

U.S.C.G. Merchant Marine Exam

DDE – Unlimited HP

Q621 Steam Plants

(Sample Examination)

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

1. The purpose of the boiler drum air cock is to _____.
- A. permit escape of air when the boiler is being filled
 - B. admit air when the boiler is being emptied
 - C. permit escape of air when steam is forming in the drum after lighting off
 - D. all of the above

Correct answer: D

2. The best conductor of heat in a marine boiler is _____.
- A. steam
 - B. steel
 - C. water
 - D. brick

Correct answer: B

3. Bottom blow valves are installed on water-tube boilers to _____.
- A. completely drain the boiler in an emergency
 - B. prevent sludge from forming in the steam drum
 - C. remove floating impurities from the boiler water surface
 - D. remove settled solids from the water drum

Correct answer: D

4. The purpose of the separating nozzle in the accumulator of a water-tube, coil-type, steam generator is to separate _____.
- A. dry steam from the steam and water mixture
 - B. condensate from feedwater
 - C. superheated steam from saturated steam
 - D. sludge accumulations from feedwater

Correct answer: A

5. Which of the following statements concerning fire-tube boilers is correct?
- A. Combustion gases flow through the tubes.
 - B. Flames impinge on the tubes.
 - C. Combustion occurs in the tubes.
 - D. Water flows through the tubes.

Correct answer: A

6. A boiler pressuretrol senses steam pressure changes and _____.
- A. controls the flow of feedwater to the boiler
 - B. monitors the boiler high water level
 - C. secures the fires when a fusible plug burns out
 - D. automatically regulates the quantity of oil and air flow to the burner

Correct answer: D

7. During unsafe firing conditions in a boiler, various control actuators are interlocked with the burner circuit to prevent start-up, in addition to safety shutdown. These controls are referred to as _____.

- A. limit controls
- B. flame safeguard controls
- C. combustion controls
- D. programming controls

Correct answer: A

8. Bi-color water level indicators, connected directly to the boiler drum, operate on the principle of _____.

- A. different chemical properties of steam and water
- B. different densities which result from the comparison of the varying steam pressure in the drum
- C. special insoluble indicating fluids
- D. different refractive properties of steam and water

Correct answer: D

9. The purpose of the mica used in a boiler water gauge glass assembly is to prevent _____.

- A. overheating of the glass
- B. light refraction in the glass
- C. leakage from the glass
- D. etching of the glass

Correct answer: D

10. On a boiler safety valve, the blowdown adjusting ring is locked in place by a _____.

- A. cotter pin
- B. set screw
- C. locknut
- D. wire seal

Correct answer: B

11. Which of the listed types of safety valves is shown in the illustration? Illustration SG-0018

- A. Huddling chamber type
- B. Pressure loaded type
- C. Jet flow type
- D. Nozzle reaction type

Correct answer: A

12. The useful life of furnace refractory is affected most by _____.

- A. large and rapid changes in furnace temperature
- B. high steady steaming boiler loads
- C. the quality of the fuel being burned
- D. improper treatment of boiler water

Correct answer: A

13. Boiler refractory previously baked out and fired is most sensitive to _____.
- A. rapid cooling
 - B. sustained high furnace temperature
 - C. rapid heating
 - D. radiant heat of the burner

Correct answer: A

14. As the percentage of CO₂ in the stack gas decreases, you can assume that _____.
- A. fuel is being burned with increasing economy
 - B. the fuel to air ratio is increasing
 - C. you are approaching secondary combustion
 - D. excess air is increasing

Correct answer: D

15. Why should the fuel oil be recirculated before lighting off a cold boiler on heavy fuel?
- A. To allow the fuel strainers to thoroughly clean the fuel
 - B. To allow fuel pressure to buildup gradually
 - C. To heat the fuel enough for proper atomization
 - D. To ensure that all water is removed from the fuel

Correct answer: C

16. When raising steam on a cold boiler under normal conditions, you should always _____.
- A. use a large orifice burner sprayer plate to start
 - B. use a small orifice burner sprayer plate to start
 - C. take 24 hours to raise steam
 - D. raise steam within one hour or less

Correct answer: B

17. Which of the following is the best reason for opening the air cock when draining a water-tube boiler?
- A. With the air cock open, the boiler drains without producing a vacuum.
 - B. Air mixed with the water will create a cleansing effect in the tubes.
 - C. Air coming into the boiler will help dry out the boiler's surface.
 - D. Water flows out of the boiler too rapidly with the air cock closed.

Correct answer: A

18. Before using a boiler compressed air soot blower system, you should _____.
- A. lower the water level
 - B. reduce the boiler pressure
 - C. decrease the forced draft fan speed
 - D. drain the soot blower pneumatic operating lines

Correct answer: D

19. When cleaning the inside surfaces of the boiler tubes of a water-tube boiler with a powered rotary brush, the brush should be kept in motion to _____.
- A. avoid internal tube damage
 - B. prevent it from seizing
 - C. reduce tube pitting
 - D. reduce wear to brush bristles

Correct answer: A

20. The correct method of expanding a generating tube at the boiler drum tube sheet is to roll _____.
- A. slightly at the tube end prior to welding the tube to the drum tube sheet
 - B. heavily at the tube end prior to welding the tube to the drum tube sheet
 - C. to a depth less than the thickness of the drum tube sheet
 - D. to a depth greater than the thickness of the drum tube sheet

Correct answer: D

21. When drying and baking are impractical, or time is not available, which of the listed materials could be used to repair both burner openings and gas baffles?
- A. Baffle mix
 - B. Plastic chrome ore
 - C. Plastic fire clay
 - D. High temperature castable refractory

Correct answer: D

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

Correct answer: A

23. When a 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 possibility of thermal spalling
 - C. Prevent cracking of the brickwork
 - D. Reduce the probability of corrosion

Correct answer: D

24. The boiler water gauge glasses should be blown down _____.
- A. every 12 hours of steady boiler steaming operation
 - B. when you are in doubt about the water level
 - C. twice each day on the midnight and afternoon watches
 - D. when the boiler water level changes in a steaming boiler

Correct answer: B

25. Water in the fuel supply to a steaming boiler can be detected by _____.

- A. sputtering of the fires
- B. panting of the casing
- C. dense white smoke being observed in the periscope
- D. observation of the fuel oil heater drains

Correct answer: A

26. A higher than normal stack gas temperature could indicate _____.

- A. eroded water screen tube walls
- B. inner or outer casing leakage
- C. defects in burner cone refractory
- D. dirty firesides or watersides

Correct answer: D

27. Oil accumulation in boiler water would _____.

- A. practically eliminate boiler sludge formation
- B. prevent acid attack on the boiler tubes
- C. increase the heat transfer rate
- D. cause foaming and carryover from the boiler

Correct answer: D

28. Boiler tube failures can result from _____.

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

Correct answer: D

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

- A. ammonia
- B. sulfur dioxide
- C. hydrogen sulfide
- D. carbon dioxide

Correct answer: D

30. Normally a boiler water sample should be taken _____.

- A. from the highest point in the feed system
- B. before the boiler has been blown down or chemicals added
- C. after the boiler has been blown down
- D. when the boiler has been refilled with makeup

Correct answer: B

31. An adequate phosphate reserve should be maintained in boiler water to _____.

- A. maintain a pH of 7
- B. reduce the blowdown frequency
- C. prevent hard scale formation
- D. remove dissolved oxygen concentrations

Correct answer: C

32. The property of a fuel oil which is a measurement of its available energy, is known as its _____.

- A. heating value
- B. cetane number
- C. cetane index
- D. viscosity index

Correct answer: A

33. The BTU value of fuel oil is determined by a/an _____.

- A. viscosimeter
- B. calorimeter
- C. open cup test
- D. hydrometer

Correct answer: B

34. In terms of the diluting effect of excessive excess air, when viewing the flame through a peephole, what would be the indication of the greatest diluting effect with far too much excess air?

- A. Yellow flame
- B. Orange flame
- C. Golden yellow flame
- D. Dazzling white flame

Correct answer: D

35. 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

Correct answer: B

36. Constant capacity, pressure atomizing, fuel burners designed to meet a wide variation in steaming loads on a boiler, are _____.

- A. automatically supplied with warmer air on demand
- B. automatically supplied with more fuel on demand
- C. equipped with standard variable capacity atomizers
- D. cycled on and off in response to steam demand

Correct answer: D

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

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

Correct answer: B

38. When operating with the auxiliary feed line, feed water flow is controlled _____.

- A. automatically by the eco by-pass
- B. manually by adjustment of the auxiliary feedwater regulator spring setting
- C. automatically by the main feedwater regulator
- D. manually by throttling the auxiliary feed stop-check valve

Correct answer: D

39. Under normal conditions, the rate of heat transfer in a feed water heater is most greatly affected by the _____.

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

Correct answer: A

40. 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 nozzle diaphragm in the low-pressure end of the turbine
- C. a dummy piston and cylinder to offset axial thrust
- D. a single row of blades more than once

Correct answer: A

41. A pressure-velocity compounded impulse turbine consists of _____.

- A. several rows of moving blades attached to diaphragms
- B. two or more rows of nozzles in which no pressure drop exists
- C. velocity compounding with reaction pressure compounding
- D. two or more stages of velocity compounding

Correct answer: D

42. Design characteristics of a velocity-compounded impulse turbine include the utilization of _____.

- A. a single pressure stage with two or more velocity stages
- B. a low velocity steam jet from a nozzle
- C. two or more simple impulse stages
- D. one or more nozzles with one row of rotating blades

Correct answer: A

43. As steam accomplishes work in an engine or turbine, the pressure of the steam is reduced because it _____.

- A. becomes superheated again
- B. expands in volume
- C. becomes saturated again
- D. diminishes in volume

Correct answer: B

44. What statement concerning the operation of a propulsion steam turbine turning (jacking) gear is true?

- A. The turning gear is used to prevent turbine rotor distortion while warming-through or while cooling, since distortion is an issue when warming-through or cooling.
- B. The turning gear is used to rotate the turbines, gearing, and shaft periodically when the main engines are secured only. The turning gear is never used to prevent turbine rotor distortion.
- C. The turning gear is used to prevent turbine rotor distortion while cooling only. The turning gear is never used while warming-through since rotor distortion is not an issue when warming-through.
- D. The turning gear is used to prevent turbine rotor distortion while warming-through only. The turning gear is never used while cooling since distortion is not an issue when cooling.

Correct answer: A

45. Main steam turbine bearings are lined with _____.

- A. cast-iron
- B. Babbitt
- C. ferrous oxide
- D. steel

Correct answer: B

46. 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

Correct answer: B

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

- A. casing flexible joints
- B. a deep flexible I beam support
- C. rotor position indicators
- D. pivoted-shoe type thrust bearings

Correct answer: B

48. Labyrinth seals used to reduce leakage around a turbine shaft are constructed of _____.
- A. spring bound carbon segments
 - B. machined metallic packing strips or fins
 - C. staged rubber composition seal stripping
 - D. braided asbestos covered core segments

Correct answer: B

49. Which type of packing is primarily utilized to control steam leakage from the casing of a modern auxiliary turbine?
- A. Teflon
 - B. Dovetail
 - C. Carbon
 - D. Labyrinth

Correct answer: D

50. If contaminated lube oil were allowed to settle undisturbed in a tank, into which layers would the contaminants separate?
- A. Sediment on the bottom, water in the middle, and oil on top.
 - B. Sediment on the bottom, oil in the middle, and water on top.
 - C. Water on the bottom, oil in the middle, and sediment on top.
 - D. Water on the bottom, sediment in the middle, and oil on top.

Correct answer: A

51. Which of the following conditions is indicated by oil flowing through a lube oil gravity tank overflow sight glass?
- A. Sufficient oil flow is being supplied to the gravity tank
 - B. Excessive oil is stored in the gravity tank
 - C. Turbine bearing failure has occurred
 - D. Insufficient oil is being pumped to the gravity tank

Correct answer: A

52. Which of the following types of bearing lubrication schemes can carry the highest unit loading?
- A. Pressure lubricated
 - B. Oil whip lubricated
 - C. Ring lubricated
 - D. Disk lubricated

Correct answer: A

53. The lube oil coolers installed in a gravity lubricating oil system are located between the _____.
- A. lube oil pumps and gravity tanks
 - B. gravity tanks and lube oil sump
 - C. gravity tanks and main units
 - D. lube oil sump and lube oil pumps

Correct answer: A

54. 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

Correct answer: D

55. Of the many impurities commonly found in marine lubricating oil, which of the following CANNOT be removed by a centrifugal purifier at normal operating speeds and temperatures?

- A. Water
- B. Metal particles
- C. Carbon particles
- D. Diesel fuel oil

Correct answer: D

56. When monitoring steam propulsion plant lubricating oil pressures, what pressure is the most critical to check regularly while underway?

- A. The pressure at the most remote bearing
- B. The pressure immediately downstream of the variable orifice
- C. Lube oil service pump discharge pressure
- D. The pressure immediately upstream of the variable orifice

Correct answer: A

57. Babbitt is a metal alloy commonly used for lining _____.

- A. saltwater piping
- B. precision bearings
- C. shim stock
- D. valve seats

Correct answer: B

58. On main turbine propulsion units, gear-type flexible couplings are generally used between the _____.

- A. quill shaft and high-speed pinion
- B. second reduction and the shaft thrust bearing
- C. rotor shaft and pinion shaft
- D. rotor shaft and quill shaft

Correct answer: C

59. The component shown in the illustration, labeled "I", is the _____. Illustration SE-0013

- A. first reduction gear
- B. second reduction gear
- C. second reduction pinion
- D. first reduction pinion

Correct answer: A

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

Correct answer: D

61. While your vessel is underway at normal speed, a steam drum safety valve develops a significant leak. Your first corrective action should be to _____.
- A. attempt to reseal the valve using the hand releasing gear
 - B. secure the boiler and blank off the valve flange
 - C. secure the boiler and check the valve spring compression
 - D. inspect the escape piping for binding on the valve body

Correct answer: A

62. Which of the precautions listed should be taken when gagging a boiler safety valve?
- A. Tighten the gag only with the special wrench supplied with the gag.
 - B. Tighten the gag only finger tight to prevent damage to the valve stem, disc or seat.
 - C. Ensure that all moving parts of the safety valve are free to move before installing the gag.
 - D. Do not allow the gag to contact the safety valve stem.

Correct answer: B

63. The intake and exhaust valves used in a diesel engine are returned to their seats by _____.
- A. push rod pressure
 - B. spring force
 - C. exhaust pressure
 - D. combustion pressure

Correct answer: B

64. Before any auxiliary diesel engine hydraulic starting system is opened for servicing or repair, you must _____.
- A. place all control levers in the 'HOLD' position
 - B. ensure that the hydraulic fluid reservoir is full
 - C. block all hydraulic hoses using high-pressure covers
 - D. bleed off all hydraulic pressure from the system

Correct answer: D

65. In diesel engines, hydraulic valve lifters are used to _____.
- A. obtain greater valve lift
 - B. create longer valve duration
 - C. reduce valve gear pounding
 - D. increase valve operating lash

Correct answer: C

66. The service life of a worn aluminum piston for an auxiliary diesel, for which no spares are readily available, can be extended by _____.
- A. turning down the piston skirt to concentric values
 - B. increasing the dimensions of the ring land grooves
 - C. building up the piston skirt with a liquid epoxy material and then re-machining
 - D. knurling the piston skirt surface

Correct answer: D

67. A diesel engine may fail to start when being cranked, due to _____.
- A. high cetane number
 - B. low lube oil viscosity
 - C. high lube oil pressure
 - D. insufficient compression

Correct answer: D

68. High exhaust temperature and black smoke exhausting from an auxiliary diesel engine can be caused by _____.
- A. low combustion temperature
 - B. engine overload
 - C. excessive compression pressure
 - D. plugged fuel nozzle holes

Correct answer: B

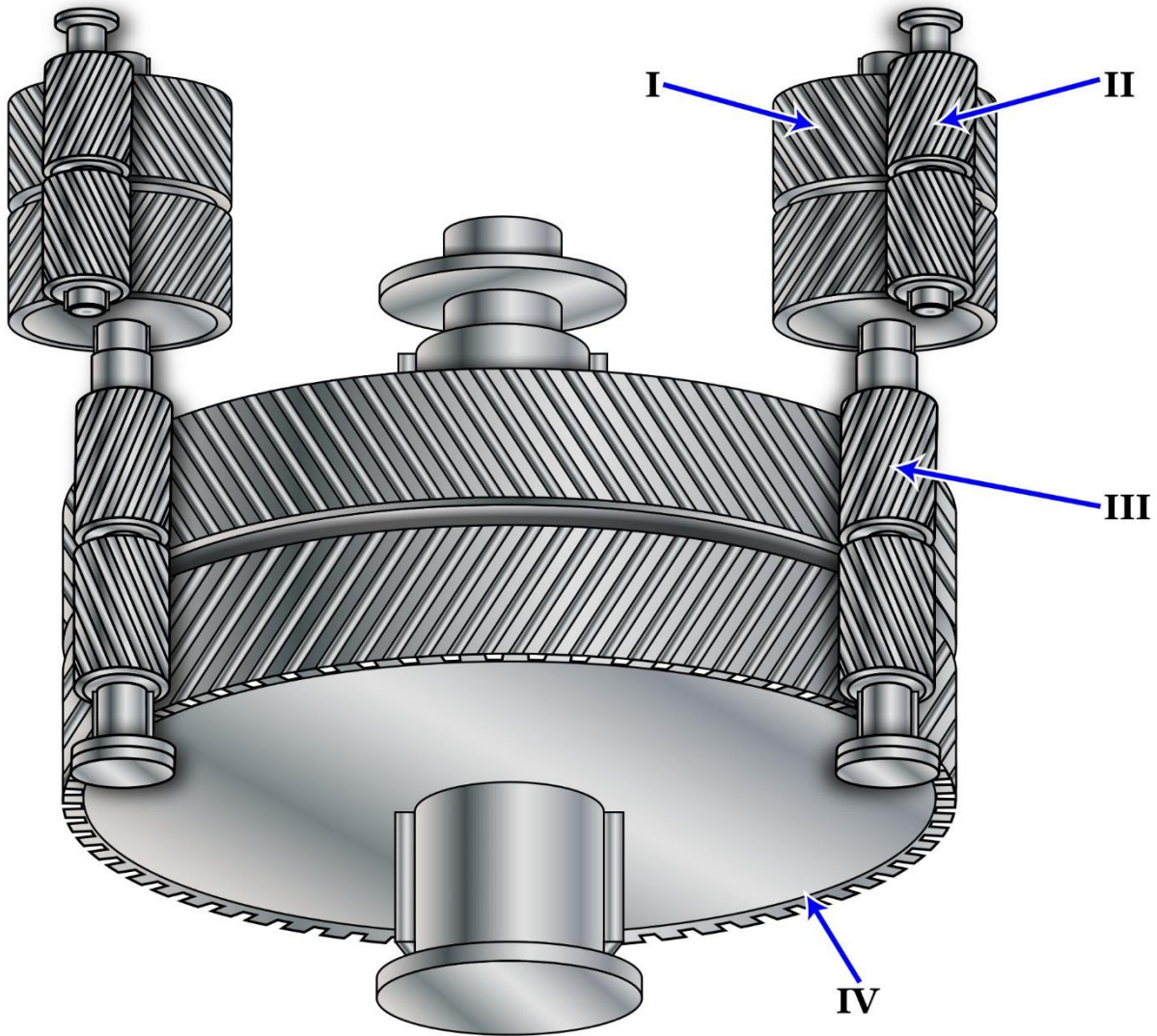
69. All of the diesel engine cylinder firing pressures are normal, yet all of the exhaust temperatures are low. Which of the following situations is responsible for this condition?
- A. Light load
 - B. Leaking piston rings
 - C. Combustion knock
 - D. Excessively early injection timing

Correct answer: A

70. In a four-stroke cycle diesel engine, badly worn intake valve guides can cause excessive _____.
- A. lube oil consumption
 - B. exhaust temperatures
 - C. exhaust pressure
 - D. cooling water temperatures

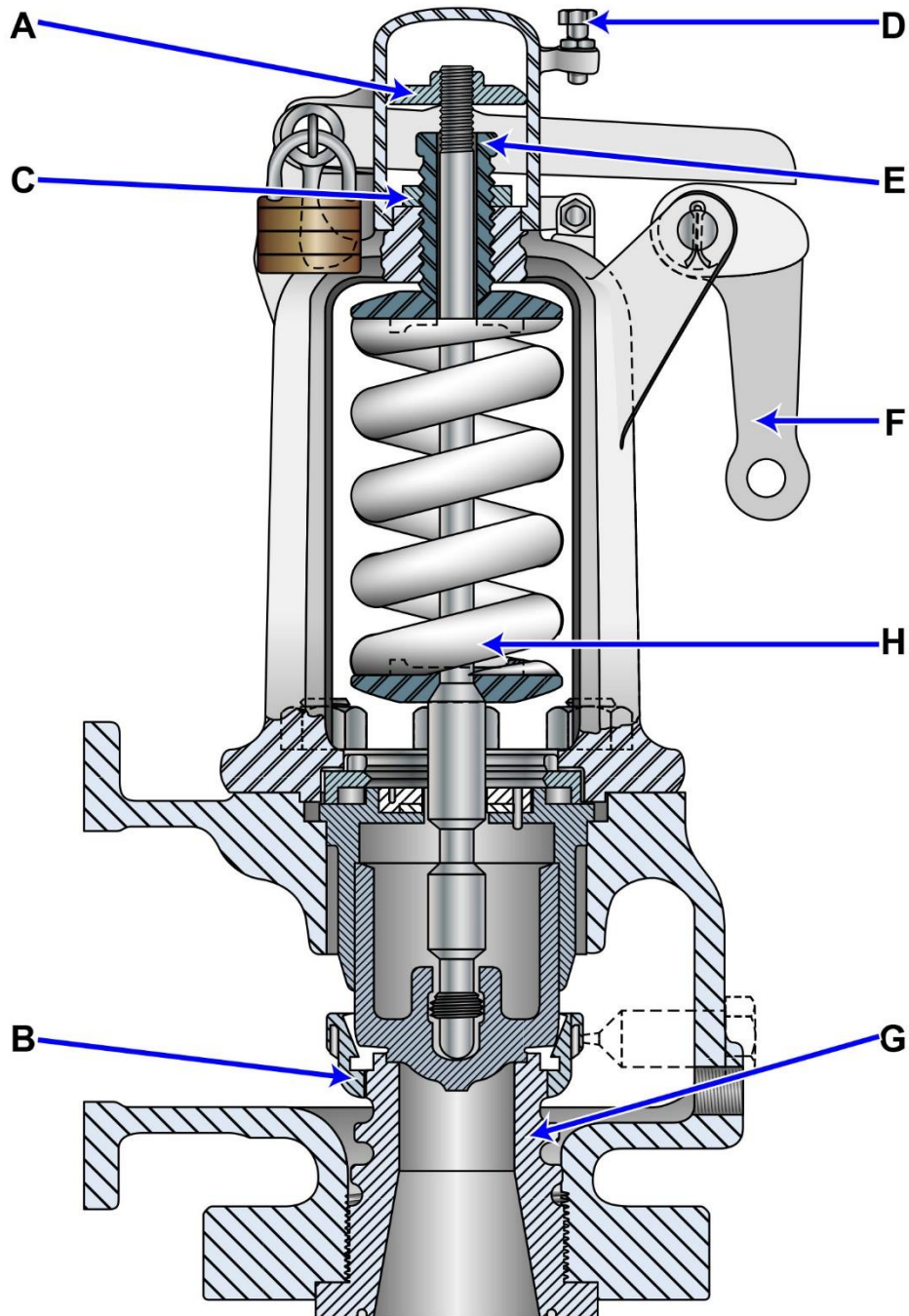
Correct answer: A

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