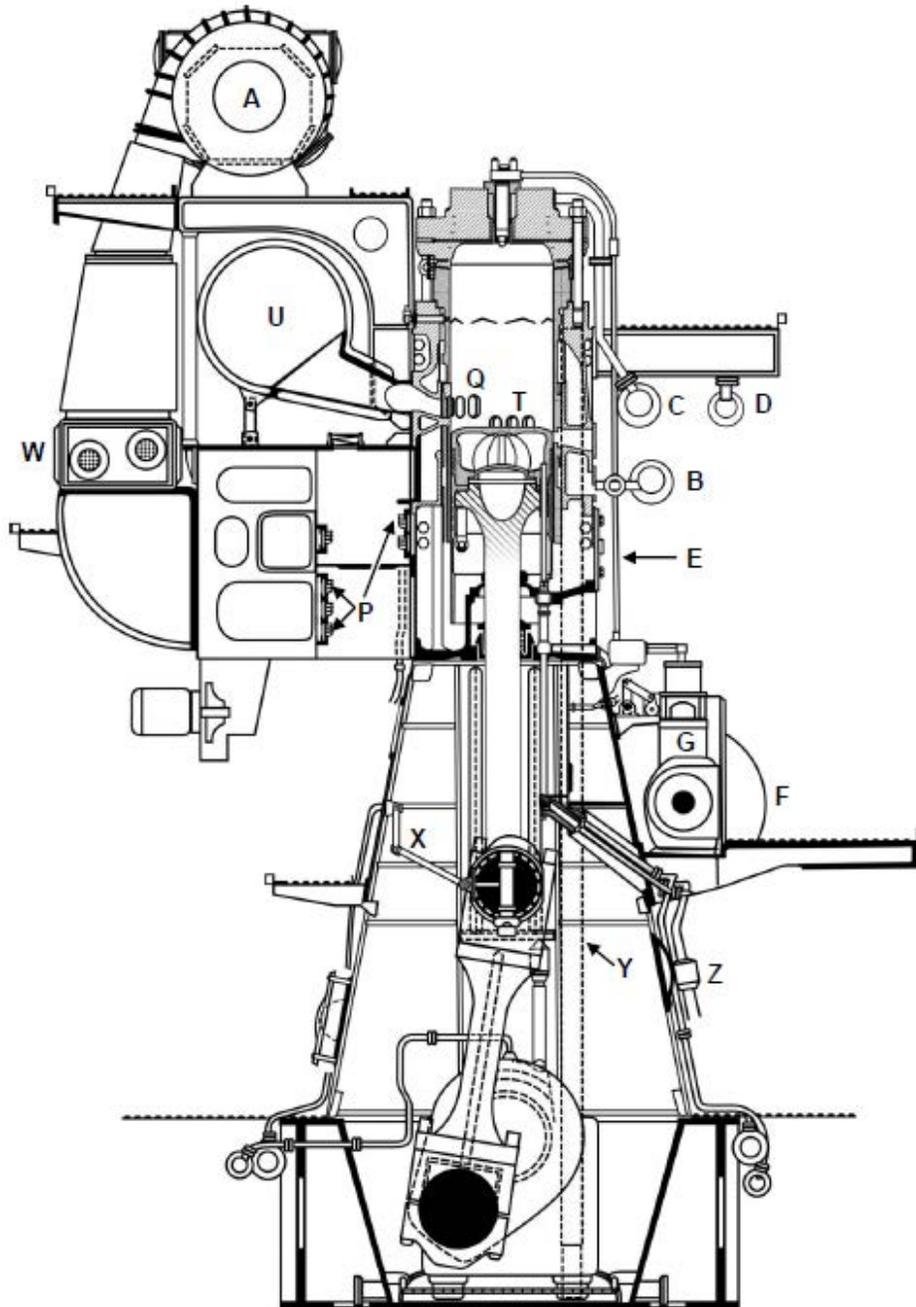
*If choice D is selected set score to 1.*

**70.** The concentration of total dissolved solids in the water of an auxiliary boiler can increase as a result of \_\_\_\_\_.

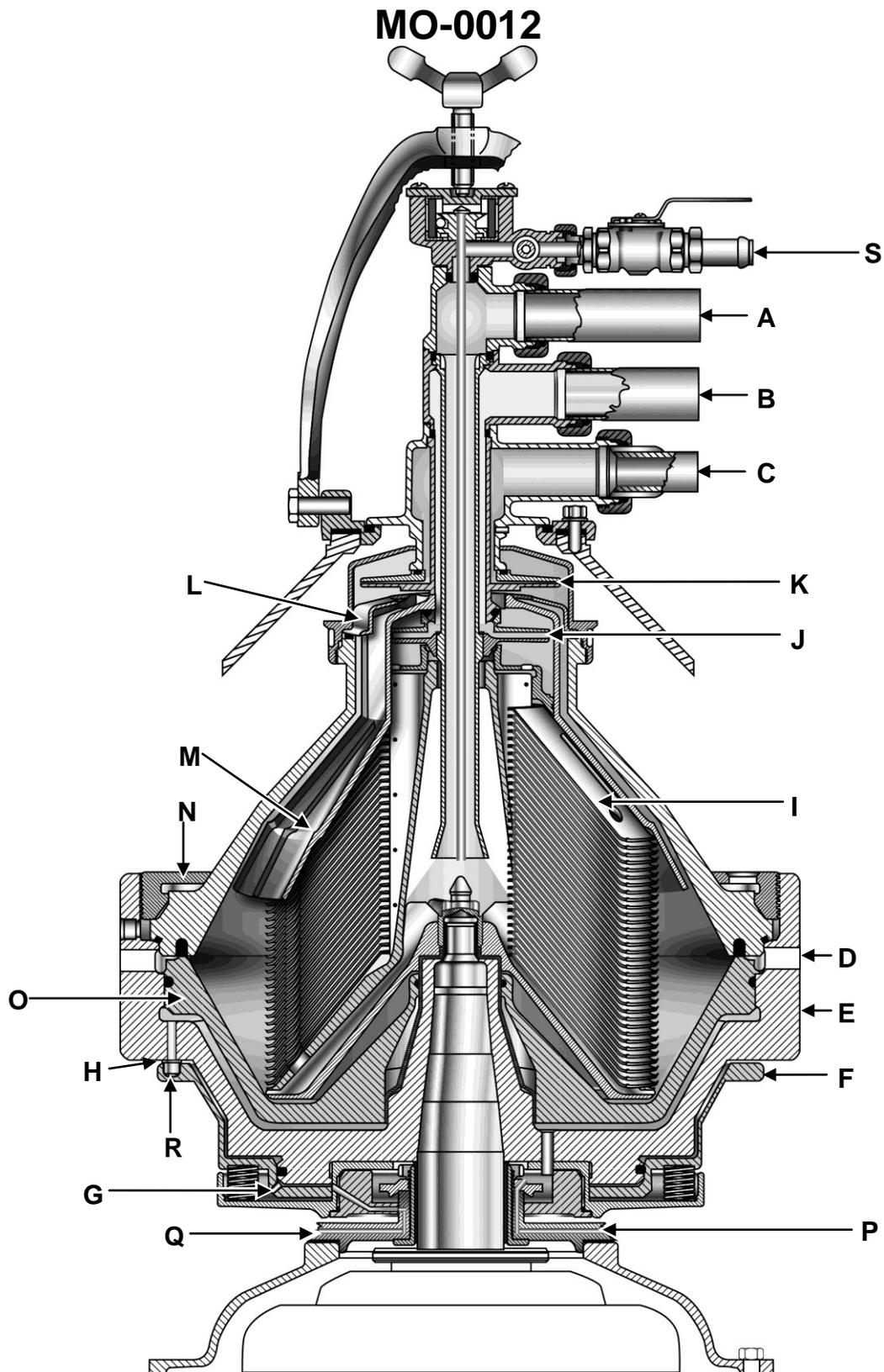
- (A) sea water contamination
- (B) frequent surface blows
- (C) dissolved oxygen deaeration
- (D) frequent bottom blows

*If choice A is selected set score to 1.*

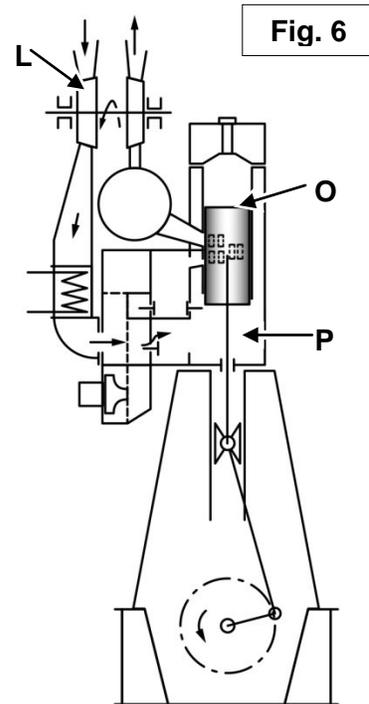
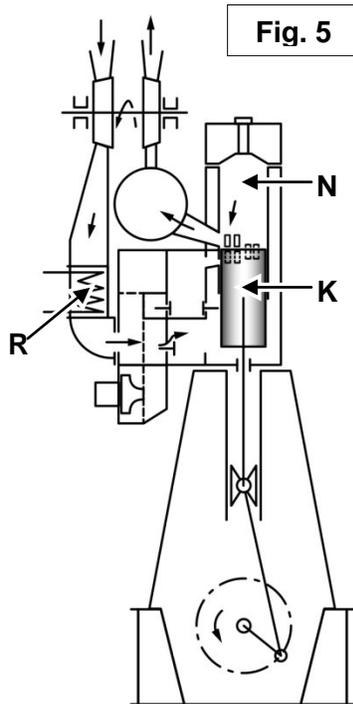
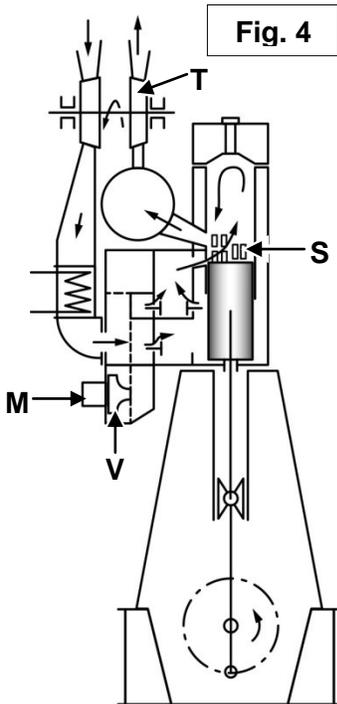
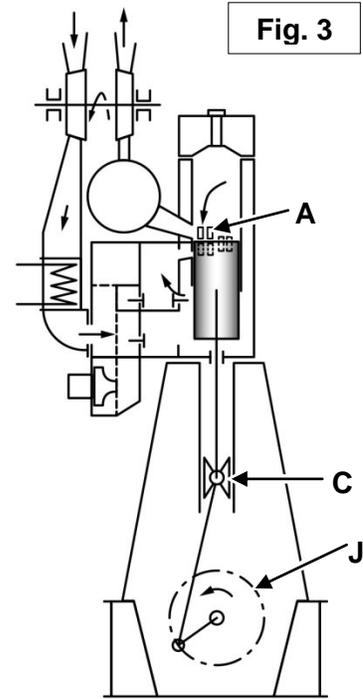
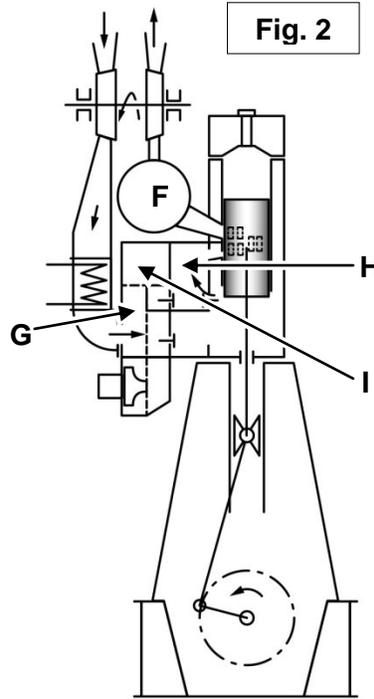
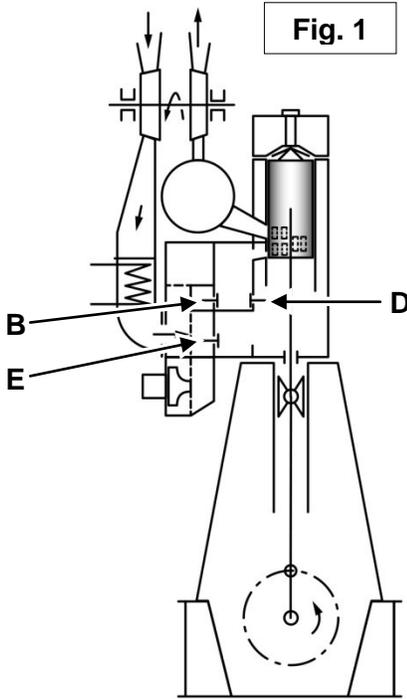
## MO-0003



Adapted for testing purposes only from Introduction to Practical Marine Engineering, Vol. 2: Figures, Rowen, Gardner, Femenia, Chapman and Wiggins.  
© 2005 The Society of Naval Architects and Marine Engineers.  
Further reproduction prohibited without permission.



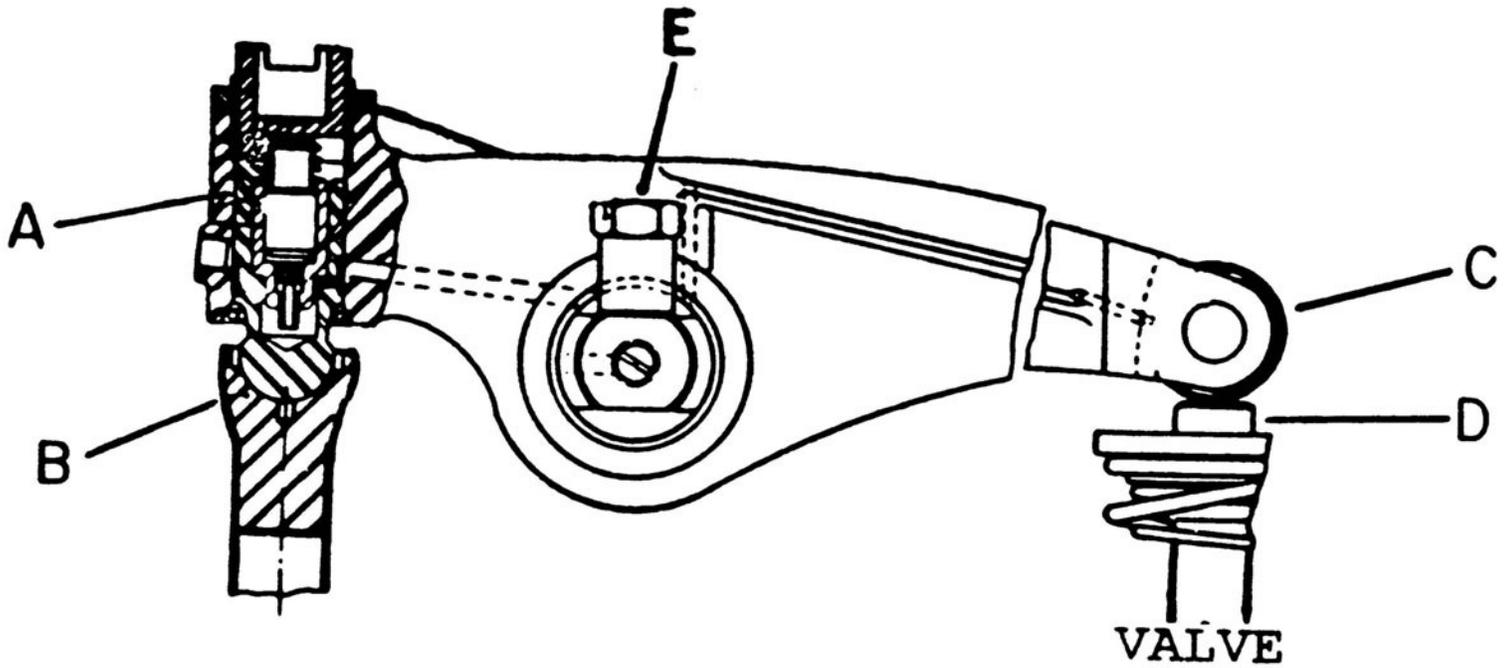
## MO-0025



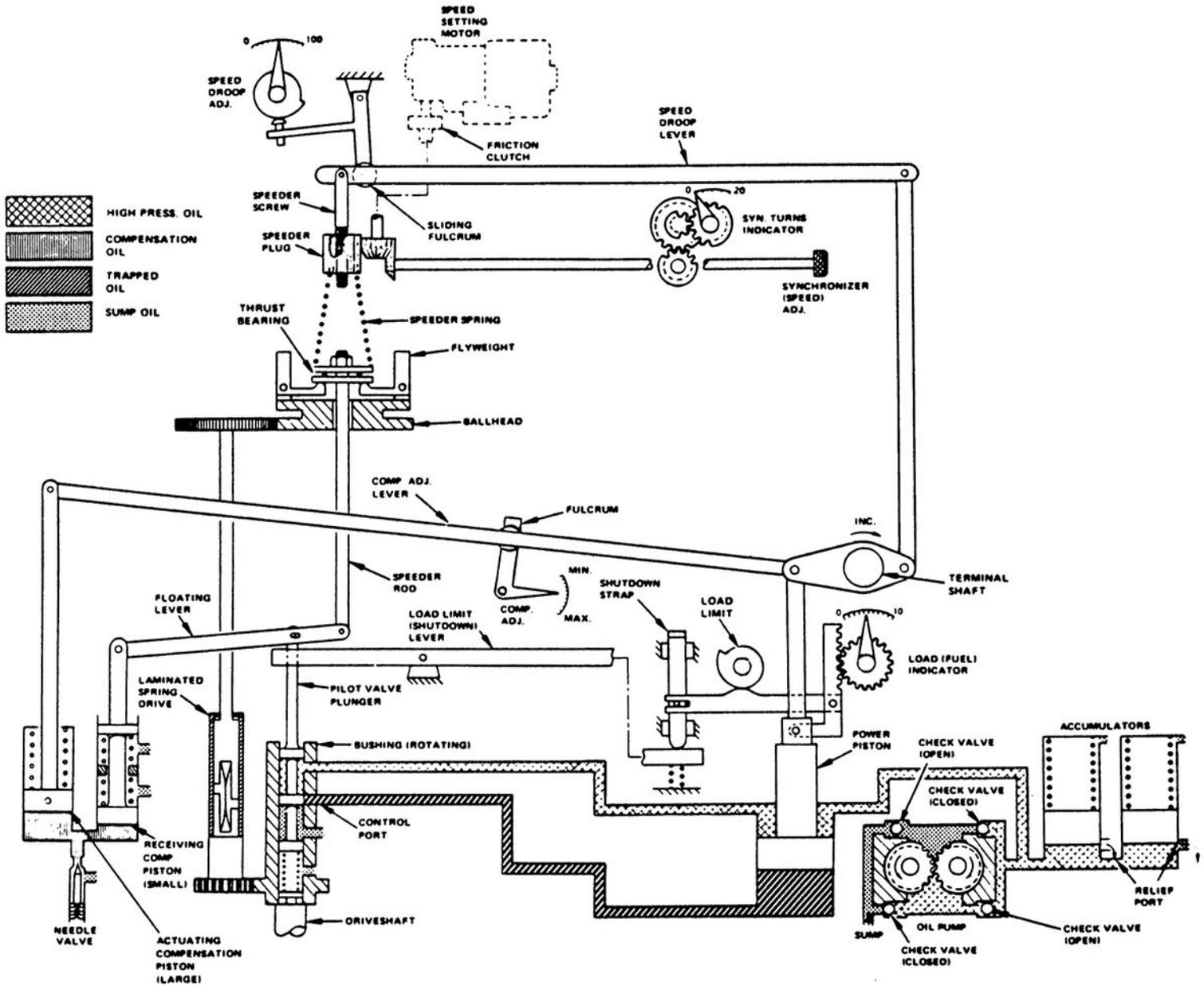
Adapted for testing purposes only from Description of and Operating Instructions  
for Sulzer Diesel Engines, RND-M. © Sulzer Brothers Limited.

Further reproduction prohibited without permission.

## MO-0074



## MO-0092

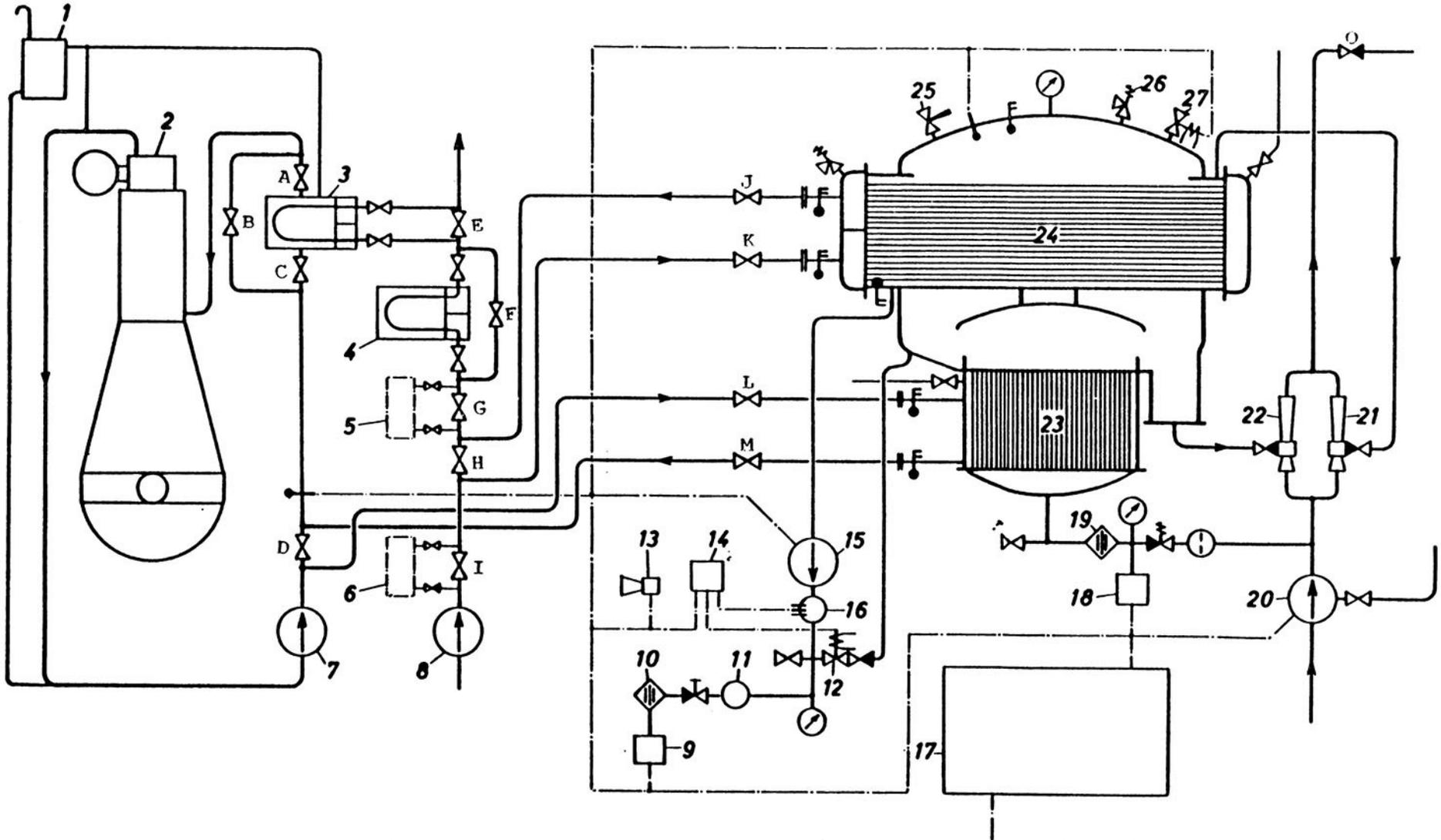


Adapted for testing purposes only from LILLY, Diesel Engine Reference Book

Copyright © 1984 Butterworth and Co. (Publishers) Ltd.

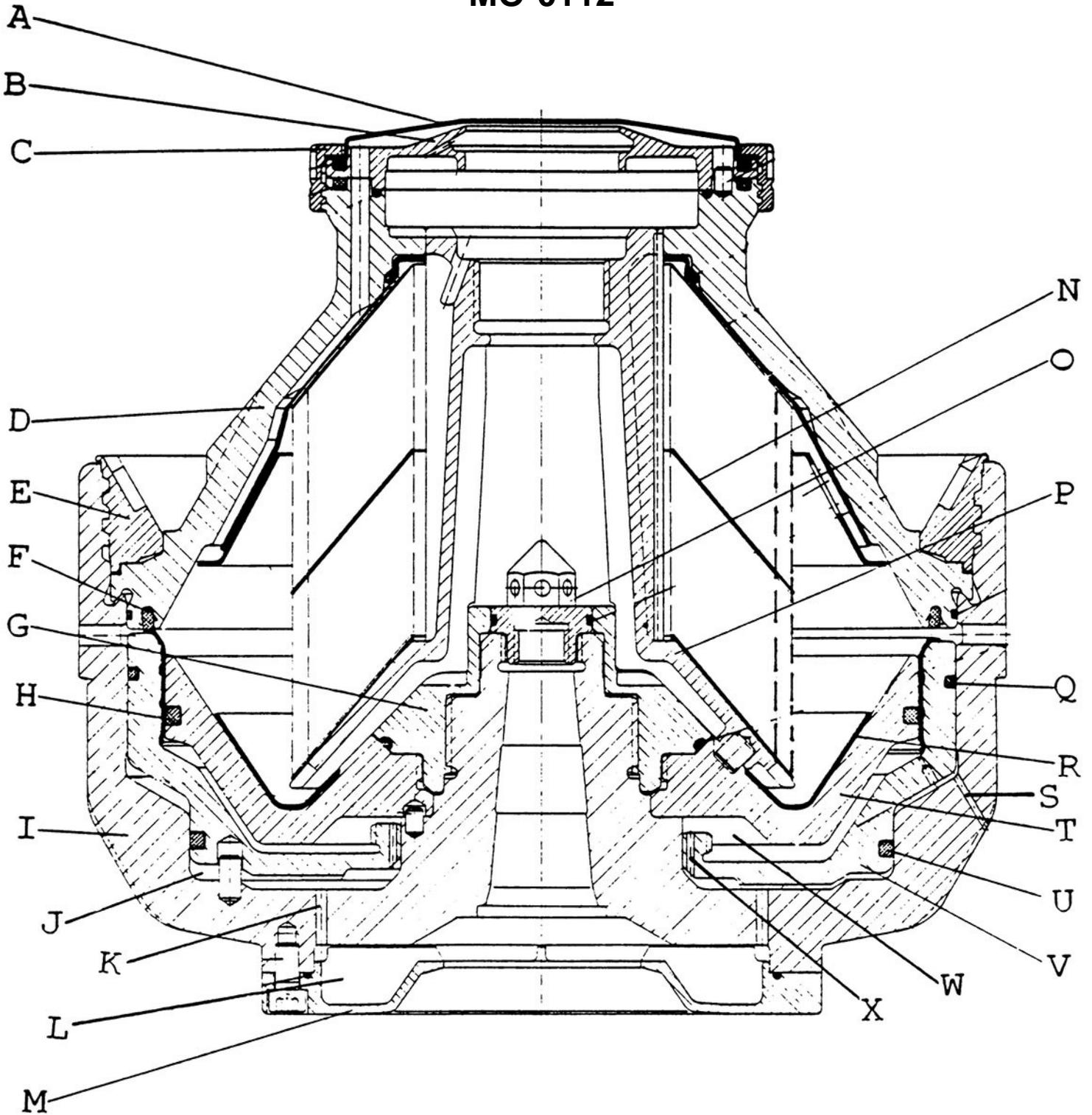
Further reproduction prohibited without permission.

## MO-0111



Adapted for testing purposes only from KNAK, Diesel MotorShips' Engines and Machinery Diagrams  
Copyright © 1979 The Institute of Marine Engineers.  
Further reproduction prohibited without permission.

## MO-0112

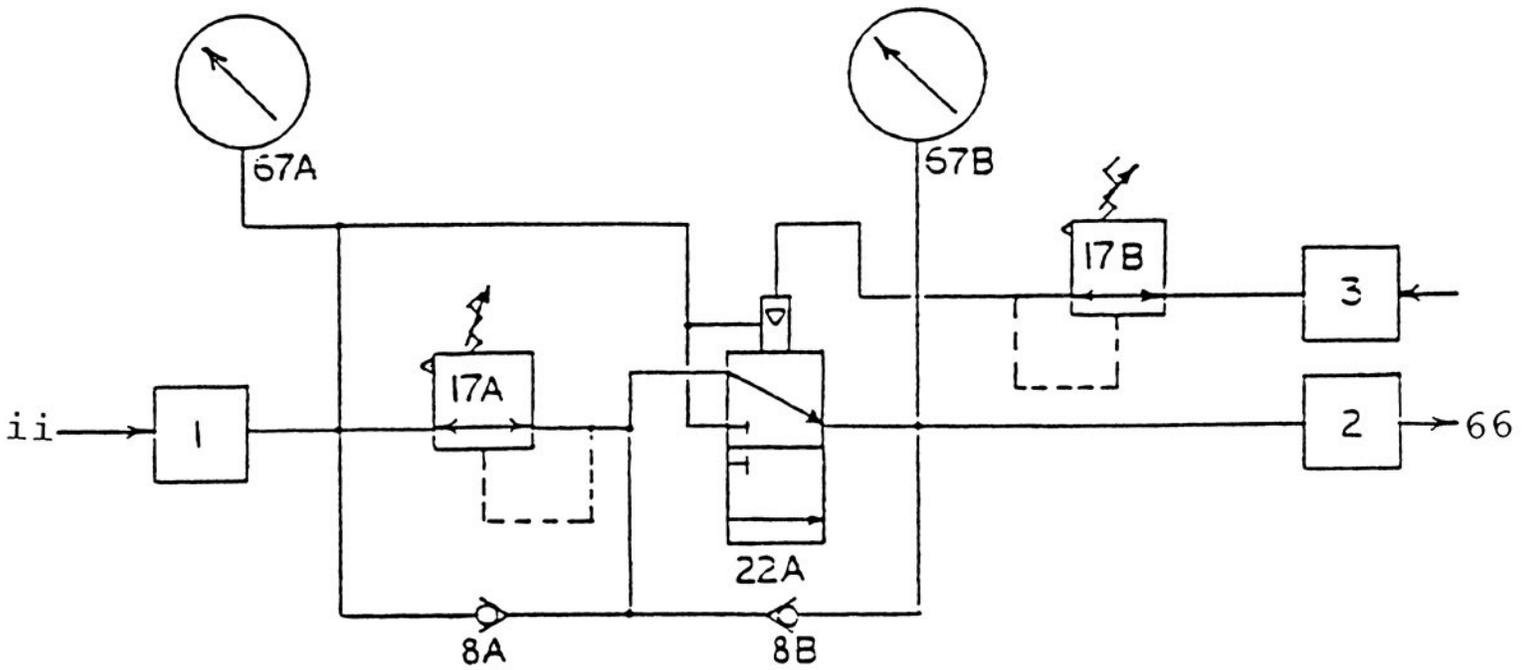


Adapted for testing purposes only from Model OSA 20-02-066 Instruction Manual

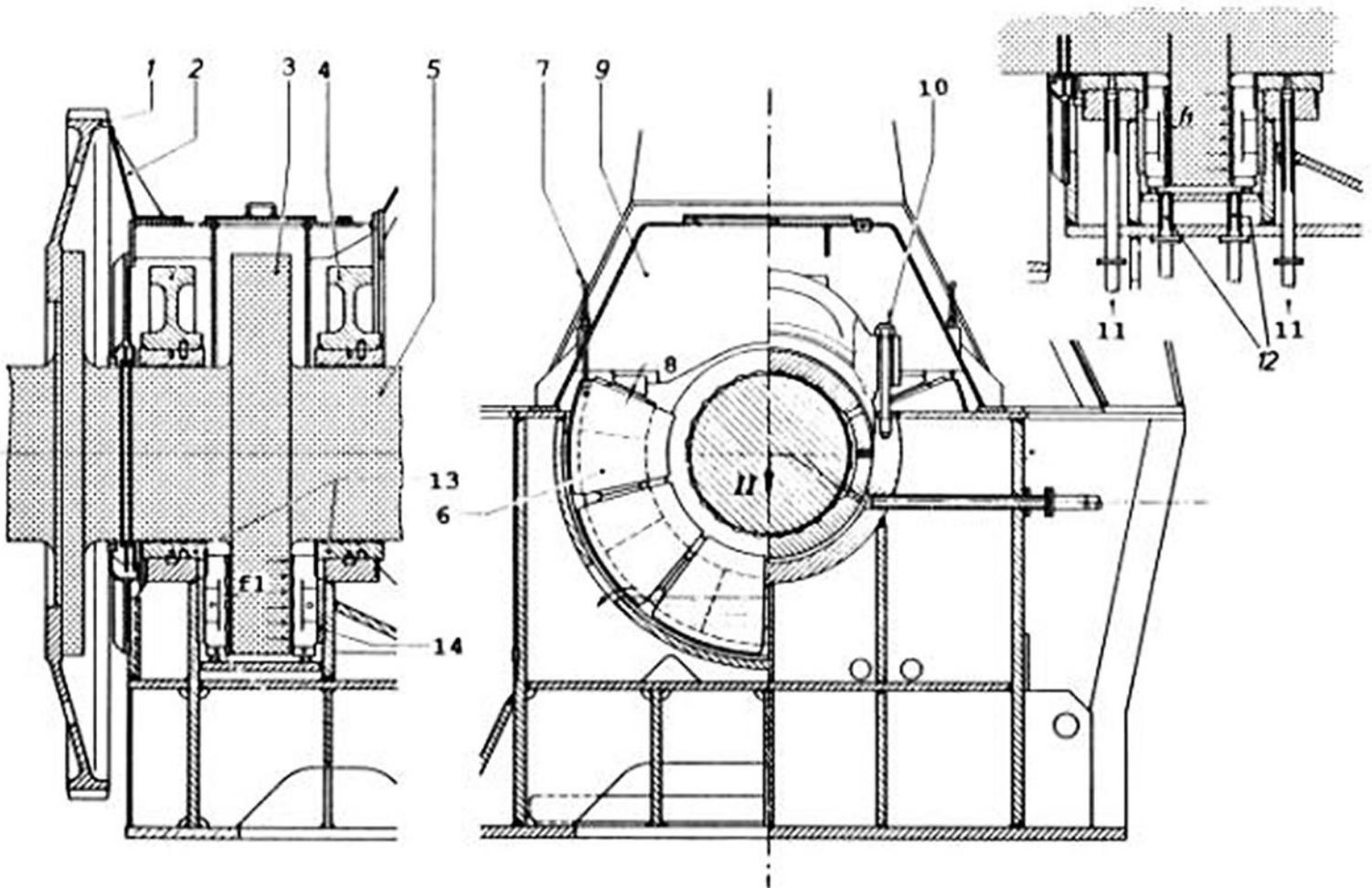
Copyright © Westfalia Separator

Further reproduction prohibited without permission.

## MO-0114



## MO-0120

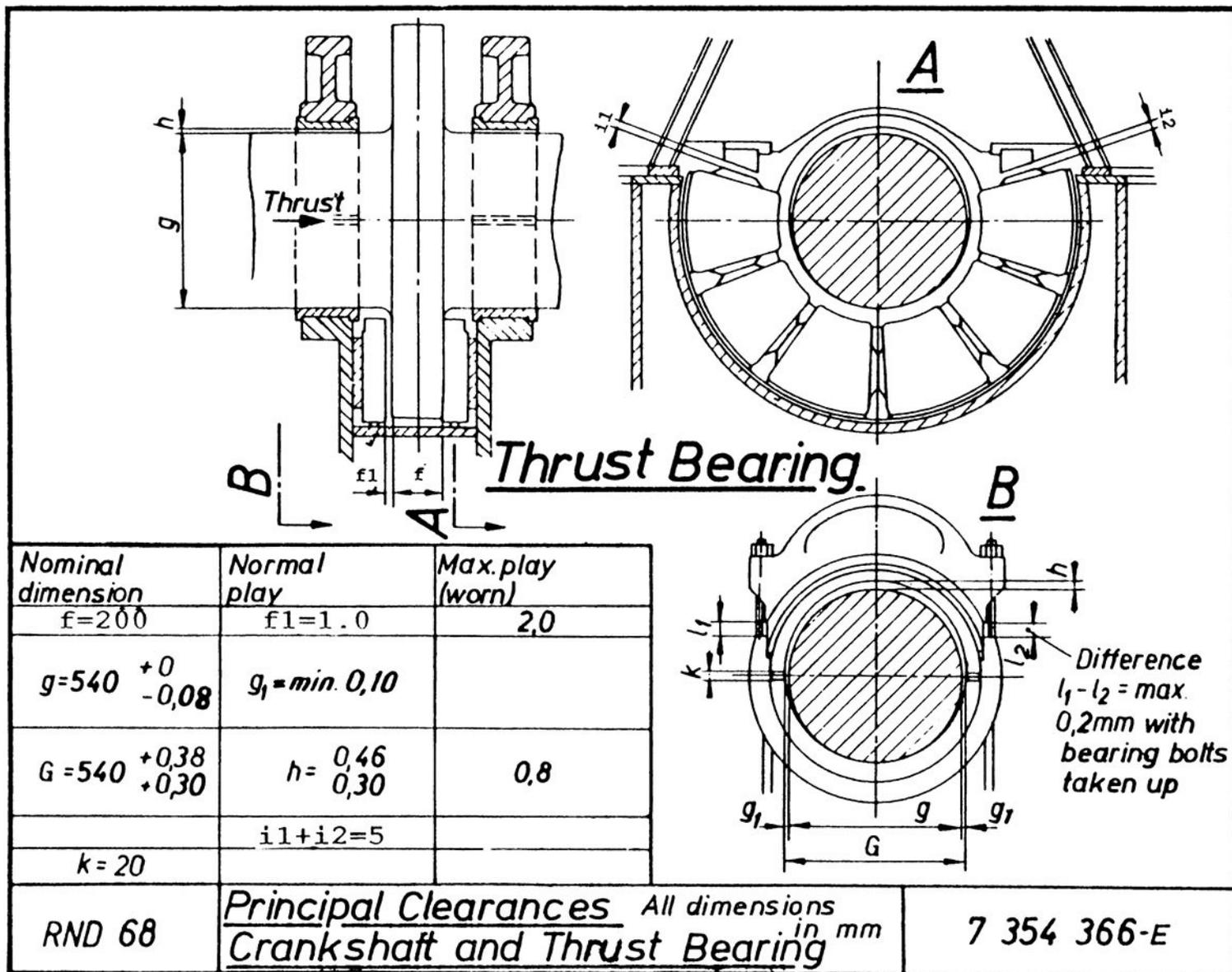


Adapted for testing purposes only from Sulzer, Description of and  
Operating Instructions for Sulzer Diesel Engines RND-M

Copyright © Sulzer Brothers Limited

Further reproduction prohibited without permission.

## MO-0121



Adapted for testing purposes only from Sulzer, Description of and Operating Instructions for Sulzer Diesel Engines RND-M

Copyright © Sulzer Brothers Limited

Further reproduction prohibited without permission.

## MO-0128

