

U.S.C.G. Merchant Marine Exam  
Assistant Engineer – Limited  
Q611 Steam Plants  
(Sample Examination)

**Choose the best answer to the following Multiple-Choice Questions:**

1. Depending upon the design of the boiler, the constant pressure maintained at the steam drum or the superheater outlet is known as the \_\_\_\_\_.
- A. overload pressure
  - B. designed maximum pressure
  - C. output pressure
  - D. operating pressure

Correct answer: D

2. Steam tables can be used to obtain the \_\_\_\_\_.
- A. mechanical efficiency of the main unit
  - B. steam generating capacity of a vessel's boilers
  - C. specific fuel consumption under steady steaming conditions
  - D. values for properties of water and steam vapor at various conditions

Correct answer: D

3. Reaching which "end point" will result in the most severe damage to the boiler?
- A. Combustion
  - B. Atomization
  - C. Circulation
  - D. Carryover

Correct answer: C

4. A boiler safety valve must be capable of \_\_\_\_\_.
- A. Remaining open until all pressure in the steam drum is relieved
  - B. Remaining open until a preset pressure drop occurs
  - C. Closing with a chattering motion to free scale deposits from the seats
  - D. Opening gradually above a designated pressure

Correct answer: B

5. A secondary function of the refractory installed in a marine boiler is to \_\_\_\_\_.
- A. Maintain air flow through the burner diffuser
  - B. Support the boiler casing
  - C. Support the burner distance piece
  - D. Direct the flow of combustion gases

Correct answer: D

6. The advantage of installing waterwall tubes in a boiler furnace is to \_\_\_\_\_.
- A. decrease the flow of gases through the furnace
  - B. permit higher combustion rates
  - C. increase the flow of gases through the furnace
  - D. increase heat transfer to the mud drum

Correct answer: B

7. The device shown in the illustration is a/an \_\_\_\_\_. Illustration SG-0013
- A. Deaerator
  - B. Air ejector
  - C. Eductor
  - D. Desuperheater

Correct answer: D

8. Where is the "dry pipe" located in a boiler?
- A. Below the generation tube bank
  - B. At the superheater outlet
  - C. Behind the superheater screen tubes
  - D. In the top of the steam drum

Correct answer: D

9. Scavenging air is supplied to steam sootblower elements to \_\_\_\_\_.
- A. Prevent overheating of adjacent tubing
  - B. Prevent back up of combustion gases into sootblower heads
  - C. Prevent buildup of soot on the element
  - D. Provide cooling air when sootblower elements are rotating through blowing arcs

Correct answer: B

10. In a boiler equipped with a convection type superheater, the superheater tubes are located \_\_\_\_\_.
- A. In a position screened from the furnace
  - B. In the path of the radiant heat of combustion
  - C. Between the economizer and generating tubes
  - D. Between the downtake nipple and circulator tube

Correct answer: A

11. The superheater vents should always be open when \_\_\_\_\_.
- A. Lighting off the boiler
  - B. Blowing tubes
  - C. Blowing down the boiler
  - D. The water level is lower than normal

Correct answer: A

12. After steam has been raised and a boiler is being placed on the line, the superheater vent can be closed when \_\_\_\_\_.
- A. The boiler steam stops have been warmed up
  - B. The boiler is supplying auxiliary steam
  - C. Boiler pressure is 5 psi above line pressure
  - D. Main and auxiliary steam line drains are opened

Correct answer: B

13. Which of the following is the best reason for opening the air cock when draining a water-tube boiler?

- A. Air mixed with the water will create a cleansing effect in the tubes.
- B. With the air cock open, the boiler drains without producing a vacuum.
- C. Water flows out of the boiler too rapidly with the air cock closed.
- D. Air coming into the boiler will help dry out the boiler's surface.

Correct answer: B

14. To avoid acid corrosion of the economizer tubes when blowing tubes \_\_\_\_\_.

- A. Lower water level
- B. Drain the sootblowers headers
- C. Raise boiler pressure
- D. Lower boiler pressure

Correct answer: B

15. To make temporary emergency repairs to brickwork in a boiler furnace, which of the materials listed should be used?

- A. Calcined diatomaceous earth
- B. Plastic refractory
- C. Air setting mortar
- D. Insulating block

Correct answer: B

16. You are standing watch in the engine room of a steam vessel. You should blow down a gauge glass periodically to \_\_\_\_\_.

- A. maintain the proper water level in the steam drum
- B. test the feedwater stop-check valve
- C. remove any sediment that has accumulated
- D. provide water samples for the second assistant

Correct answer: C

17. Water in the fuel supply to a steaming boiler can be detected by \_\_\_\_\_.

- A. Dense white smoke being observed in the periscope
- B. Sputtering of the fires
- C. Observation of the fuel oil heater drains
- D. Panting of the casing

Correct answer: B

18. Which color burner flame would indicate too much excess air?

- A. Orange red
- B. Yellowish orange
- C. Bright red
- D. Incandescent white

Correct answer: D

19. Boiler tube failures can result from \_\_\_\_\_.

- A. overheating
- B. corrosion
- C. mechanical stress
- D. all of the above

Correct answer: D

20. Excessive foaming in a steaming boiler can cause damage to the \_\_\_\_\_.

- A. superheater
- B. desuperheater
- C. economizer
- D. internal feed pipe

Correct answer: A

21. Vent condensers are usually an integral part of deaerating feed heaters and serve to condense \_\_\_\_\_.

- A. only steam vented from high-pressure steam traps
- B. steam vented from high-pressure steam glands
- C. the steam vapor entrained with the non-condensable gases
- D. the gases liberated by the deaeration process

Correct answer: C

22. If manual control of the water level in a steaming boiler is required, the proper method of control is with the auxiliary feed \_\_\_\_\_.

- A. pump pressure control
- B. pump speed control
- C. stop-check valve
- D. stop valve

Correct answer: C

23. A single element boiler feedwater regulating system used aboard ship utilizes \_\_\_\_\_.

- A. proportional plus reset plus rate action
- B. two-position differential gap action
- C. proportional action
- D. proportional plus reset action

Correct answer: C

24. The two-element feedwater regulator functions similarly to the three-element feedwater regulator, but does not utilize \_\_\_\_\_.

- A. feedwater flow measurement
- B. water level
- C. drum pressure
- D. steam flow measurement

Correct answer: A

25. If the DC heater relief valve lifts frequently, the cause can be excessive \_\_\_\_\_.

- A. condensate supplied to the DC heater
- B. feedwater recirculated from the feed pump
- C. makeup feed introduced to the system
- D. auxiliary exhaust steam pressure

Correct answer: D

26. The loop seal connected to the main condenser returns the drains from the \_\_\_\_\_.

- A. vent condenser
- B. intercondenser
- C. aftercondenser
- D. all of the above

Correct answer: B

27. Which statement listed represents a vital function of the main condenser?

- A. Cooling of the exhaust steam from the auxiliary exhaust system before it enters the deaerating feed tank
- B. Condensing of the exhaust steam from the main feed turbine pumps
- C. The recovery of feedwater for reuse
- D. Storage of feedwater for immediate use in the boilers

Correct answer: C

28. Under normal conditions, the rate of heat transfer in a feedwater heater is most greatly affected by the \_\_\_\_\_.

- A. temperature differential between the steam and feedwater
- B. density of the feedwater
- C. speed of the main feed pump
- D. pH of the feedwater

Correct answer: A

29. Excessively hot water returning to an atmospheric drain tank indicates \_\_\_\_\_.

- A. A heating coil has ruptured
- B. The condensate recirculating valve is open
- C. A steam trap is hung open
- D. There is a loss of circulating water

Correct answer: C

30. The property of a fuel oil which is a measurement of its available energy, is known as its \_\_\_\_\_.

- A. Cetane index
- B. Heating value
- C. Viscosity index
- D. Cetane number

Correct answer: B

31. The most harmful slag forming compounds found in fuel oils are \_\_\_\_\_.
- A. calcium and silica
  - B. potassium and nickel
  - C. vanadium and sodium
  - D. iron and sulfur

Correct answer: C

32. Which characteristic of fuel oil is the most significant when determining the temperature to which the fuel oil must be heated for proper atomization?
- A. Viscosity
  - B. Flash point
  - C. Specific gravity
  - D. Pour point

Correct answer: A

33. The component labeled "F" as shown in the illustration is \_\_\_\_\_. Illustration SG-0007
- A. One of the main burner assemblies
  - B. A permanently installed Orsat apparatus
  - C. A regenerative air heater
  - D. One of the retractable sootblower elements

Correct answer: A

34. The illustrated burner atomizer assembly is \_\_\_\_\_. Illustration SG-0022
- A. An example of a rotary cup type atomizer
  - B. Straight mechanical
  - C. Used in a return flow type burner management system
  - D. Used only for variable load steam atomization

Correct answer: B

35. Fuel oil solenoid valves at the burner fronts should be of the manual reset type to \_\_\_\_\_.
- A. permit the operator to secure each burner during a blackout
  - B. permit the operator to secure each burner after a blackout
  - C. prevent the furnace from filling with oil during a power failure
  - D. prevent the furnace from filling with oil after restoration of power

Correct answer: D

36. According to the illustration, what part number identifies the "igniter"? Illustration SG-0016
- A. 2
  - B. 3
  - C. 7
  - D. 9

Correct answer: A

37. In an impulse turbine, the fixed blades function to \_\_\_\_\_.

- A. decrease steam velocity
- B. change the direction of steam flow
- C. prevent steam turbulence
- D. equalize pressure differences

Correct answer: B

38. Which of the parts listed for a reaction turbine serve the same function as the nozzles of an impulse turbine?

- A. Moving blades only
- B. Fixed nozzles
- C. Moving nozzles
- D. Fixed blades and moving blades

Correct answer: D

39. When a turbine is in operation, a rotor position micrometer is used to determine any change in rotor \_\_\_\_\_.

- A. axial position relative to the casing
- B. radial position relative to the casing
- C. axial position relative to the micrometer
- D. radial position relative to the micrometer

Correct answer: A

40. The astern element of a main propulsion turbine is usually designed as a \_\_\_\_\_.

- A. single entry, double flow turbine
- B. multiple entry, helical flow turbine
- C. Parsons stage, reaction turbine
- D. Curtis stage, impulse turbine

Correct answer: D

41. Labyrinth seals used to reduce leakage around a turbine shaft are constructed of \_\_\_\_\_.

- A. staged rubber composition seal stripping
- B. machined metallic packing strips or fins
- C. spring bound carbon segments
- D. braided asbestos covered core segments

Correct answer: B

42. On a main propulsion turbine bearing, the readings obtained with a bridge gauge represent the \_\_\_\_\_.

- A. oil clearance and bearing wear
- B. diaphragm tip clearance
- C. Babbitt thickness
- D. blade axial clearance

Correct answer: A



43. Which of the devices listed is found on an LP main propulsion steam turbine casing?

- A. Duplex set of relief valves
- B. HP turbine bypass valve
- C. Sliding beam
- D. Sentinel valve

Correct answer: D

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

- A. Spring bearings
- B. Spherically seated bearings
- C. Ball bearings
- D. Roller bearings

Correct answer: B

45. For a large main propulsion turbine, the most commonly used turbine thrust bearing is the \_\_\_\_\_.

- A. pivoted segmental shoe
- B. overhung turbine wheel
- C. self-oiling sleeve
- D. self-aligning shell

Correct answer: A

46. Which of the devices listed is generally used to engage the main engine turning gear to the high-pressure turbine high-speed pinion?

- A. Quill shaft
- B. Manually operated sliding jaw clutch
- C. Sleeve coupling
- D. Manually operated band brake

Correct answer: B

47. Before placing the jacking gear in operation on a main turbine unit, you must always ensure that \_\_\_\_\_.

- A. the gland seal steam system is operating
- B. the main lube oil system is operating
- C. the condensate system is operating
- D. the main saltwater circulating pump is operating

Correct answer: B

48. When securing a main propulsion turbine equipped with carbon packing glands, the vacuum should always be broken before securing the gland seal steam because \_\_\_\_\_.

- A. loop seal will flood the aftercondenser
- B. gland seal leakoff lines will flood with water
- C. cold air rapidly entering the gland may result in damage to the carbon segments and sealing surfaces
- D. the turbine rotor expands faster than the gland casing

Correct answer: C

49. A common cause of the Babbitt linings cracking in a turbine journal bearing is from \_\_\_\_\_.

- A. prolonged operation at full-speed
- B. prolonged operation at low-speed
- C. excessive thrust bearing wear
- D. vibration generated by the rotor

Correct answer: D

50. 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 spring loaded flyballs to actuate a control lever.
- C. Excessive centrifugal force causes a spring-loaded weight to trip a valve latch.
- D. Excessive speed causes an increase in lube oil control temperature which actuates a solenoid oil dump valve.

Correct answer: A

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

- A. Dovetail
- B. Labyrinth
- C. Teflon
- D. Carbon

Correct answer: B

52. The turbine of a turbo-electric drive should be secured by \_\_\_\_\_.

- A. tripping the throttle trip by hand
- B. closing the main steam stops
- C. dynamic braking of the generator
- D. closing the throttle by hand

Correct answer: A

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

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

Correct answer: D

54. A common method of preheating main turbine lube oil prior to rolling over the main unit would be to \_\_\_\_\_.

- A. run both the lube oil pumps simultaneously
- B. operate the lube oil purifier on the main lube oil sump
- C. slightly increase gland sealing steam pressure
- D. bypass the lube oil gravity tank

Correct answer: B

55. The term "separation" as used in oil purification refers to the removal of \_\_\_\_\_.

- A. acid contaminants from oil
- B. oil from its additives
- C. solids from lube oil
- D. water from a mixture of oil liquids

Correct answer: D

56. According to the illustration, what is the normal function of the component shown? Illustration SE-0010

- A. indicate the temperature and flow of lube oil leaving a turbine bearing
- B. indicate the pressure and flow of lube oil entering a turbine bearing
- C. indicate the pressure and temperature of lube oil leaving a turbine bearing
- D. act as a final filter for oil entering a bearing

Correct answer: A

57. As the speed of an oil lubricated ball bearing increases, fluid friction, due to churning, generates heat. This condition may be avoided by \_\_\_\_\_.

- A. adding more lubricant until the ball bearings are completely covered with a layer of oil
- B. reducing the quantity of lubricant until only a mist of oil is present on the ball bearings
- C. maintaining a continuous fluid level over half of the outer race
- D. installing oil rings on the ball bearings

Correct answer: B

58. Magnets are installed in the main propulsion turbine lube oil strainers to attract metal particles released through wearing of the \_\_\_\_\_.

- A. turbine blades
- B. reduction gears
- C. turbine labyrinth
- D. Babbitt bearings

Correct answer: B

59. If the main and standby lube oil service pumps of the main engine fail while underway at sea, \_\_\_\_\_.

- A. emergency lubrication can be supplied through the use of the hand pump
- B. the reduction gear bearings will immediately fail
- C. the turbine bearings will immediately fail
- D. an emergency supply of oil in the gravity tank will provide time to crash stop the turbine and gears

Correct answer: D

60. 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. be equal to main lube oil sump temperature
- C. be equal to the normal lube oil cooler outlet temperature
- D. never exceed the highest main engine bearing temperature

Correct answer: A

61. After starting the main lube oil pump in a gravity-type lube oil system, you should verify that the gravity tanks are full by \_\_\_\_\_.

- A. sounding the lube oil sump
- B. observing the flow from the bearings
- C. sounding the gravity tanks
- D. observing the overflow sight glass

Correct answer: D

62. Which of the following methods is used to securely fasten the Babbitt lining of a reduction gear bearing to its shell?

- A. The Babbitt is relieved in way of the split and held in place by locking pins.
- B. The Babbitt is securely bonded to the shell by the pressure of the hydrodynamic oil wedge.
- C. The Babbitt has a crescent shaped pocket cast symmetrically about the bearing split.
- D. The Babbitt is centrifugally spun into the bearings or cast under a pressure head.

Correct answer: D

63. Which of the coupling types listed is shown in the illustration? Illustration SE-0001

- A. Solid
- B. Gear
- C. Claw
- D. Pin

Correct answer: B

64. Which of the following statements defines the term "axial float" in reference to reduction gears?

- A. A pinion is capable of free axial motion, mating with a fixed double helical gear which establishes its position in the gear train.
- B. The gears are capable of free motion, neither supporting nor being supported radially by other gears.
- C. The gears cut with a single helical profile have axial thrust eliminated.
- D. The gears are not subject to excessive tooth loads due to mismatching of the journal bearing halves.

Correct answer: A

65. In the diagrammatic arrangement of the thrust bearing, shown in the illustration, the direction of shaft rotation and the direction of thrust are indicated respectively by arrows \_\_\_\_\_. Illustration SE-0012
- A. F and H
  - B. G and H
  - C. F and J
  - D. G and J

Correct answer: C

66. The most practical method of determining the condition of a shaft bearing while the shaft is in operation is to \_\_\_\_\_.
- A. visually inspect the bearing
  - B. perform a carbon blot test on an oil sample from the bearing
  - C. check the lube oil viscosity
  - D. check the lube oil temperature

Correct answer: D

67. The Butterworth heater shown in the illustration receives steam at approximately \_\_\_\_\_. Illustration SG-0005
- A. 130 psi
  - B. 170 psi
  - C. 205 psi
  - D. 850 psi

Correct answer: A

68. According to the illustration, what actuates the bellows "I" in the gland seal regulator? Illustration SE-0019
- A. control air pressure
  - B. lube oil pressure
  - C. steam throttle pressure
  - D. gland seal steam pressure

Correct answer: D

69. The level of the contaminated drain inspection tank continually decreases when steam is admitted to a fuel oil double bottom tank. You can expect \_\_\_\_\_.
- A. higher than normal return temperatures
  - B. a leaking makeup feed regulator
  - C. a plugged heating coil
  - D. a perforated heating coil

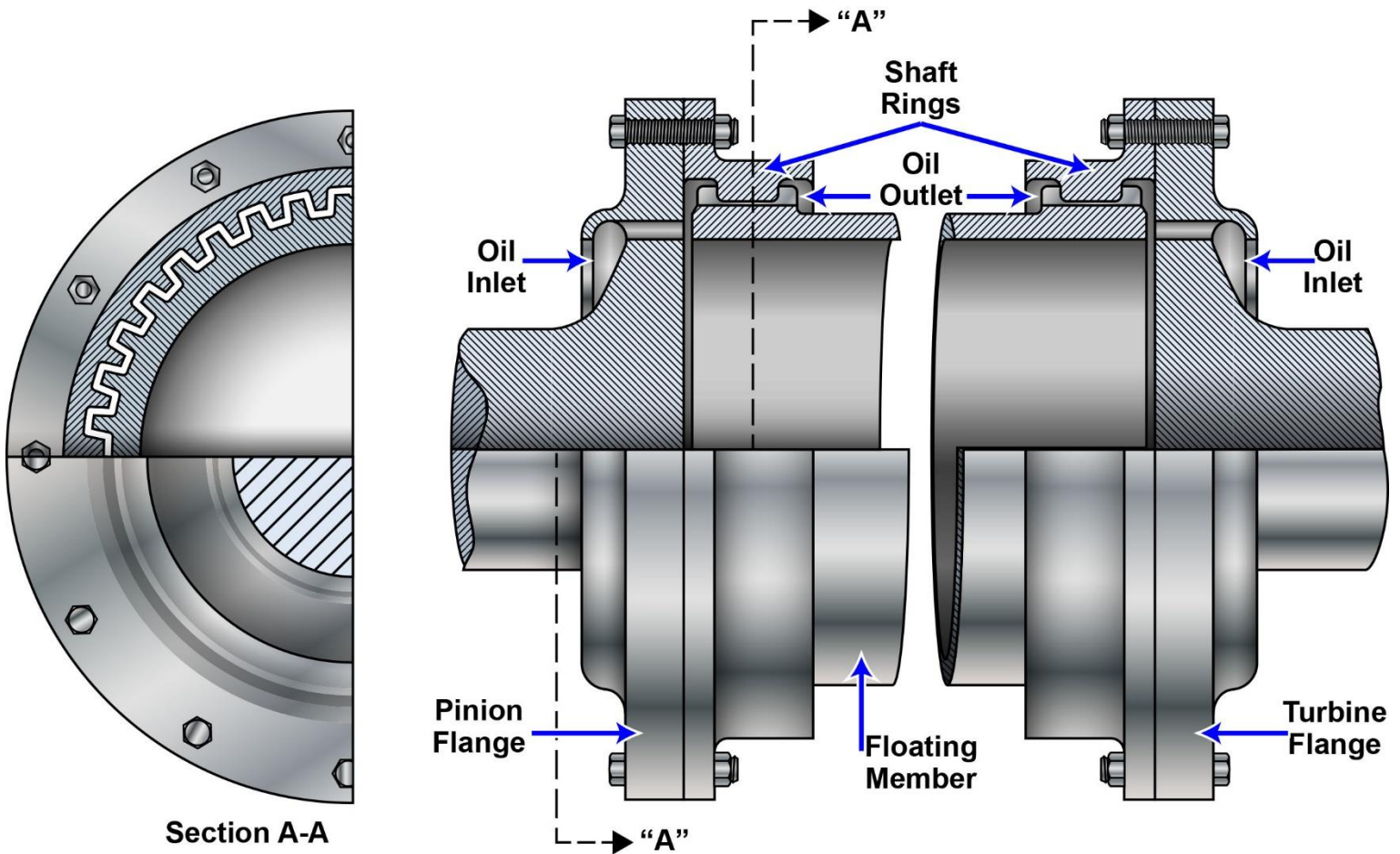
Correct answer: D

70. The primary source of steam to the auxiliary exhaust system is typically supplied directly from \_\_\_\_\_.

- A. turbine driven and reciprocating steam pumps
- B. the turbine gland exhaust system
- C. the main engine LP bleed
- D. all of the above

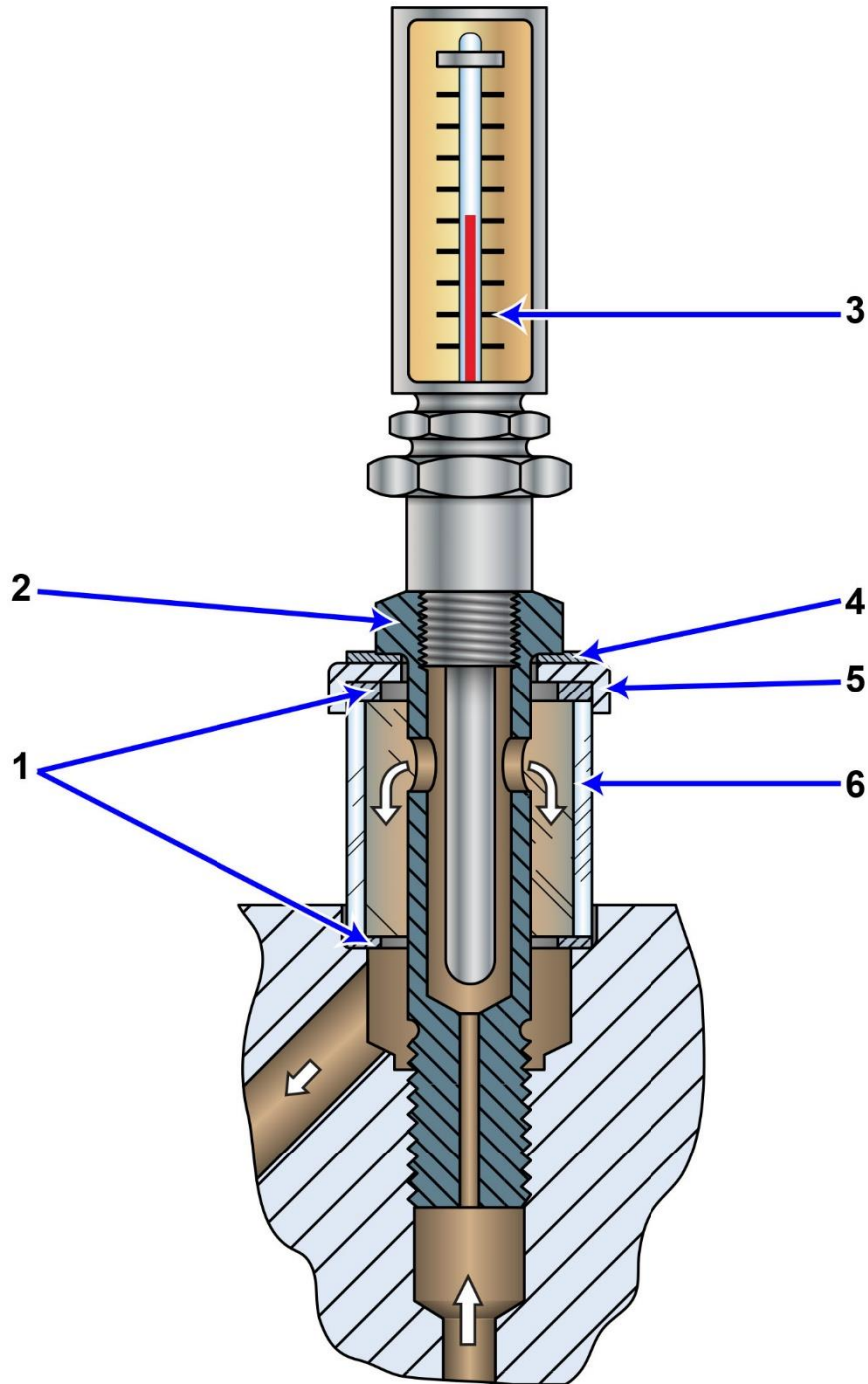
Correct answer: A

## SE-0001



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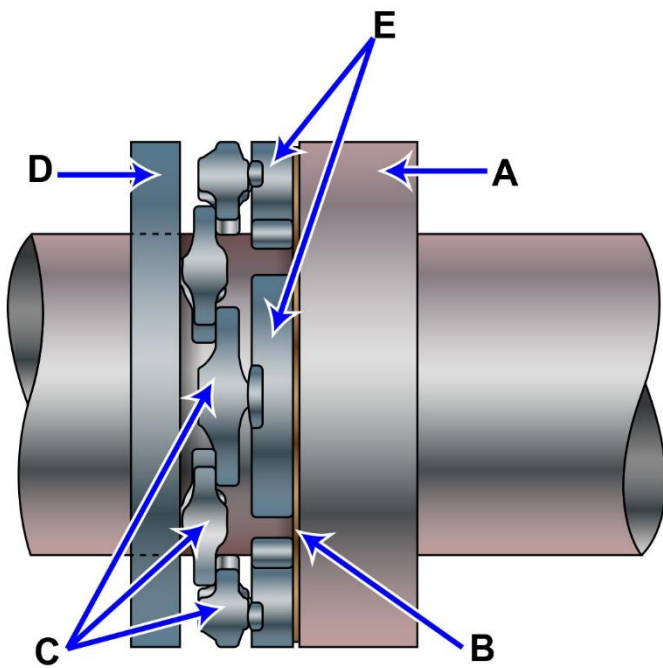
## SE-0010



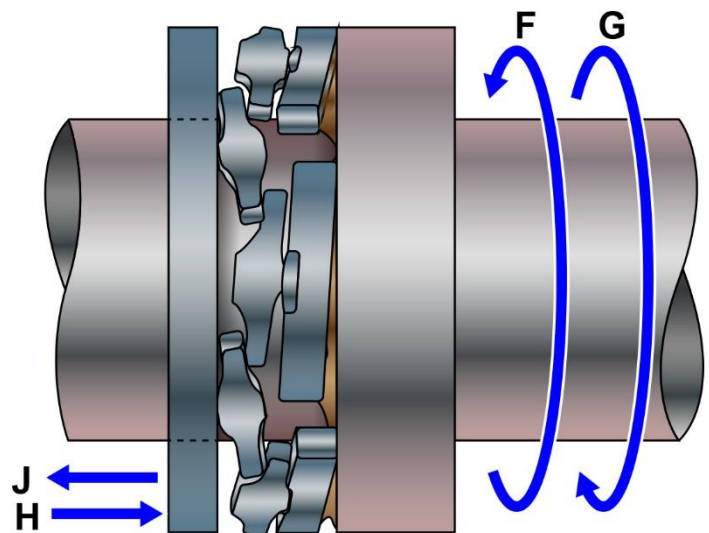
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## SE-0012



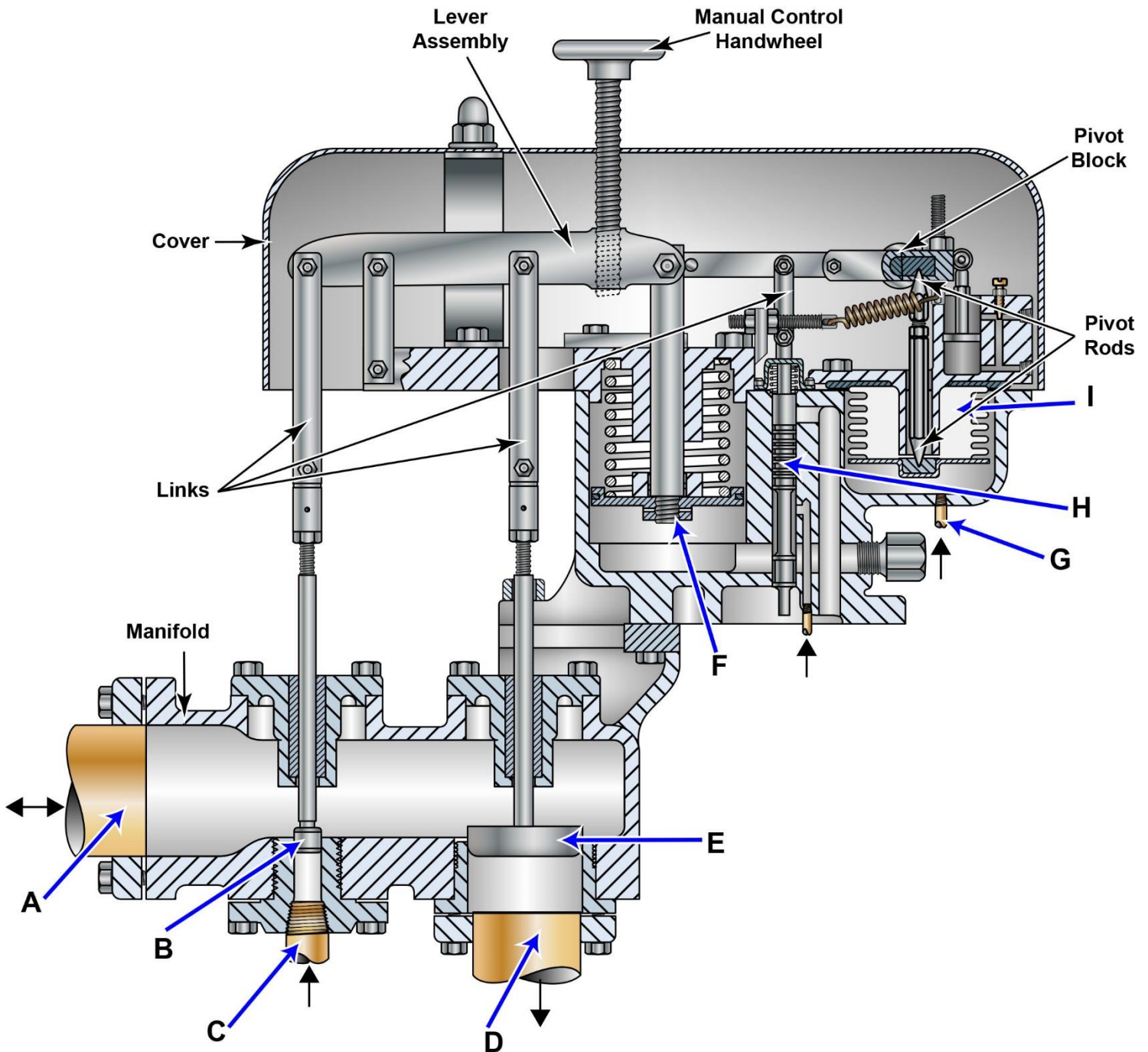
Stationary View



Rotating View

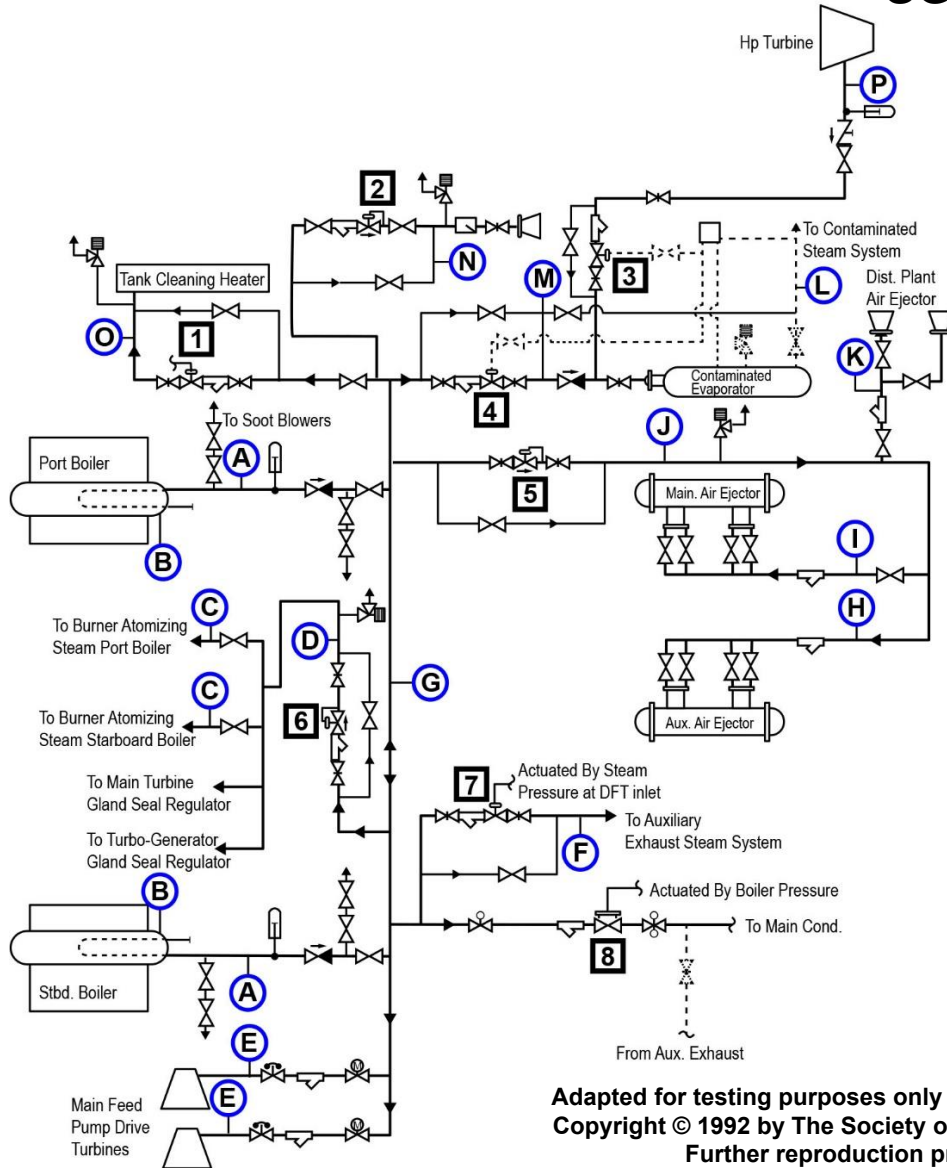
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## SG-0005



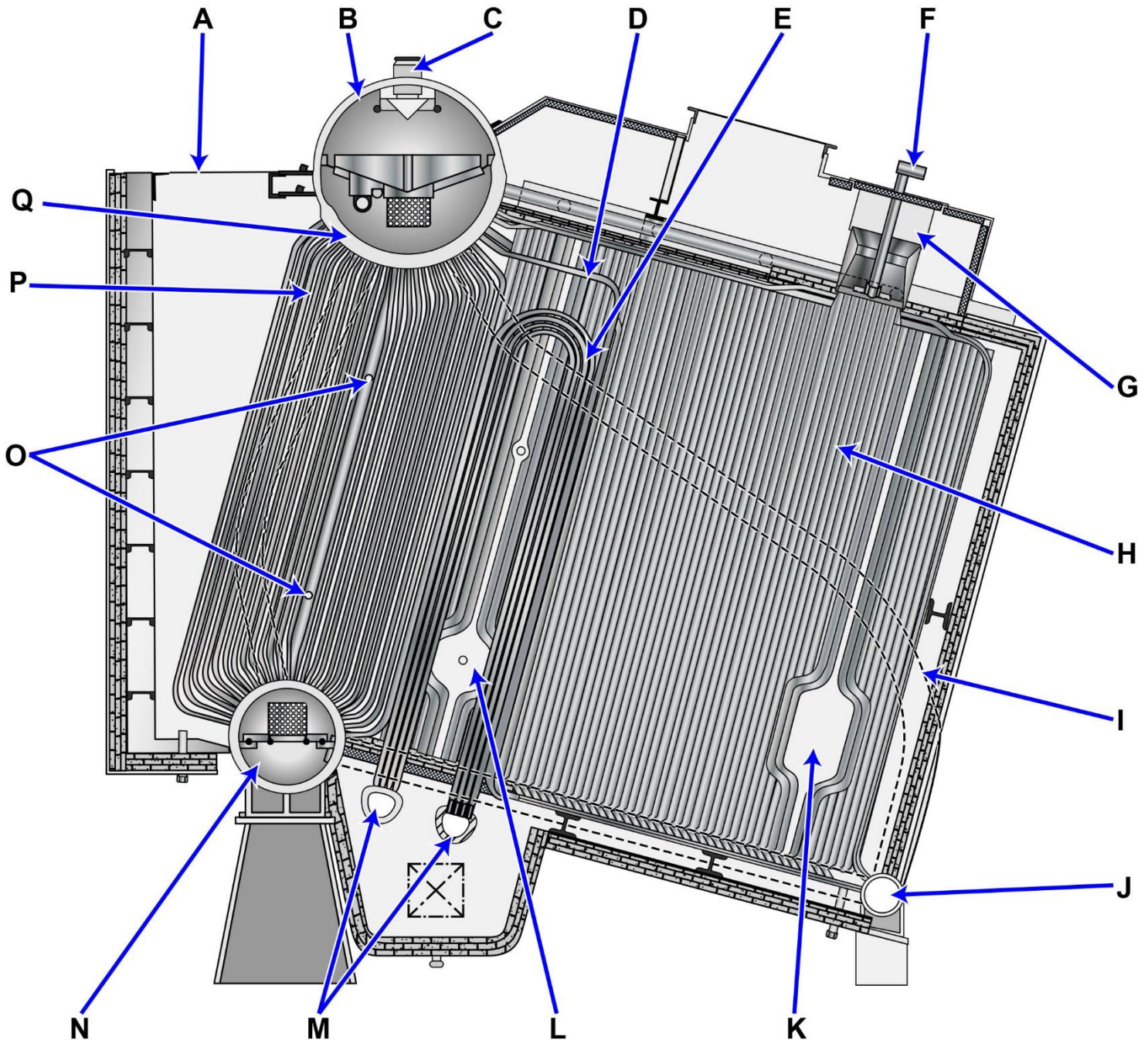
Nominal System Pressures	
Gauge	psig
A	850
B	860
C	143
4	350
D	143
E	850
6	143
F	32
G	850
H	143
I	143
J	143
K	143
L	130
M	350
N	140
O	130
P	205 (at full power)

Device Settings	
Valve	Psig
1	130
2	140
3	185
4	350
5	143
6	143
7	32
8	860

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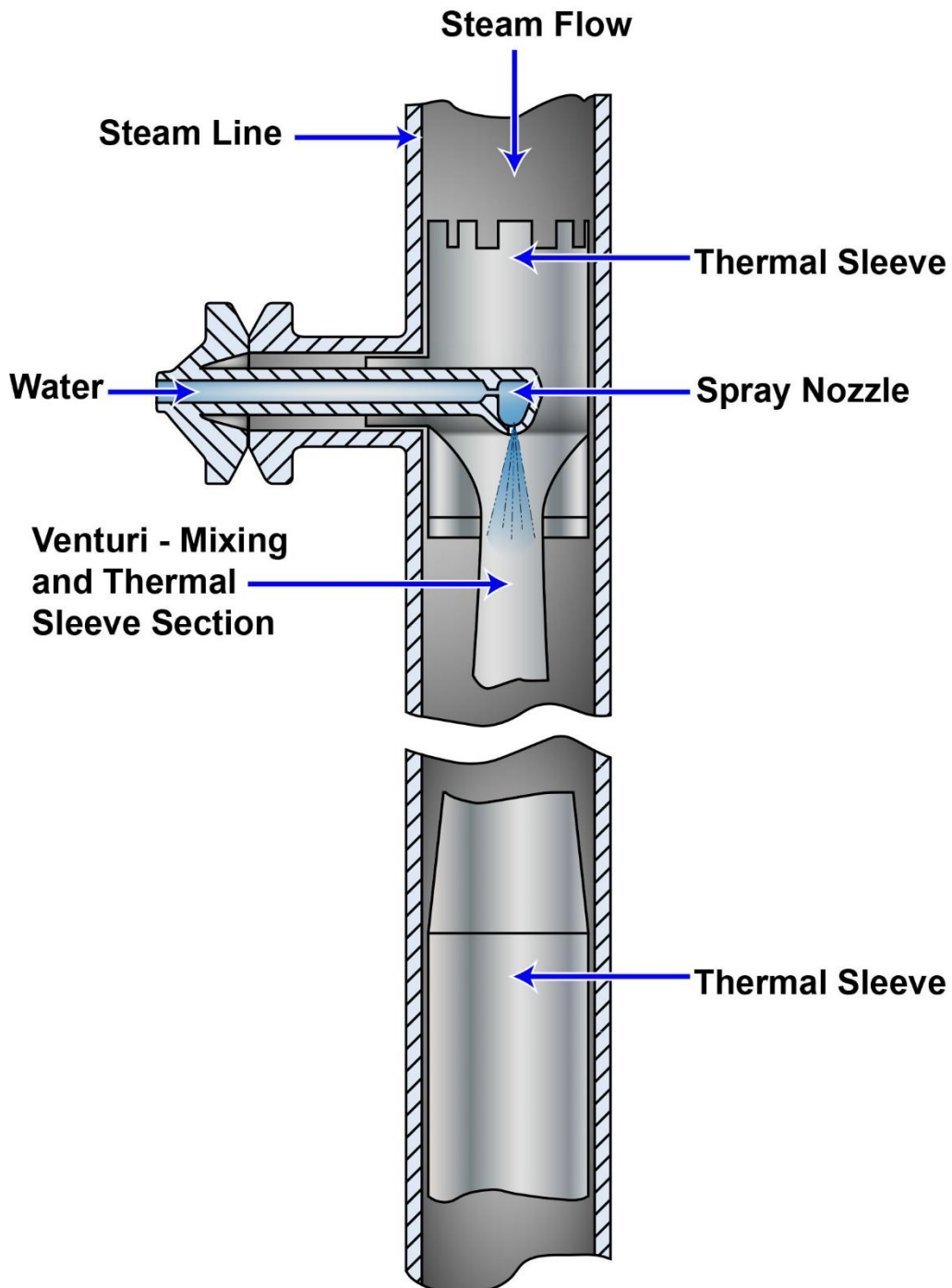


## SG-0007



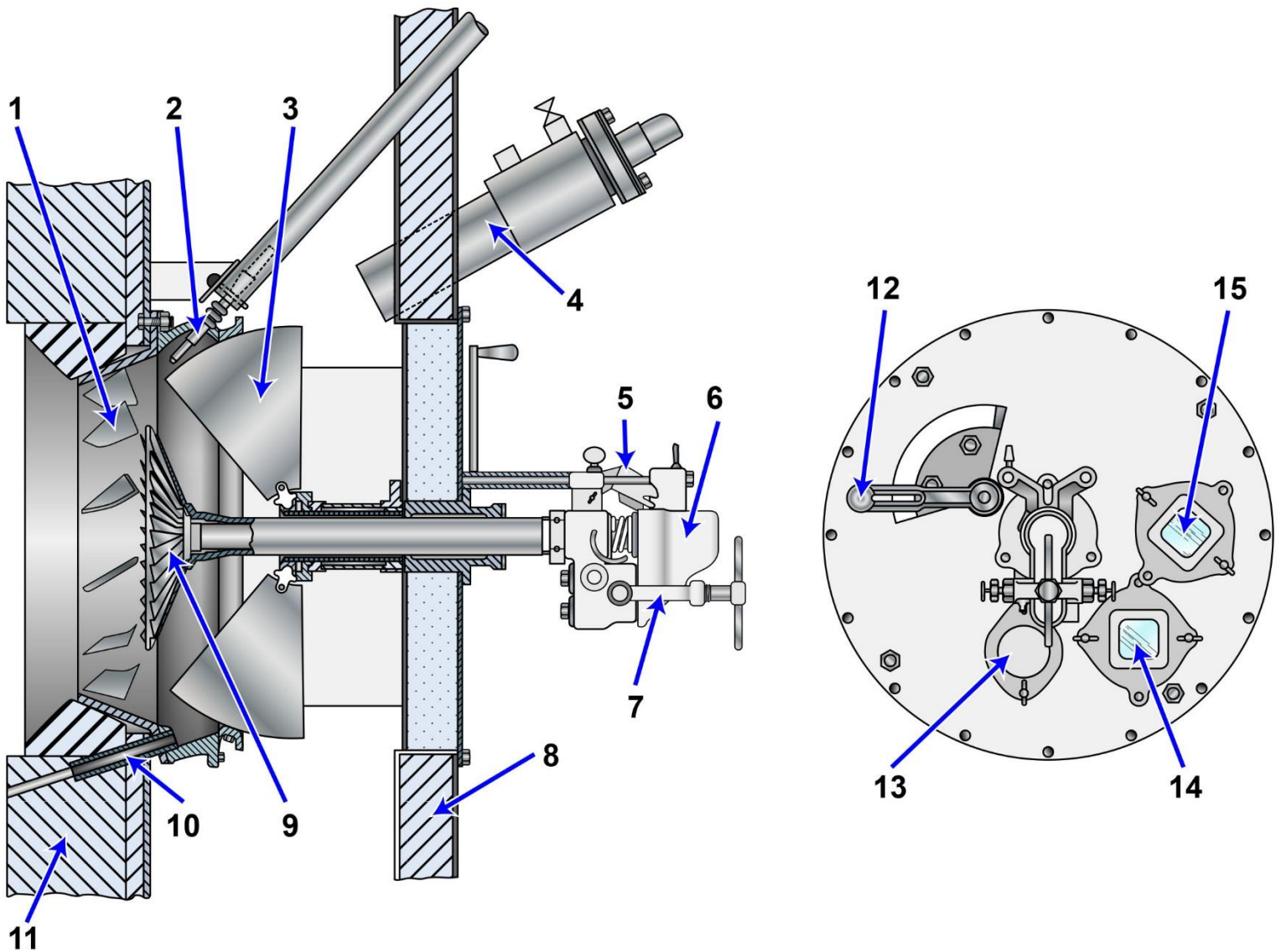
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## SG-0013



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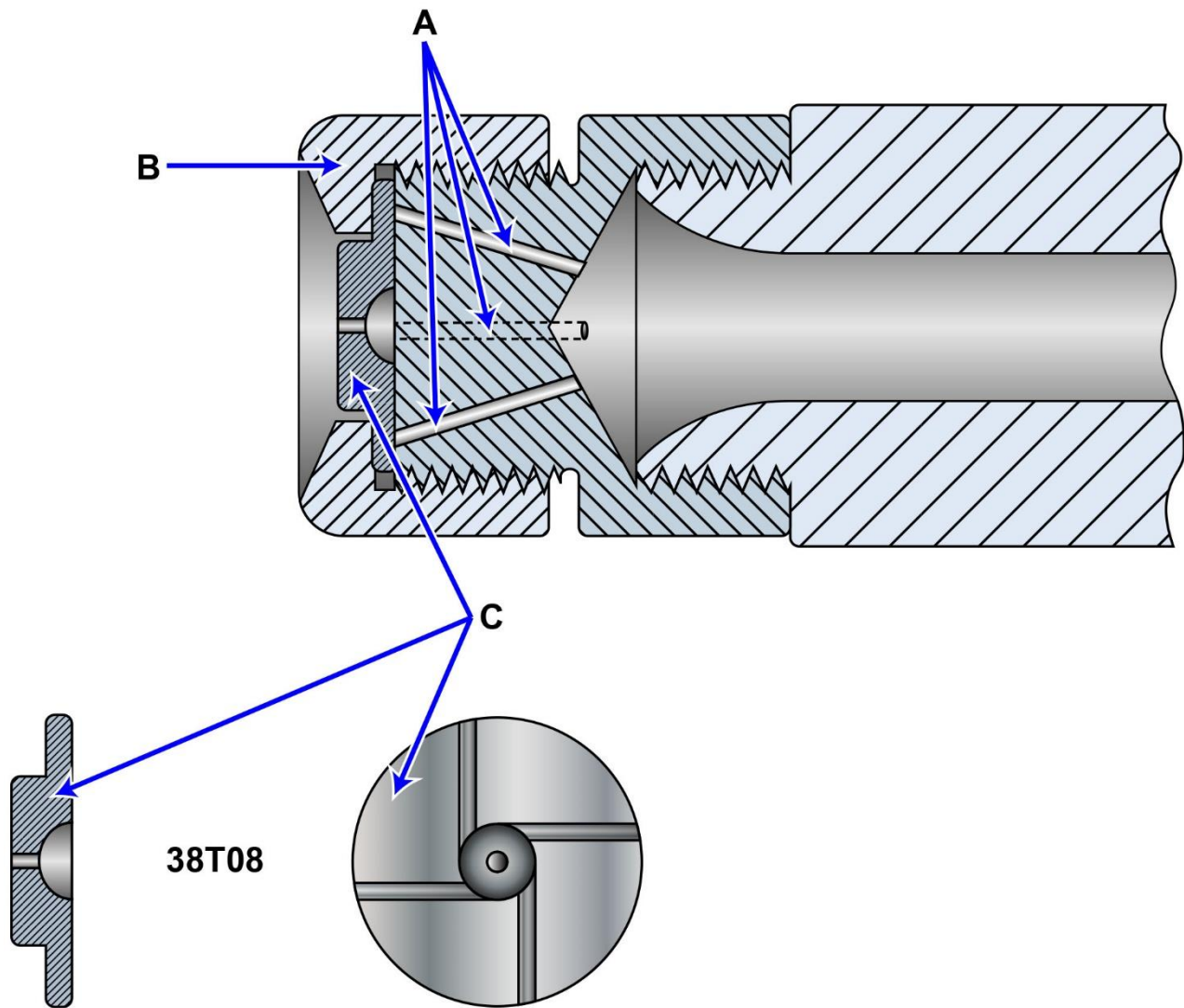
## SG-0016



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## SG-0022



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