U.S.C.G. Merchant Marine Exam

Third Assistant Engineer

Q537 Steam Plants I

(Sample Examination)

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Illustrations: 4

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

1. Circulation of water and the steam/water mixture within a natural circulation boiler is retarded by _____.

A. Large changes in steam density
B. Fluid friction in the downcomers, drums, generating tubes, and headers
C. High feedwater pressure
D. Back pressure in the steam drum acting on the user tubes

Correct answer: B

2. Overheating of the generating tubes will occur when a boiler reaches its end point of _____.

A. Circulation
B. Moisture carryover
C. Evaporation
D. Combustion

Correct answer: A

3. The primary operational difference between a huddling chamber type safety valve and a nozzle reaction type safety valve is the _____.

A. Principle by which blowdown is accomplished
B. Manner in which lifting pressure is adjusted
C. Manner in which steam pressure causes initial valve opening
D. Difference in valve relieving capacities

Correct answer: A

4. A boiler safety valve must be capable of _____.

A. Closing with a chattering motion to free scale deposits from the seats
B. Opening gradually above a designated pressure
C. Remaining open until all pressure in the steam drum is relieved
D. Remaining open until a preset pressure drop occurs

Correct answer: D

5. Which of the listed refractory materials is capable of providing structural stability?

A. Insulating brick
B. Insulating block
C. Chrome castable
D. Firebrick

Correct answer: D

6. Arrow "B" shown in the illustration indicates the _____. Illustration SG-0008

A. Combustion air inlet
B. Regenerative air heater
C. Uptakes
D. Retractable sootblower opening

Correct answer: A

7. In most marine boilers, the primary reason the first few rows of generating tubes, called screen or furnace row tubes, are made larger in diameter than the rest of the generating tubes is because _____.

A. they must act as downcomers to ensure proper circulation
B. they must screen the superheater from the direct radiant heat of the burners
C. they require more water flow since they are exposed to the greatest heat
D. their main function is to retard combustion gas flow for maximum heat transfer rates

Correct answer: C

8. Which of the following statements represents the primary function of handholes used on a boiler?

A. To allow access for cleaning in the stack.
B. To allow access into the steam and water drum.
C. To allow access into the headers.
D. To provide access for cleaning out the firebox.

Correct answer: C

9. Which of the following locations could desuperheated steam be considered to occur?

A. Spray attemperator
B. Main engine extractions
C. Both "A" and "B"
D. Neither "A" nor "B"

Correct answer: C

10. Which of the following statements describes the effects that dissolved oxygen has on boiler internal surfaces with changes in temperature and pressure?

A. It increases the corrosive effect with increased pressure and decreases its corrosive effect with increased temperature.
B. It decreases the corrosive effect when both pressure and temperature are increased.
C. It increases the corrosive effect with lowered pressure and increases its corrosive effect with increased temperature.
D. Temperature and pressure have no effect on the corrosive effect of dissolved oxygen.

Correct answer: A

11. When vapor is in contact with and remains at the same temperature as the boiling liquid from which it was generated, the vapor and liquid are said to be in which of the following?

A. latent contact
B. critical state
C. sensible contact
D. saturated condition

Correct answer: D

12. Which of the following statements concerning boiler steam drum surface blow piping is correct?

A. Usually the surface blow pipe is perforated with holes along its top surface; however, when a scum pan is also employed, the holes are located along the bottom of the pipe surface.
B. To ensure adequate blowdown, the aggregate cross-sectional area of these perforated holes must be equal to approximately twice the cross-sectional area of the pipe.
C. The centerline of the pipe is normally situated at a distance from the bottom of the steam drum equal to approximately one fourth the diameter of the drum.
D. All of the above.

Correct answer: A

13. Where is the "dry pipe" located in a boiler?

A. Behind the superheater screen tubes
B. In the top of the steam drum
C. Below the generation tube bank
D. At the superheater outlet

Correct answer: B

14. Which of the conditions listed could cause steam formation in the economizer?

A. Soot buildup on the gill rings
B. An open main feed pump recirculating line
C. Excessive water flow rates
D. Sudden large increase in the firing rate

Correct answer: D

15. A check valve is located between the economizer and the steam drum to _____.

A. Assure a positive feedwater flow through the economizer
B. Assure a positive feedwater flow to the steam drum
C. Prevent the feed pump from becoming vapor bound
D. Prevent steam and water flow reversal from the drum should an economizer casualty occur

Correct answer: D

16. Scavenging air is supplied to steam sootblower elements to _____.

A. Prevent back up of combustion gases into sootblower heads
B. Prevent buildup of soot on the element
C. Prevent overheating of adjacent tubing
D. Provide cooling air when sootblower elements are rotating through blowing arcs

Correct answer: A

17. Boiler fuel savings gained by the use of an economizer can amount to _____.

A. One half percent for each 15°F rise in feedwater temperature
B. One percent for each 10°F rise in feedwater temperature
C. Three percent for each 5°F rise in feedwater temperature
D. Three percent for each 20°F rise in feedwater temperature

Correct answer: B

18. In a boiler equipped with a convection type superheater, the superheater tubes are located _____.

A. In a position screened from the furnace
B. Between the downtake nipple and circulator tube
C. Between the economizer and generating tubes
D. In the path of the radiant heat of combustion

Correct answer: A

19. The boiler superheater shown in the illustration is a/an _____. Illustration SG-0007

A. Vertical U-type
B. Horizontal U-type
C. Overdeck convection-type
D. Overdeck integral-type

Correct answer: A

20. Many steam plants are designed so that diesel oil can be provided to the burners when _____.

A. Lighting off a cold ship
B. A heavy fuel must be blended
C. Overload capacity is required
D. Heavy smoking persists

Correct answer: A

21. Why should the fuel oil be recirculated before lighting off a cold boiler?

A. To ensure that all water is removed from the fuel.
B. To allow the fuel strainers to thoroughly clean the fuel.
C. To allow fuel pressure to buildup gradually.
D. To heat the fuel enough for proper atomization.

Correct answer: D

22. When raising steam on a cold boiler under normal conditions, you should always _____.

A. Take 24 hours to raise steam
B. Use a large orifice burner sprayer plate to start
C. Raise steam within one hour or less
D. Use a small orifice burner sprayer plate to start

Correct answer: D

23. When raising steam on a boiler, the superheater drains should _____.

A. Remain open or partially open until steam blows through the lines, and then the valves should be closed
B. Be opened to remove condensate, and then closed when the first burner is lit
C. Be closed until just before line pressure is reached, and then given a short blow period
D. Be closed until after the air cock is closed, and then opened until the boiler is placed on line

Correct answer: A

24. Which of the actions listed should be carried out immediately after securing the fires in one boiler of a two-boiler ship?

A. Open the air registers wide to cool the furnace.
B. Relieve all fuel oil service pressure to that boiler.
C. Secure the main feed pump.
D. Drain and refill the boiler with cold water.

Correct answer: B

25. Before blowing tubes in a boiler equipped with steam sootblowers, you should _____.

A. Increase the boiler water level
B. Lower the boiler steam pressure
C. Reduce the forced draft fan speed
D. Decrease the boiler water level

Correct answer: A

26. When increasing the firing rate of a boiler, which of the following should be carried out FIRST?

A. Increasing the forced draft air pressure.
B. Increasing the feedwater flow.
C. Increasing the fuel pressure.
D. Decreasing the steam pressure.

Correct answer: A

27. If there is a sudden drop in the outlet temperature of an uncontrolled superheater, you should _____.

A. Reduce the forced draft fan speed
B. Check for high water level in the drum
C. Increase the firing rate
D. Bypass the air heater

Correct answer: B

28. Which of the following items should be checked each time the firing rate or forced draft pressure is adjusted?

A. Smoke periscope
B. Atomizing steam pressure
C. Fuel oil heater inlet temperature
D. Fuel oil suction pressure

Correct answer: A

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

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

Correct answer: B

30. The boiler water gauge glasses should be blown down _____.

A. twice each day on the midnight and afternoon watches
B. when the boiler water level changes in a steaming boiler
C. every 12 hours of steady boiler steaming operation
D. when you are in doubt about the water level

Correct answer: D

31. Which of the following repairs should be made to a badly warped boiler tube?

A. Replace the tube with a spare, if available, or plug it.
B. Assure that the warped tube does not touch adjacent tubes and then reroll it in the header.
C. Use a hydraulic jack to cold bend the tube.
D. Heat the tube and use a soft mallet to straighten it.

Correct answer: A

32. Radial cracks have developed in the castable refractory of the burner cones after the first firing since the installation of new furnace front refractory. This is an indication of _____.

A. inadequate cone angle
B. relieved stresses
C. a need for castable refractory patchwork
D. a need for plastic firebrick patchwork

Correct answer: B

33. When a propulsion boiler is removed from service for an extended period, why should the firesides be thoroughly dried after water washing?

A. Prevent flarebacks on lighting off
B. Reduce the probability of corrosion
C. Prevent cracking of the brickwork
D. Reduce the possibility of thermal spalling

Correct answer: B

34. Which of the following would indicate a moderate leak in the desuperheater?

A. Higher than normal fuel oil consumption
B. Lower than normal fuel oil consumption
C. Lower than normal auxiliary steam temperature
D. Higher than normal auxiliary steam pressure

Correct answer: C

35. If the engineer on watch has reason to doubt the accuracy of the water level showing in the boiler gauge glass, he should FIRST _____.

A. blowdown the gauge glass
B. open the auxiliary feed line
C. start the standby feed pump
D. replace the gauge glass

Correct answer: A

36. While the vessel is rolling in heavy seas, the level in the boiler gauge glass remains steady, this is an indication that _____.

A. the water level in the steam drum is too low
B. there is most likely an obstruction in the lower valve
C. the steam drum is adequately baffled
D. the gauge glass is functioning normally

Correct answer: B

37. Insufficient combustion air supply to the furnace would cause _____.

A. high stack temperature
B. high feedwater consumption
C. low superheater outlet temperature
D. the fires to sputter

Correct answer: C

38. Which of the conditions listed would indicate excessive soot buildup on the economizer?

A. Low air temperature entering the boiler
B. High feedwater temperature entering the boiler
C. High superheater temperature
D. Lower than usual air pressure in the furnace

Correct answer: C

39. In the boiler steam and water system, pressure is highest in the _____.

A. dry pipe
B. mud drum
C. feed line
D. steam stop

Correct answer: C

40. A pneumatic dual element, main propulsion, boiler feedwater regulating system commonly used aboard ship utilizes _____.

A. Proportional action
B. Proportional plus reset action
C. On off reset action
D. Two-position differential action

Correct answer: B

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

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

Correct answer: D

42. Deaeration of condensate primarily occurs in what section of the illustration shown? Illustration SG-0010

A. DFT
B. distilled water tank
C. first stage feed heater
D. main condenser hotwell

Correct answer: A

43. The two-element feedwater regulator functions similarly to the three-element feedwater regulator, but does not utilize _____.

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

Correct answer: D

44. A triple element, main propulsion, boiler feedwater regulating system commonly used aboard ship utilizes _____.

A. Proportional plus reset plus rate action
B. Proportional action
C. Two-position differential gap action
D. Proportional plus reset action

Correct answer: A

45. While underway on watch in the engine room of a steam vessel, the proper valve positions for controlling feedwater to the boiler using the auxiliary feed system should be _____.

A. The stop and stop-check valves fully open and the feed pump speed used to regulate the amount of flow
B. The stop valve fully open and the auxiliary stop-check valve used to regulate the amount of flow
C. The check valve fully open and the stop-check valve regulated by the feedwater regulator
D. The auxiliary check valve fully open and the stop-check valve used to regulate the amount of flow

Correct answer: B

46. In a closed feed and water cycle, which of the conditions listed could prevent vacuum from reaching the desired level?

A. Marine growth on the cooling water side of the main condenser.
B. Condensate recirculating back to the condenser during maneuvering.
C. Steam leaking from the turbine glands.
D. Steam pressure to air ejectors maintained at 10 psig above designed supply pressure.

Correct answer: A

47. The function of item "E" shown in the illustration is to _____. Illustration GS-0099

A. control the admission of steam into chamber "L" as part of the process to produce sound
B. pulse supply steam or air to chamber "M"
C. act as a reed to enable the production of sound
D. allow steam/condensate or air to be evacuated from the unit as sound is produced

Correct answer: A

48. The automatic recirculating valve in the main condensate recirculating line is controlled by a temperature sensor which is located at the _____.

A. air ejector condensate discharge
B. main condensate pump suction
C. condensate inlet to the main air ejectors
D. main condensate pump discharge

Correct answer: A

49. Air accumulated in the after condenser of the air ejector unit is discharged directly to the _____.

A. high-pressure turbine
B. main condenser
C. inter condenser
D. atmosphere

Correct answer: D

50. According to the illustrated diagram, what is the correct sequential order of heat exchangers that the main condensate pump pumps condensate through? Illustration SG-0010

A. Main air ejector condenser, deaerating feed tank, first stage feed heater, gland exhaust condenser.
B. Main air ejector condenser, first stage feed heater, gland exhaust condenser, deaerating feed tank.
C. Main air ejector condenser, gland exhaust condenser, first stage feed heater, deaerating feed tank.
D. Main air ejector condenser, deaerating feed tank, gland exhaust condenser, first stage feed heater.

Correct answer: C

51. While maneuvering out of port, you answer a stop bell. You notice a lot of steam coming out of the gland exhaust condenser vent, in addition to the main condenser hotwell level being low. For this condition you should _____.

A. manually recirculate condensate and add some makeup feed
B. increase steam pressure to the air ejectors
C. decrease gland sealing steam pressure
D. speed up the condensate pump

Correct answer: A

52. Which of the listed systems would be a potential source for the high-pressure drain system?

A. Steam systems operating in excess of 150 psi
B. Fuel oil tank heating coils
C. Laundry steam pressing machines
D. Galley steam tables

Correct answer: A

53. When heated, fuel oil will _____.

A. increase in specific gravity
B. increase in viscosity
C. expand in volume
D. have a higher specific heat

Correct answer: C

54. Originally steam ship f/o service and settling tanks were designed with only a high suction and a low suction and no other valves. What was the purpose of the low suction?

A. Prevent loss of suction during rough weather
B. Decrease suction head on the pump
C. Increase the amount of fuel available for use
D. Facilitate water removal

Correct answer: D

55. In accordance with 46 CFR Subchapter D (Tank Vessels), what is the minimum flash point of oil to be used as fuel for the boilers?

A. 80°F (26.7°C)
B. 110°F (43.3°C)
C. 140°F (60.0°C)
D. 150°F (65.6°C)

Correct answer: C

56. Which of the following chemicals is used in an Orsat apparatus to absorb carbon dioxide?

A. Potassium chromate
B. Pyrogallic acid
C. Cuprous chloride
D. Potassium hydroxide

Correct answer: D

57. If the stack temperature is higher than normal, this could indicate _____.

A. low fuel oil back pressure
B. too much excess air
C. high feedwater pressure
D. external boiler casing leakage

Correct answer: B

58. When burning fuel oil in a boiler, a high CO2 content is desired in the stack gas because _____.

A. efficient combustion is indicated and the heat liberated is equal to the heat produced by the formation of CO
B. efficient combustion is indicated even though the heat liberated is less than the heat produced by burning to CO
C. more heat is liberated by the production of CO2 than CO
D. less excess air is required to produce CO2 than CO

Correct answer: C

59. Fuel oil is transferred to the settling tanks for _____.

A. heating to the correct temperature for proper burner atomization
B. purging of any large air bubbles that have formed
C. heating to allow water and sediment to settle out
D. the purpose of removing any volatile gases present in the fuel

Correct answer: C

60. 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. Specific gravity
B. Flash point
C. Pour point
D. Viscosity

Correct answer: D

61. The amount of oil atomized by a straight mechanical fuel oil burner depends on the sprayer plate size and the _____.

A. forced draft pressure
B. oil return pressure
C. fuel oil pressure
D. furnace air pressure

Correct answer: C

62. All fuel oil service pumps are equipped with a _____.

A. direct suction to the double bottom tanks
B. relief valve on the suction side
C. combustion control valve on the discharge side
D. remote means of stopping the pump

Correct answer: D

63. 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. prevent the furnace from filling with oil after restoration of power
C. prevent the furnace from filling with oil during a power failure
D. permit the operator to secure each burner after a blackout

Correct answer: B

64. All oil-fired main propulsion burners with automatic safety control systems must automatically close the burner valve when _____.

A. Actuated by a boiler safety trip
B. The flame in boiler furnace is confirmed
C. Starting "trial for ignition"
D. The burner is properly seated

Correct answer: A

65. A flame scanner installed in modern boiler combustion control systems, functions to _____.

A. monitor the intensity of the burner flame
B. regulate burner fuel oil pressure
C. regulate the air flow to the furnace
D. monitor the stack for soot fires

Correct answer: A

66. Which of the terms listed represents the ratio between the highest and lowest fuel oil pressure at which the burners will remain ignited?

A. Modulating band ratio
B. Air/fuel ratio
C. Firing range ratio
D. Turndown ratio

Correct answer: D

67. Which of the following procedures represents the proper care of unused burners during low load conditions?

A. They should be removed, cleaned, refitted with smaller tips and reinstalled to be ready for immediate use.
B. They may be left in place, but only if they are clean and if fuel oil is recirculated to provide cooling.
C. They may be left in place, with fuel and steam secured as long as they are not fouled.
D. They should be removed, cleaned and stored in the rack on the burner bench.

Correct answer: D

68. When a boiler flareback occurs, you should _____.

A. close the master fuel oil valve
B. take the boiler off the line
C. increase the fuel oil supply pressure
D. reduce the forced draft blower speed

Correct answer: A

69. Insufficient combustion air supply will cause an atomizer flame to appear as a _____.

A. dull red flame with black streaks
B. ragged flame
C. pointed flame
D. light yellow flame with white streaks

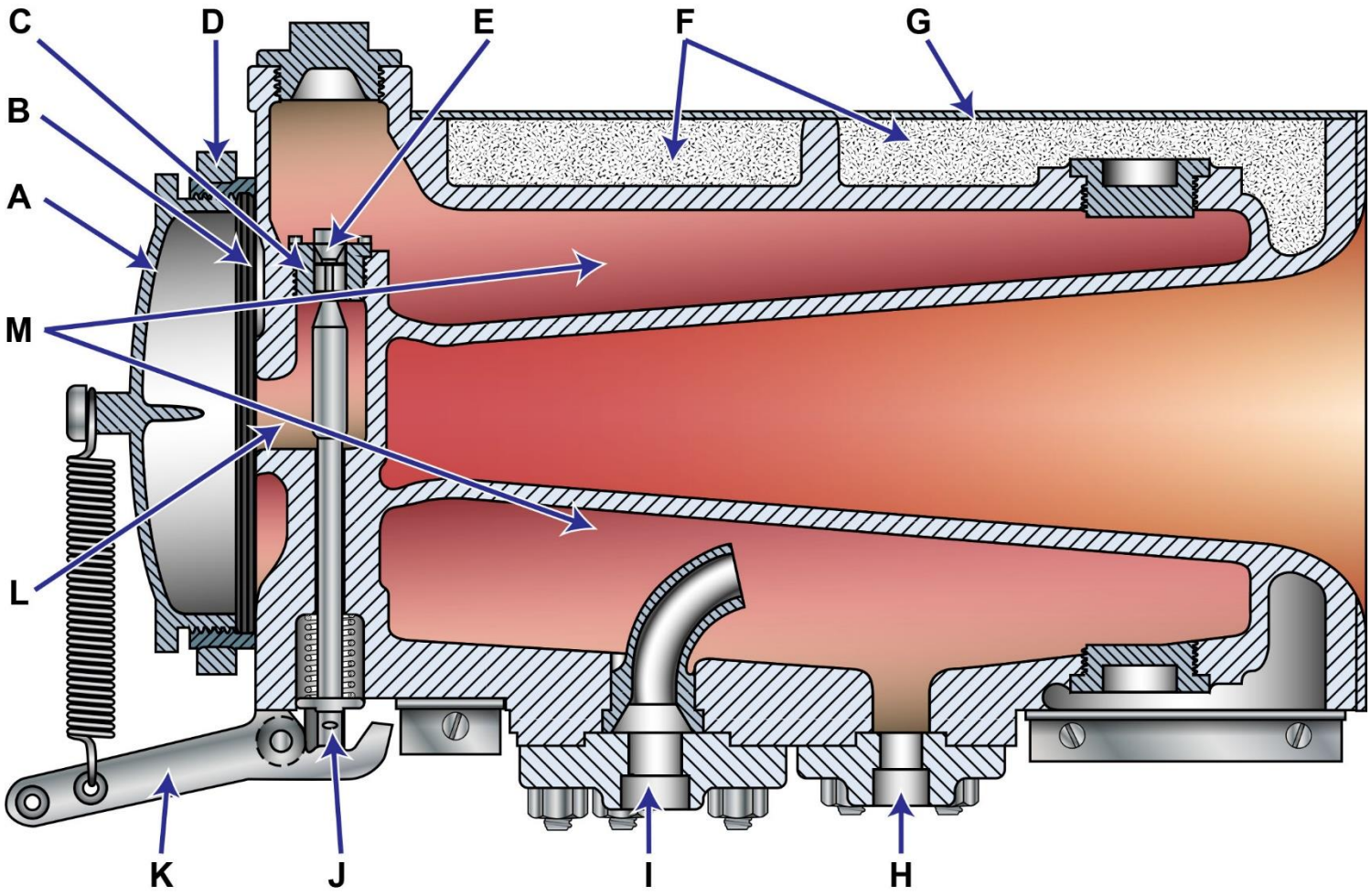
Correct answer: A

70. Boiler fuel oil atomizer parts should be cleaned by soaking in 'tip cleaner' or diesel fuel and _____.

A. brushed with a steel brush
B. scraped with a nonabrasive tool
C. scraped with a modified table knife
D. polished with emery cloth

Correct answer: B

GS-0099



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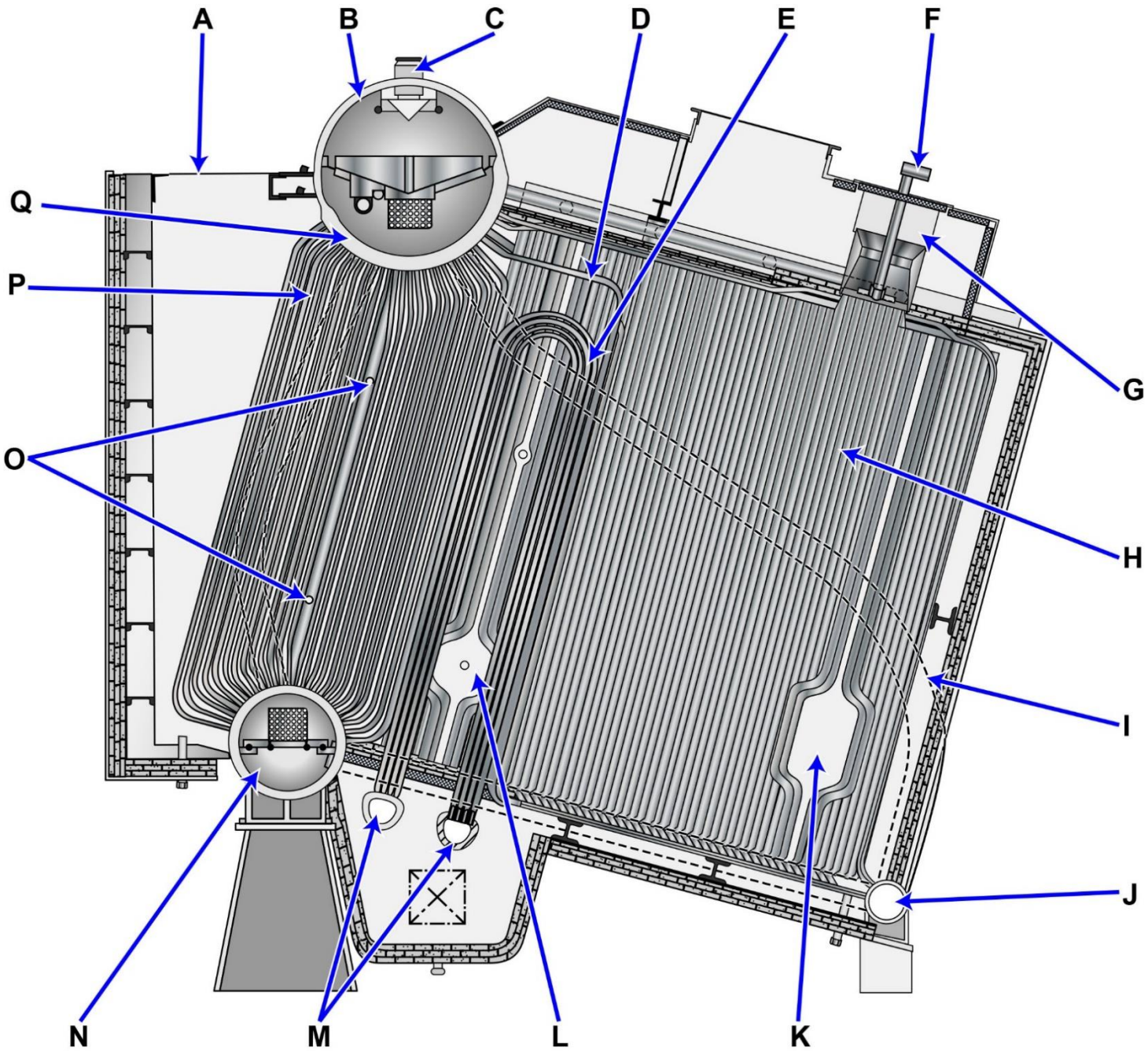

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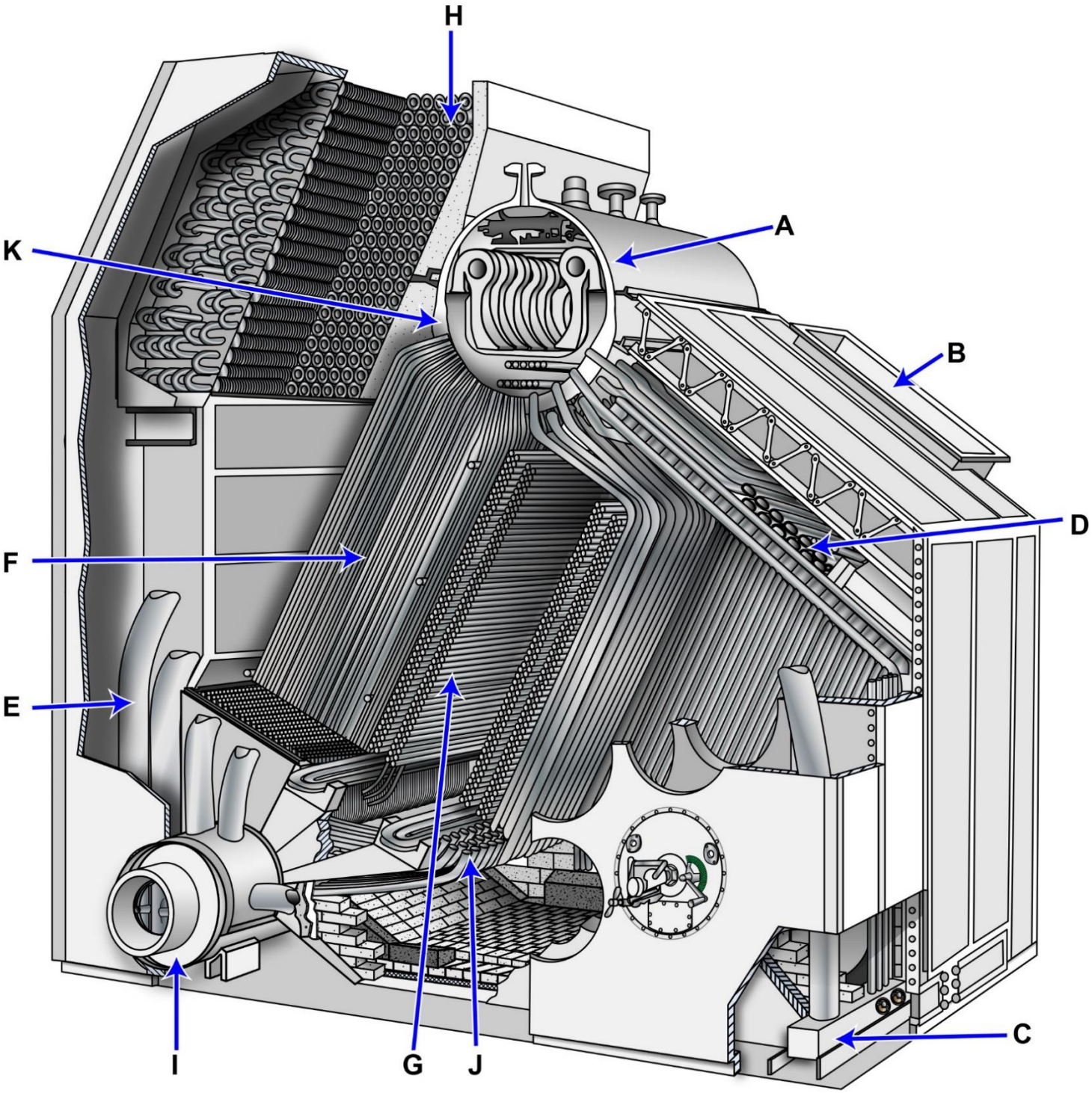

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