

U.S.C.G. Merchant Marine Exam

Third Assistant Engineer

Q538 Steam Plants II

(Sample Examination)

Choose the best answer to the following Multiple Choice Questions:

1. A unit of measure used to express the chloride content of boiler water is _____.

- (A) Microfarads
- (B) PPM
- (C) Microohms
- (D) pH

If choice B is selected set score to 1.

2. The most troublesome corrosive substances in boiler water are oxygen and _____.

- (A) carbon dioxide
- (B) ammonia
- (C) sulfur dioxide
- (D) hydrogen sulfide

If choice A is selected set score to 1.

3. As the pH of the boiler water approaches zero, the water becomes increasingly _____.

- (A) neutral
- (B) alkaline
- (C) acidic
- (D) soft

If choice C is selected set score to 1.

4. What boiler water chemistry is necessary to ensure the precipitation of hard scale forming calcium?

- (A) Hydrazine concentrations should be at the proper level.
- (B) Boiler water should have a reserve of phosphates.
- (C) Boiler water hardness should be high.
- (D) Boiler water should be slightly acidic.

If choice B is selected set score to 1.

5. The major reason dissolved gases are removed from boiler feedwater is because they may cause _____.

- (A) vapor lock in the feed pumps
- (B) a false boiler water level
- (C) corrosive conditions in the boiler
- (D) condenser vacuum loss

If choice C is selected set score to 1.

6. Boiler water hardness is increased by _____.

- (A) scale forming salts in the feedwater
- (B) dissolved gases in the water
- (C) improper operation of the DC heater
- (D) zero alkalinity in the water

If choice A is selected set score to 1.

7. Which of the following represents a significant system limitation to be aware of when a burner management system is operated in the "HAND" mode?

- (A) The burner sequence control is fully automatic even in the "HAND" mode.
- (B) The burner is not capable of maintaining a high firing rate when the boiler is in the "HAND" mode.
- (C) Some boiler safety interlocks are bypassed when the boiler is "HAND" fired.
- (D) The flame failure alarm cannot function when the boiler is "HAND" fired.

If choice C is selected set score to 1.

8. When firing a boiler in local manual control, an increase in boiler load must be accompanied by a/an _____.

- (A) Increase or a decrease in the fuel oil flow and forced draft air pressure simultaneously
- (B) Increase in the forced draft air pressure before an increase in the fuel oil flow
- (C) Increase in the fuel oil flow before an increase in the forced draft pressure
- (D) Decrease in the forced draft air pressure before a decrease in the fuel oil flow

If choice B is selected set score to 1.

9. As found in a basic pneumatic automatic combustion control system, the function of a standardizing relay is to _____.

- (A) Provide a backup means for manual control of the system
- (B) Introduce a control for maintaining constant superheated steam temperature regardless of boiler load
- (C) Control the boiler drum water level within acceptable limits regardless of the load
- (D) Introduce a control for maintaining constant steam pressure regardless of boiler load

If choice D is selected set score to 1.

10. Modern day boiler automation allows bypassing the "flame safeguard" system to permit a burner to have a "trial for ignition" period during burner light off. This period may not exceed _____.

- (A) 5 seconds
- (B) 10 seconds
- (C) 15 seconds
- (D) 30 seconds

If choice C is selected set score to 1.

11. The type of turbine shown in the illustration is classified as a _____. Illustration SE-0003

- (A) pressure-velocity compounded impulse
- (B) pressure-compounded reaction
- (C) velocity-compounded impulse
- (D) pressure-compounded impulse

If choice C is selected set score to 1.

12. What happens to the steam as it moves across the moving blades in a reaction turbine?

- (A) It creates an axial thrust opposing the direction of steam flow.
- (B) It loses velocity at constant pressure.
- (C) It creates an axial thrust in the direction of the steam flow.
- (D) It gains velocity at constant pressure.

If choice C is selected set score to 1.

13. Large temperature and pressure drops which occur in the first stage of a combination impulse and reaction turbine are caused by steam passing through _____.

- (A) one or more velocity-compounded impulse stages at the high-pressure end of the turbine
- (B) a dummy piston and cylinder to offset axial thrust
- (C) a nozzle diaphragm in the low-pressure end of the turbine
- (D) a single row of blades more than once

If choice A is selected set score to 1.

14. As steam first enters the main propulsion turbine, which of the following energy conversions takes place?

- (A) potential to kinetic
- (B) mechanical to thermal
- (C) thermal to chemical
- (D) chemical to thermal

If choice A is selected set score to 1.

15. Why is superheated steam used in the main propulsion turbines instead of saturated steam?

- (A) Higher pressure available than saturated steam.
- (B) Lower required specific volume than saturated steam.
- (C) Less specific energy available per pound of steam.
- (D) Greater heat energy available per pound of steam.

If choice D is selected set score to 1.

16. Allowance for axial expansion of the steam turbine due to temperature changes is provided for by the use of _____.

- (A) Pivoted-shoe type thrust bearings
- (B) Casing flexible joints
- (C) A deep flexible I beam support
- (D) Rotor position indicators

If choice C is selected set score to 1.

17. Which of the following statements is true concerning the turbine shown in the illustration? Illustration SE-0016

- (A) The ahead rotor can be classified as a helical flow, Parsons type turbine.
- (B) A steam deflector is provided between the astern element and the ahead stages of the LP turbine.
- (C) The low-pressure turbine is designed with reaction type stages.
- (D) The astern element is of the Curtis type consisting of two three-row stages.

If choice B is selected set score to 1.

18. Which of the journal bearings listed most easily accommodates the minor turbine shaft misalignment?

- (A) Ball bearings
- (B) Spherically seated bearings
- (C) Spring bearings
- (D) Roller bearings

If choice B is selected set score to 1.

19. Main steam turbine bearings are lined with _____.

- (A) ferrous oxide
- (B) cast-iron
- (C) steel
- (D) Babbitt

If choice D is selected set score to 1.

20. The purpose of the sentinel valve installed on a turbine casing is to _____.

- (A) vent excess steam to the main condenser
- (B) relieve excess pressure to the turbine extraction points
- (C) warn the engineer of backflow of steam from the exhaust trunk
- (D) warn the engineer of excessive pressure in the low-pressure turbine casing

If choice D is selected set score to 1.

21. The jacking gear on main propulsion turbines can be used to _____.

- (A) provide propulsion in emergencies
- (B) provide reduction gear tooth inspection
- (C) lift the reduction gear casing
- (D) reduce turbine speed during maneuvering

If choice B is selected set score to 1.

22. During normal operation of a main propulsion turbine, the lube oil supply temperature to the bearings should be maintained at approximately _____.

- (A) 60°F
- (B) 72°F
- (C) 120°F
- (D) 135°F

If choice C is selected set score to 1.

23. The main propulsion turbine should be operated with the _____.

- (A) highest practical chest pressure and the minimum number of nozzles required to maintain the desired speed
- (B) highest practical chest pressure and the maximum number of nozzles possible to maintain the desired speed
- (C) lowest practical chest pressure and the minimum number of nozzles required to maintain the desired speed
- (D) lowest practical chest pressure and the maximum number of nozzles possible to maintain the desired speed

If choice A is selected set score to 1.

24. With vacuum up and the main propulsion turbine standing by while awaiting engine orders, it is necessary to roll the unit alternately ahead and astern every five minutes to _____.

- (A) slowly bring the lube oil and bearings to operating temperature
- (B) reduce the possibility of warping the turbine rotors
- (C) warm the astern guarding valve and the low lube oil pressure throttle trip
- (D) distribute the gland sealing steam evenly throughout the glands

If choice B is selected set score to 1.

25. In securing the main turbines, steam to the second stage air ejectors should be left on for a short period of time in order to _____.

- (A) prevent excessive condensate depression
- (B) remove the excessive amount of non-condensable vapors which accumulated during maneuvering operations
- (C) ensure equal cooling of the main turbine bearings
- (D) dry out the main turbines

If choice D is selected set score to 1.

26. Operating a steam turbine propulsion unit at medium-speed, in an area with extremely cold sea water and the main circulating pump providing full cooling water flow to the condenser will result in _____.

- (A) Increased condensate aeration due to the inability of the air ejectors to remove excessive air accumulation from the condenser
- (B) Excellent plant efficiency due to higher attainable vacuum
- (C) Increased effectiveness of the air ejectors due to the increased main condenser vacuum
- (D) Increased plant efficiency due to increased condensate depression

If choice A is selected set score to 1.

27. An overheated bearing in the main propulsion unit is indicated by _____.

- (A) high level in the lube oil sump
- (B) high temperature of the lube oil leaving the bearing
- (C) sludge in the lube oil strainers
- (D) bubbles in the sight flow glasses

If choice B is selected set score to 1.

28. Which of the following statements describes how the main propulsion turbine overspeed relay initiates closing of the throttle valve?

- (A) Excessive speed causes an oil pump to develop sufficient pressure to open a spring loaded relay valve which tends to close the steam control valve.
- (B) Excessive centrifugal force causes a spring loaded weight to trip a valve latch.
- (C) Excessive speed causes an increase in lube oil control temperature which actuates a solenoid oil dump valve.
- (D) Excessive centrifugal force causes spring loaded flyballs to actuate a control lever.

If choice A is selected set score to 1.

29. Which type of packing is primarily utilized to control steam leakage from the casing of a modern auxiliary turbine?

- (A) Carbon
- (B) Dovetail
- (C) Teflon
- (D) Labyrinth

If choice D is selected set score to 1.

30. Carbon ring packing segments are secured in a shaft gland assembly of a steam turbine by means of _____.

- (A) labyrinth rings
- (B) garter springs
- (C) centering rings
- (D) steam pressure

If choice B is selected set score to 1.

31. How is an auxiliary turbine boiler feed pump normally stopped?

- (A) By closing the exhaust valve slightly
- (B) By actuating the throttle hand tripping device
- (C) By increasing the load on the driven unit
- (D) By rotating the hand lube oil pump backwards

If choice B is selected set score to 1.

32. Which of the following statements represents the significance of the differential pressure existing between the nozzle block and steam chest of a turbo-generator equipped with a lifting beam mechanism?

- (A) The pressure differential eliminates the possibility of valve binding in the lifting beam.
- (B) The pressure differential requires the installation of a special biasing spring to open the valves.
- (C) The pressure differential assists in seating the valves when the lifting beam is lowered.
- (D) The pressure differential necessitates the use of a special balance piston.

If choice C is selected set score to 1.

33. A motor driven synchronizing device, figure "D" shown in the illustration, operated from the generator switchboard, initiates fine adjustments to the steam turbine speed by directly _____.
Illustration SE-0009

- (A) Changing the vertical location of the pilot valve bushing
- (B) Varying the pivot rod stroke length on the governor weight eccentric pad
- (C) Raising or lowering the nozzle block lifting beam
- (D) Increasing or decreasing operating spring pressure

If choice A is selected set score to 1.

34. As lube oil absorbs moisture its dielectric strength can be expected to _____.

- (A) remain the same
- (B) increase with a decrease in viscosity
- (C) decrease
- (D) increase with an increase in viscosity

If choice C is selected set score to 1.

35. In a pressure type main propulsion turbine lubrication system, the lube oil service pumps normally take suction from the main sump and discharge directly to the _____.

- (A) main thrust bearing
- (B) gravity feed tank
- (C) lube oil header
- (D) lube oil coolers

If choice D is selected set score to 1.

36. When the temperature of the main turbine lubricating oil is lowered, an increase will occur in the _____.

- (A) flash point
- (B) concentration of contaminants
- (C) viscosity
- (D) pour point

If choice C is selected set score to 1.

37. What type of lube oil cooler is shown in the illustration? Illustration GS-0122

- (A) Shell-and-tube
- (B) Bundle and stack
- (C) Plate type
- (D) Self-venting

If choice A is selected set score to 1.

38. Which of the filters listed will deplete the additives in lubricating oil?

- (A) Extended area membrane filter
- (B) Cloth bag extractor
- (C) Absorbent filter
- (D) Adsorbent filter

If choice D is selected set score to 1.

39. Which of the following conditions is indicated by oil flowing through a lube oil gravity tank overflow sight glass?

- (A) Turbine bearing failure has occurred.
- (B) Excessive oil is stored in the gravity tank.
- (C) Insufficient oil is being pumped to the gravity tank.
- (D) Sufficient oil flow is being supplied to the gravity tank.

If choice D is selected set score to 1.

40. In order to obtain the best performance with a lube oil purifier, the lube oil inlet temperature should _____.

- (A) be maintained in a temperature range of 160°F to a maximum of 180°F
- (B) never exceed the highest main engine bearing temperature
- (C) be equal to main lube oil sump temperature
- (D) be equal to the normal lube oil cooler outlet temperature

If choice A is selected set score to 1.

41. A centrifuge will satisfactorily remove which of the listed substances from lube oil?

- (A) Carbon particles
- (B) Gasoline
- (C) Fuel oil
- (D) Diesel fuel

If choice A is selected set score to 1.

42. The disk stack and tubular shaft used in a lube oil centrifugal purifier, is forced to rotate at bowl speed by _____.

- (A) the locating pin
- (B) the use of an acme thread screw
- (C) wire springs
- (D) the drive pin

If choice A is selected set score to 1.

43. The rotating speed of the tubular bowl centrifuge is more than twice that of the disk-type. The reason for this is _____.

- (A) to produce a nearly equal magnitude of centrifugal force
- (B) the friction affecting rotation is not as significant with a narrow diameter bowl
- (C) the drag bushing is used to permit the higher speed of rotation
- (D) a narrow diameter bowl is not affected as much by windage losses as a larger diameter bowl

If choice A is selected set score to 1.

44. In a steam turbine and reduction gear main propulsion plant, the alarm sensor for low turbine oil pressure is usually installed _____.

- (A) at a point on the inlet side of the main bearings as close to the bearings as possible
- (B) at the outlet of the main thrust bearing
- (C) at the end of the supply line header to the bearings
- (D) at a point on the outlet side of the main bearings as close to the bearings as possible

If choice C is selected set score to 1.

45. On a ship equipped with a gravity type lube oil system, which of the conditions listed will occur FIRST if the main lube oil pump discharge pressure is lost?

- (A) An alarm will sound.
- (B) The astern throttle will immediately open.
- (C) Lube oil will be provided to the bearings and gears via the gravity tank overflow line.
- (D) All bearing oil pressure will be lost.

If choice A is selected set score to 1.

46. Which of the following would contribute to the formation of an oil and water emulsion, in addition to acid formation?

- (A) Water and solid insoluble particles
- (B) Solid insoluble particles, aeration, and heat
- (C) Water, agitation, and heat
- (D) Aeration, agitation, and heat

If choice C is selected set score to 1.

47. A cloudy or milky appearing lube oil sample, taken from the main lubricating oil system could be caused by _____.

- (A) insufficient gland sealing steam
- (B) excessive gland sealing steam
- (C) insufficient cooling water to the lube oil cooler
- (D) excessive cooling water to the lube oil cooler

If choice B is selected set score to 1.

48. What type of bearing is shown in the illustration? Illustration SE-0017

- (A) Precision insert, split-half journal bearing
- (B) Tilting pad journal bearing
- (C) Precision insert, split-half thrust bearing
- (D) Single piece bushing

If choice A is selected set score to 1.

49. Which of the following construction methods would apply to the Babbitt lined, split-type, reduction gear bearings?

- (A) They are always mounted with the split in a horizontal plane.
- (B) They are rigidly mounted and dowelled in their housings.
- (C) They are split into four equal sized segments.
- (D) They are secured in their housing so pressure points will occur at the joint faces.

If choice B is selected set score to 1.

50. Axial movement in a gear-type flexible coupling is provided for by _____.

- (A) each gear sliding on its shaft between retaining collars
- (B) adjusting the pitch of the teeth on the pinion and high-speed gears
- (C) gear teeth on the floating member sliding between internal teeth on the shaft ring
- (D) the variable oil clearance in the quill shaft

If choice C is selected set score to 1.

51. Regarding main reduction gears, when high-speed first reduction pinions and gears are connected to low-speed pinions and gears, each contained in a sequential portion of the gear housing, the reduction gear unit is known as _____.

- (A) nested
- (B) articulated
- (C) locked train
- (D) none of the above

If choice B is selected set score to 1.

52. The reduction gear shown in the illustration is a/an _____. Illustration SE-0013

- (A) locked-train double reduction gear
- (B) nested double reduction gear
- (C) articulated double reduction gear
- (D) nested four-step reduction gear

If choice C is selected set score to 1.

53. A Kingsbury, or pivot shoe type thrust bearing, can bear much greater loads per square inch of working surface than can parallel surface bearings because provisions are made in the Kingsbury bearing _____.

- (A) for automatically adjusting clearances to the correct value when wear occurs
- (B) for the shoes to tilt slightly, thereby allowing the formation of a wedge shaped oil film under a thrust load
- (C) to allow the leveling plates to pivot on the collar when thrust loads are applied
- (D) for adjusting the filler piece thickness behind the pivotal-shoes to give a more accurate fit

If choice B is selected set score to 1.

54. Which of the following operational practices is helpful in avoiding the accumulation of condensate in the main reduction gear casing?

- (A) After the main unit is secured, lubricating oil should be circulated until the temperature of the oil and reduction gear casing approximates the engine room temperature.
- (B) The temperature of the lubricating oil should not exceed the gear manufacturer's recommendation when the unit is operating at full load.
- (C) Always ensure that the lubricating oil pressure is 14-17 psi when operating in unusually cold waters.
- (D) Avoid applying gland sealing steam to the low-pressure turbine until you are ready to start up the first-stage air ejector.

If choice A is selected set score to 1.

55. The slight wavy appearance of the tips of reduction gear teeth is a result of _____.

- (A) the method of manufacture and does affect normal operation
- (B) uneven bearing wear due to gross misalignment
- (C) insufficient lube oil pressure
- (D) high lube oil temperatures

If choice A is selected set score to 1.

56. The auxiliary exhaust system shown in the illustration can be supplied by steam from the _____ . Illustration SG-0024

- (A) IP bleed system
- (B) LP bleed system
- (C) distilling plant
- (D) turbo-generators

If choice A is selected set score to 1.

57. Which line in the illustration shown provides live steam to the gland seal regulator? Illustration SE-0019

- (A) line "C"
- (B) line "D"
- (C) line "G"
- (D) line "A"

If choice A is selected set score to 1.

58. A contaminated steam generator is used to produce saturated vapor from collected _____.

- (A) bilge water
- (B) sanitary water
- (C) fuel oil heating return drains
- (D) condenser cooling water

If choice C is selected set score to 1.

59. The intermediate pressure bleed steam system, shown in the illustration, is used to supply steam at approximately _____. Illustration SG-0024

- (A) 13.6 psia
- (B) 13.6 psig
- (C) 35.0 psig
- (D) 67.0 psig

If choice D is selected set score to 1.

60. Which boiler casualty is considered to be the most serious?

- (A) Low water level
- (B) High water level
- (C) Low feed pressure
- (D) Loss of feed suction

If choice A is selected set score to 1.

61. If a major flareback occurs to a boiler, which of the following actions should be immediately taken?

- (A) Secure the fuel to the burners
- (B) Secure the forced draft fan
- (C) Secure all fireroom ventilation
- (D) Purge the fuel oil system

If choice A is selected set score to 1.

62. When setting a propulsion boiler safety valve, in whose presence and satisfaction should this be accomplished?

- (A) Any licensed engineer
- (B) Inspector of the US Coast Guard
- (C) Chief Engineer
- (D) Master

If choice B is selected set score to 1.

63. Which of the listed operating practices is considered as safe, and should be followed when opening and inspecting the waterside of a boiler?

- (A) Remove handhole plate dogs with a slugging wrench.
- (B) Wire all valves closed that connect to other boilers.
- (C) Open the water drum manhole before opening the steam drum manhole.
- (D) Ventilate the waterside until completely dry.

If choice B is selected set score to 1.

64. Lube oil pumps taking suction from the sump of most small marine engines are usually _____.

- (A) Diaphragm type
- (B) Centrifugal type
- (C) Positive displacement type
- (D) Eductor type

If choice C is selected set score to 1.

65. When the plunger of an injection pump of an auxiliary diesel engine is stuck, it may cause which of the following conditions?

- (A) excessive fuel consumption
- (B) injector failure
- (C) engine shutdown
- (D) failure of the cylinder to fire

If choice D is selected set score to 1.

66. In which four stroke diesel engine system are sacrificial zinc anodes most commonly found?

- (A) lube oil system
- (B) cooling system
- (C) fuel system
- (D) exhaust system

If choice B is selected set score to 1.

67. At what piston position should you set the valve clearance on a four stroke auxiliary diesel engine?

- (A) BDC on the intake stroke
- (B) BDC on the power stroke
- (C) TDC on the compression stroke
- (D) TDC on the exhaust stroke

If choice C is selected set score to 1.

68. What may be an indication that you have a leaking injection nozzle?

- (A) high exhaust temperature and low compression pressure
- (B) low exhaust temperature and high firing pressure
- (C) high exhaust temperature and low firing pressure
- (D) low exhaust temperature and high compression pressure

If choice C is selected set score to 1.

69. What color smoke may be indicative of a leaking head gasket?

- (A) gray smoke
- (B) black smoke
- (C) blue smoke
- (D) white smoke

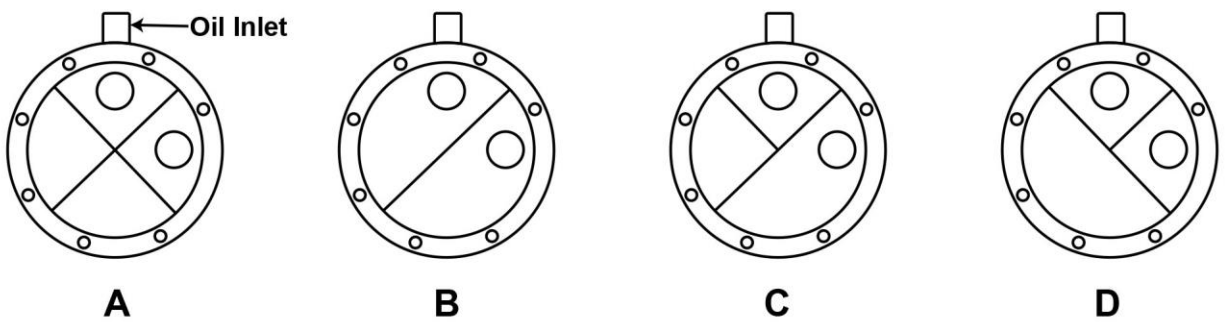
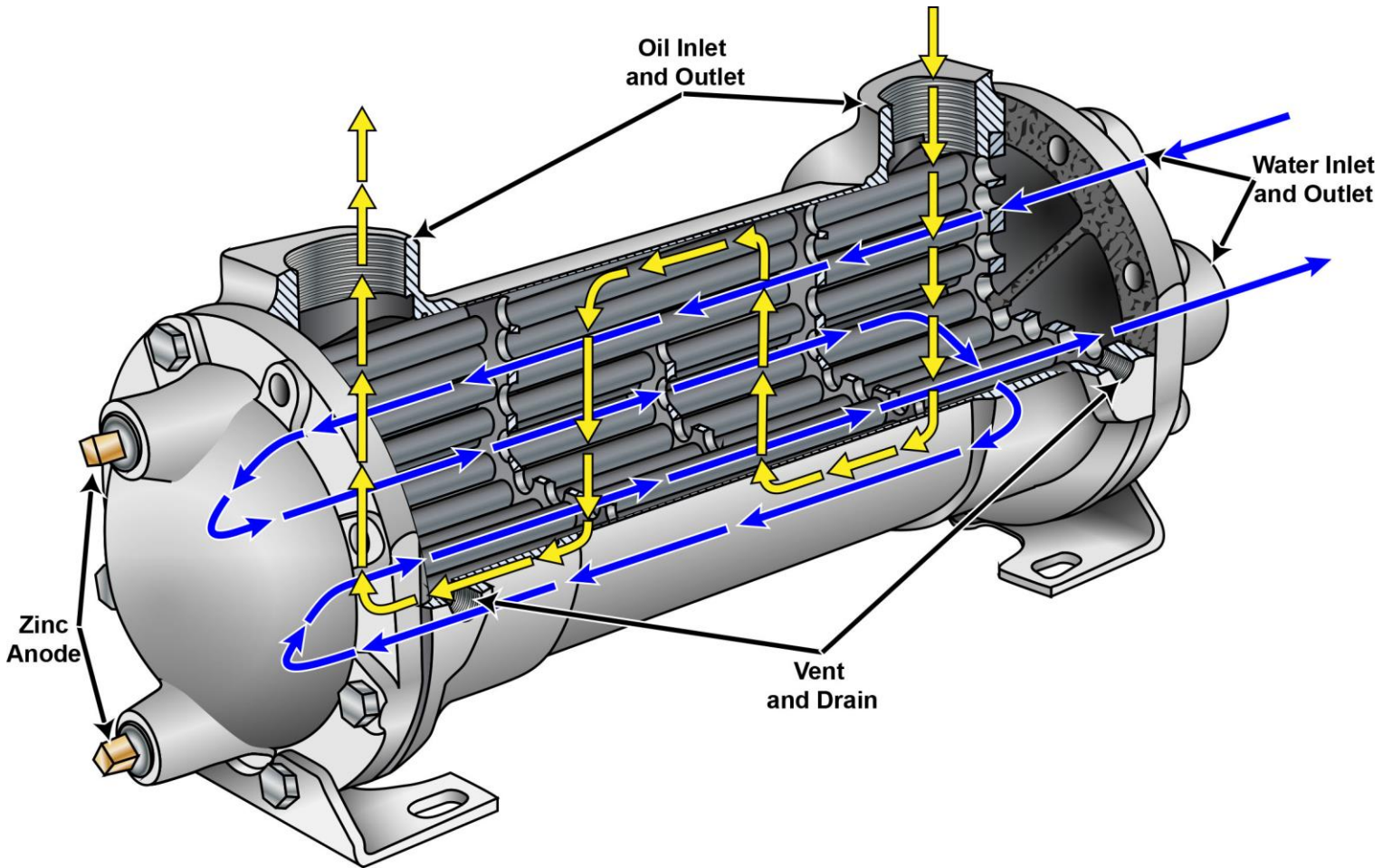
If choice D is selected set score to 1.

70. If an auxiliary diesel engine starts firing but does not come up to normal speed, without load or under a small load, one cause may be _____.

- (A) late fuel injection
- (B) a clogged fuel filter
- (C) excessive compression pressure
- (D) incorrect fuel oil

If choice B is selected set score to 1.

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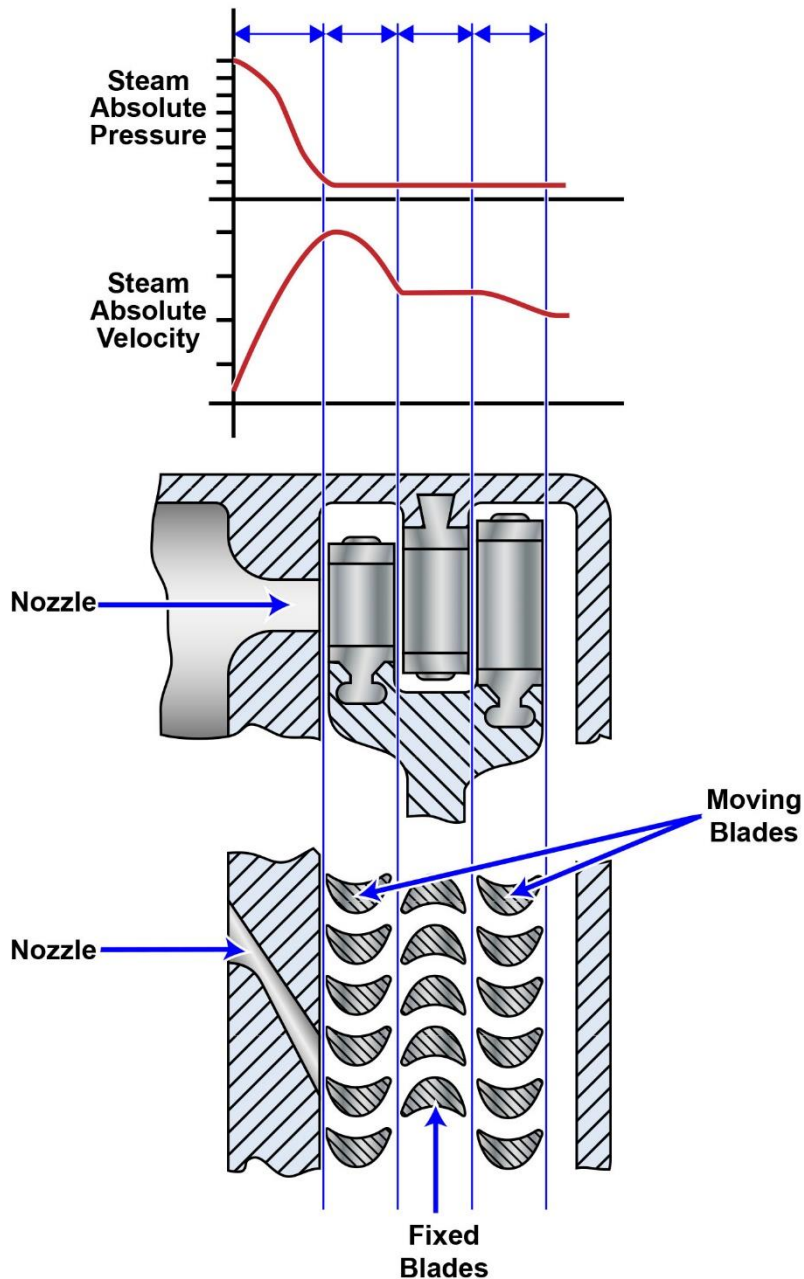


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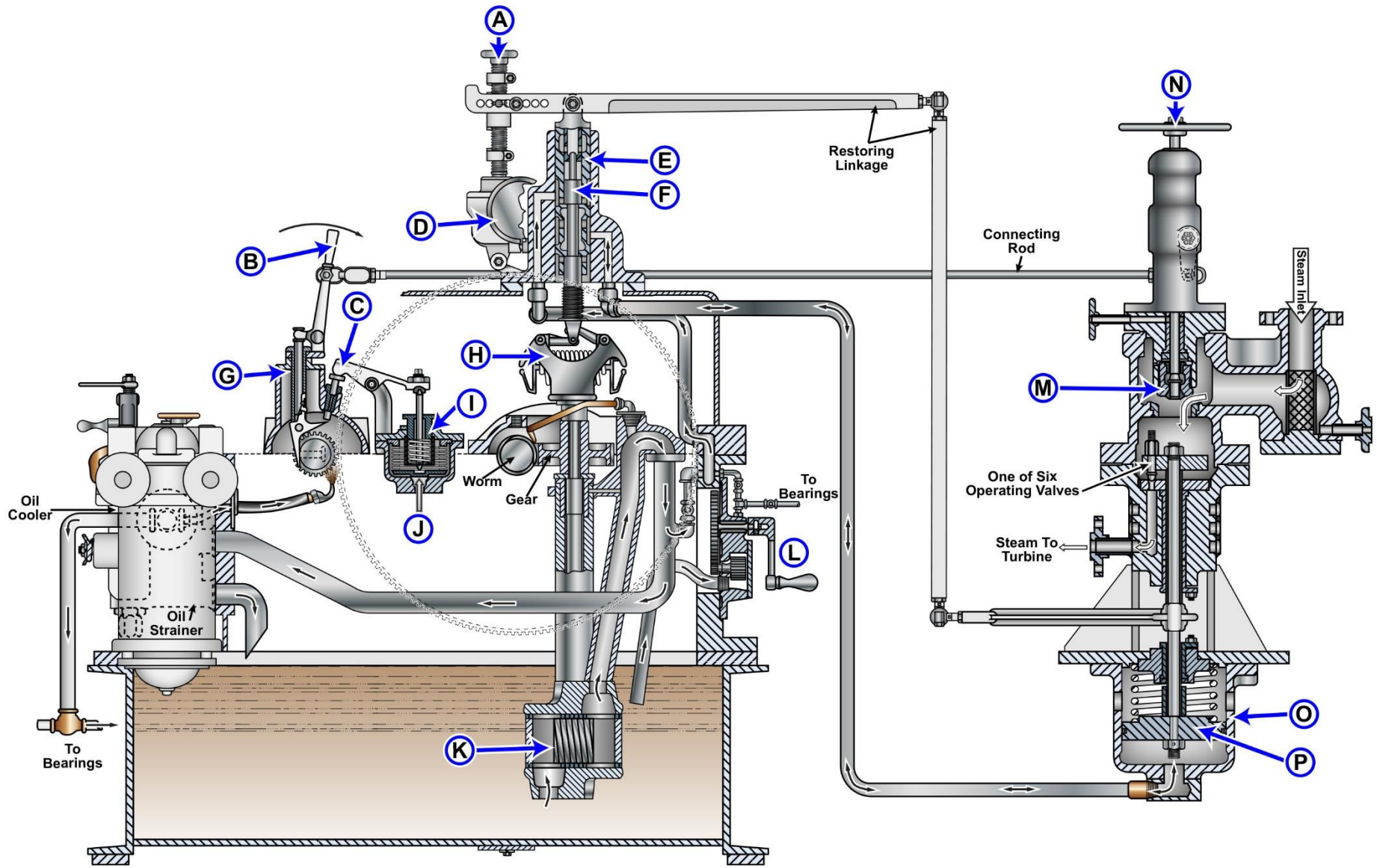
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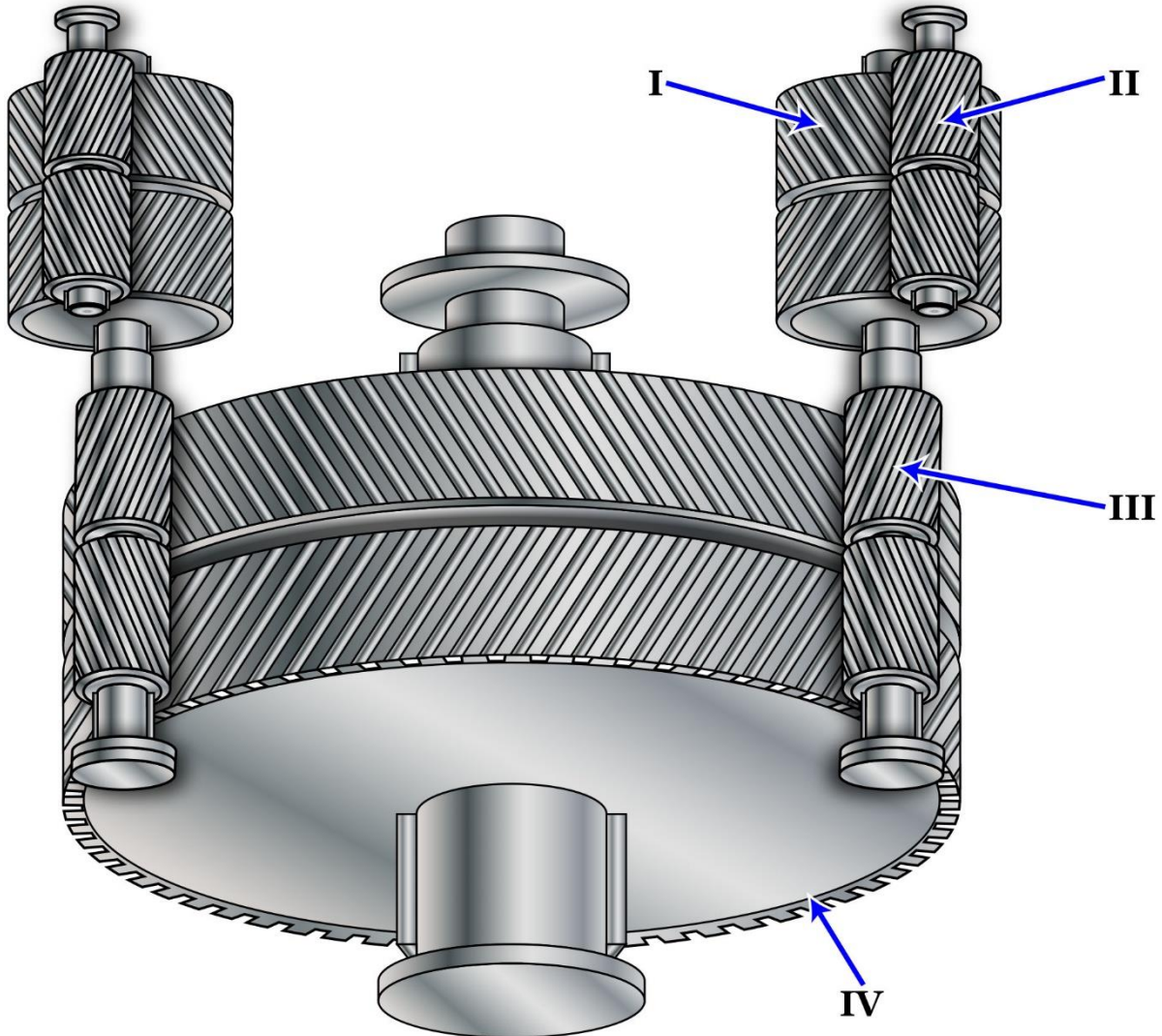
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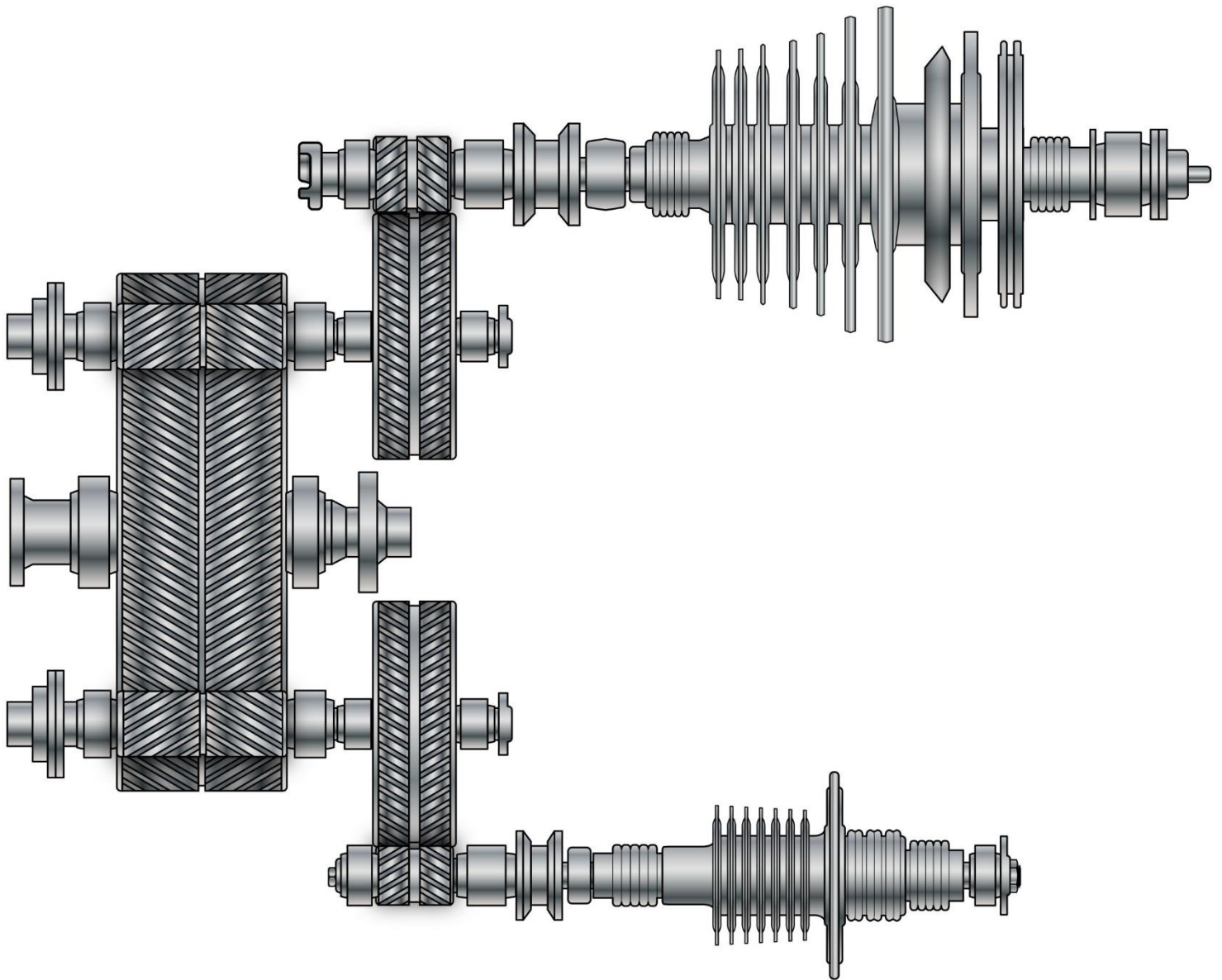
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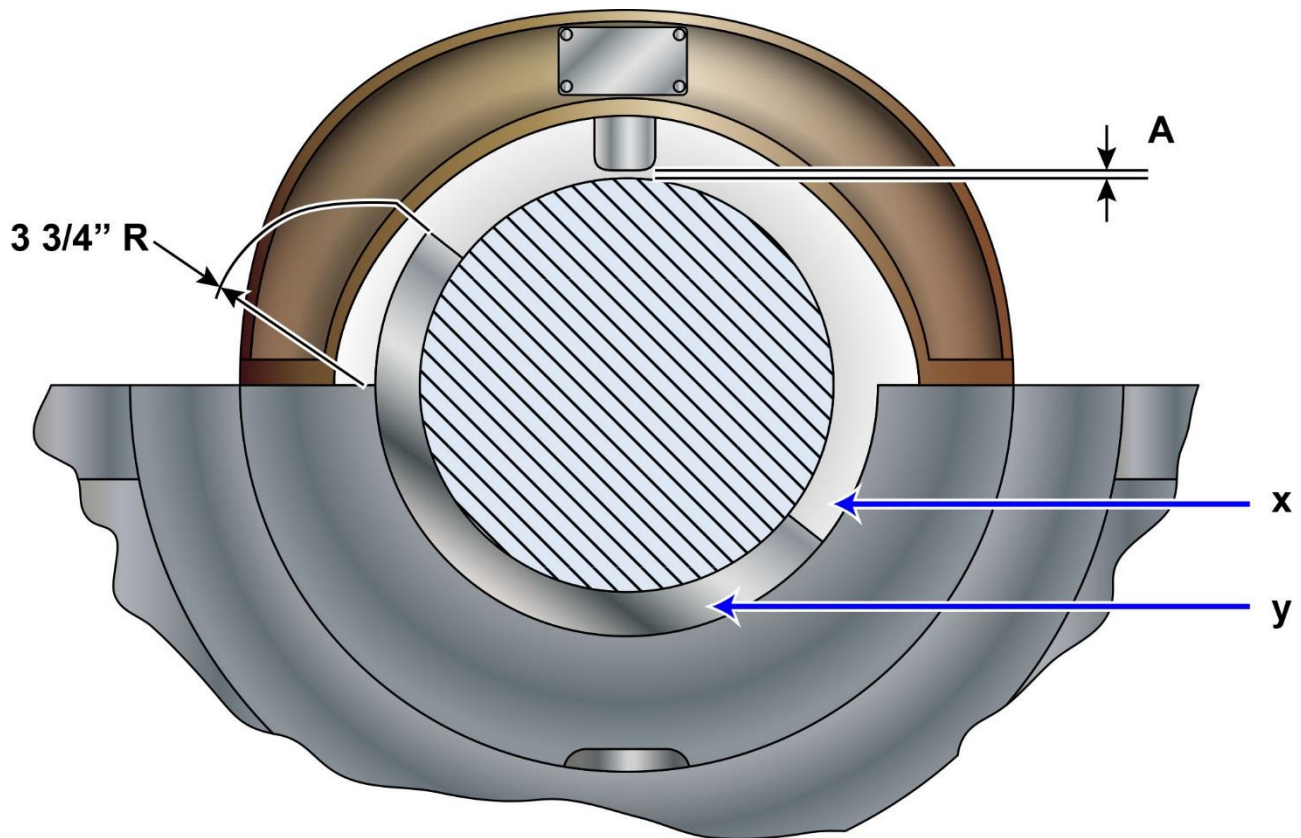
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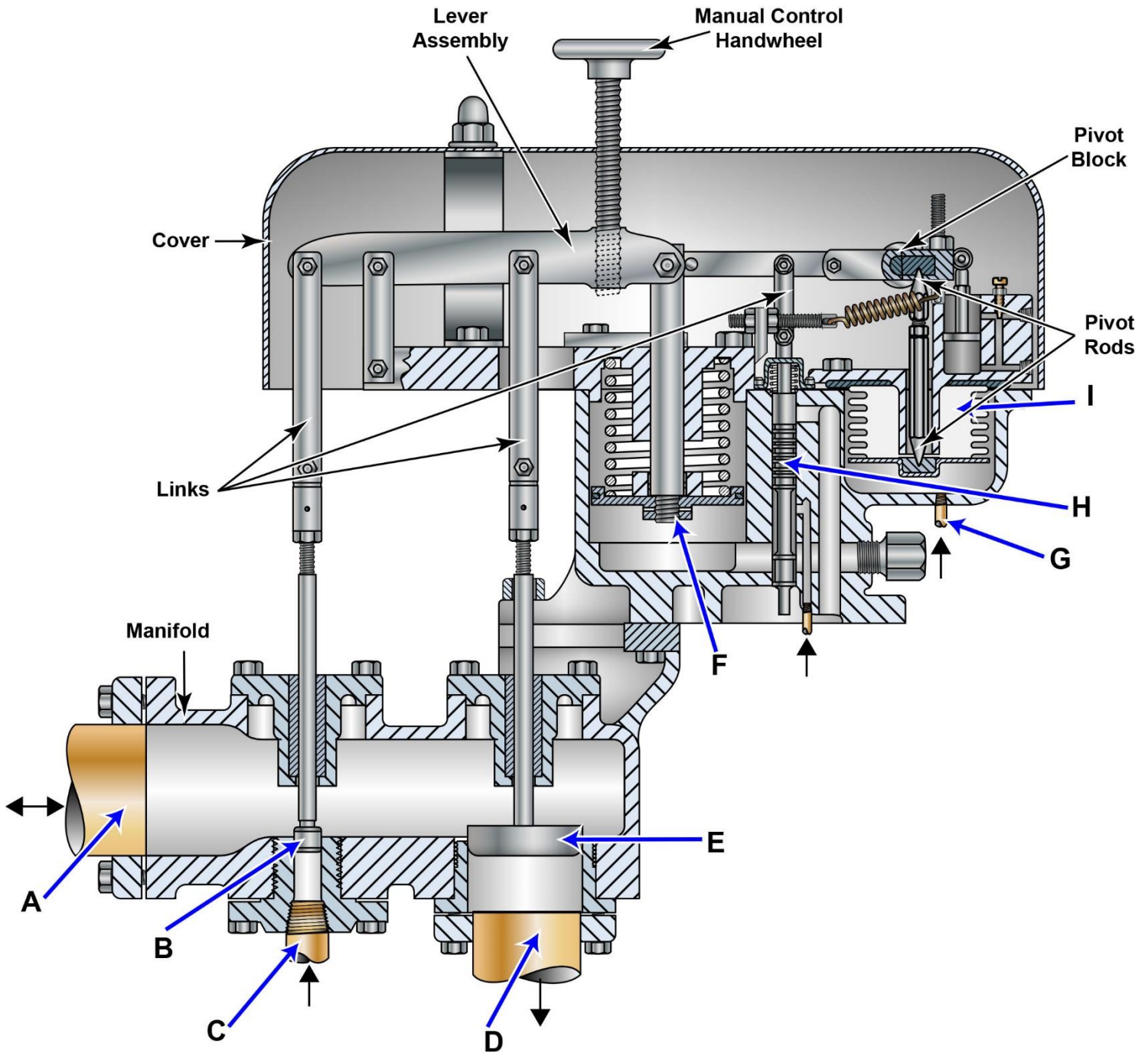
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SE-0019

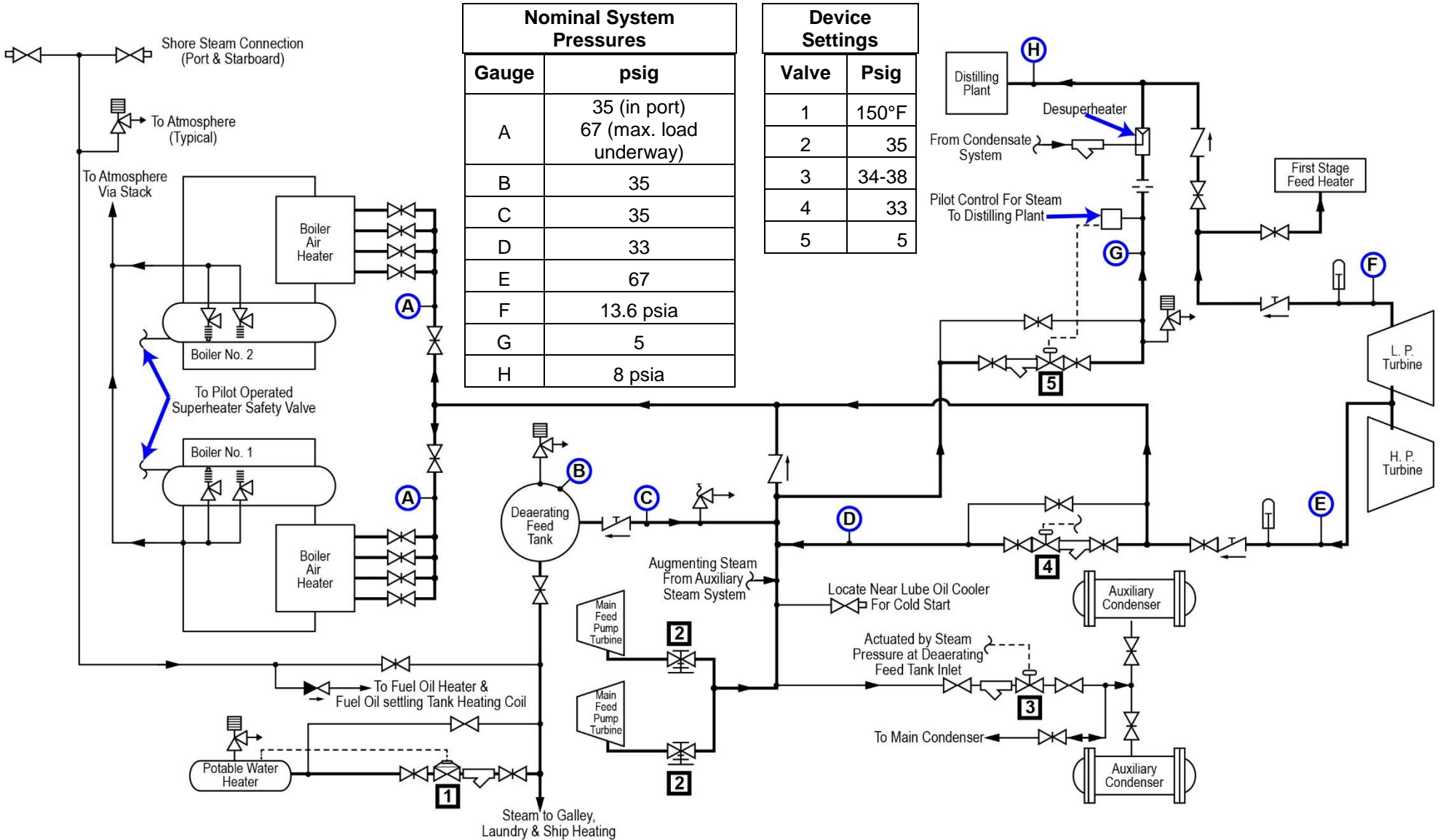


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SG-0024



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