

U.S.C.G. Merchant Marine Exam
Chief Engineer, Limited
Q605 Steam Plants
(Sample Examination)

Choose the best answer to the following Multiple Choice Questions.

1. On small diesel engines, a noticeable decrease in the time interval between the replacement of the lube filter cartridge indicates _____.

- (A) excessive oil temperature
- (B) excessive oil pressure
- (C) dirty air filter
- (D) piston ring blow-by

If choice D is selected set score to 1.

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

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

If choice B is selected set score to 1.

3. If steam is admitted to the main propulsion turbine with the jacking gear engaged, which of the following problems can occur?

- (A) Destruction of the jacking gear.
- (B) Excessive tooth stress on the high-pressure first reduction pinion.
- (C) A possibility of shearing the jacking gear flexible coupling.
- (D) Uneven warming of the turbine.

If choice A is selected set score to 1.

4. Which of the listed procedures is the most important factor to take into consideration when making repairs to the refractory surrounding the burner openings?

- (A) Design refractory cone angle must be maintained.
- (B) All cracks must be completely filled.
- (C) Plastic firebrick must be used.
- (D) Finished repair surfaces must be smooth.

If choice A is selected set score to 1.

5. The part labeled "G", as shown in the illustration, is a _____. Illustration MO-0040

- (A) connecting rod cap
- (B) bearing shell
- (C) connecting rod bushing
- (D) piston bushing

If choice C is selected set score to 1.

6. To assure a long service life for boiler refractory materials after installation, the most effective method is to _____.

- (A) patch refractory with plastic chrome ore
- (B) properly secure refractory with anchor bolts
- (C) avoid rapid temperature changes and follow recommended operating procedures
- (D) maintain a high furnace temperature at all times

If choice C is selected set score to 1.

7. When a boiler water test indicates a pH value of 6, you should _____.

- (A) chemically treat to raise the pH to normal level
- (B) check the DC heater for possible malfunction
- (C) begin a continuous boiler blow down
- (D) chemically treat to lower the pH to normal level

If choice A is selected set score to 1.

8. The splits located in the halves of main reduction gear bearings are aligned at an angle to the horizontal in order to resist _____.

- (A) wiping
- (B) steam loss
- (C) oil loss
- (D) axial stress

If choice A is selected set score to 1.

9. The main reason for having a low suction line on the fuel oil service or settling tanks is to _____.

- (A) facilitate water removal
- (B) prevent loss of suction during rough weather
- (C) decrease suction head on the pump
- (D) increase the amount of fuel available for use

If choice A is selected set score to 1.

10. Which of the following actions should be carried out if the boiler water level is falling due to a tube failure?

- (A) Start the standby feed pump and feed the boiler using two feed pumps.
- (B) Open the auxiliary feed stop and check for extra feed.
- (C) Secure the fires and try to maintain the water level.
- (D) Speed up the feed pump to keep the water level up while firing the boiler.

If choice C is selected set score to 1.

11. In a regenerative air heater, air is bypassed around the heater while _____.

- (A) operating at low steaming rates
- (B) giving a surface blow
- (C) blowing tubes
- (D) crossing over forced draft fans

If choice A is selected set score to 1.

12. Which of the following is used to hold the poppet valves closed in a turbo-generators nozzle control speed regulator?

- (A) Springs
- (B) Steam pressure
- (C) Lifting beam
- (D) Oil pressure

If choice B is selected set score to 1.

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

- (A) open cup test
- (B) hydrometer
- (C) calorimeter
- (D) viscosimeter

If choice C is selected set score to 1.

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

If choice A is selected set score to 1.

15. Before placing the jacking gear in operation on a main turbine unit, you must always ensure that _____.

- (A) the condensate system is operating
- (B) the main lube oil system is operating
- (C) the gland seal steam system is operating
- (D) the main salt water circulating pump is operating

If choice B is selected set score to 1.

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

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

If choice A is selected set score to 1.

17. Before any auxiliary diesel engine hydraulic starting system is opened for servicing or repair, you must _____.

- (A) bleed off all hydraulic pressure from the system
- (B) place all control levers in the 'HOLD' position
- (C) block all hydraulic hoses using high-pressure covers
- (D) ensure that the hydraulic fluid reservoir is full

If choice A is selected set score to 1.

18. 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) insure equal cooling of the main turbine bearings
- (C) remove the excessive amount of non-condensable vapors which accumulated during maneuvering operations
- (D) dry out the main turbines

If choice D is selected set score to 1.

19. An excess pressure governor would normally be used on a _____.

- (A) low-pressure propulsion turbine
- (B) turbine-driven feed pump
- (C) forced draft fan
- (D) main circulator pump

If choice B is selected set score to 1.

20. Your vessel is steaming full ahead and operating on both boilers. If the boiler water level of one boiler drops out of sight low in the sight glass and the burners have been secured, besides slowing down the main engine, what further action should be taken?

- (A) close the main steam stop
- (B) manually feed the boiler to bring up the level
- (C) blow down the gage glass
- (D) start the standby feed pump

If choice A is selected set score to 1.

21. A flue gas analysis is performed to determine the _____.

- (A) percentage of nitrogen by volume
- (B) carbon content of the fuel being burned
- (C) specific heat of combustion products
- (D) correct fuel/air ratio for efficient combustion

If choice D is selected set score to 1.

22. In a boiler automation system, if a burner fuel oil solenoid valve continually trips closed under normal steaming conditions, you should _____.

- (A) wedge the valve in the open position and reduce the fuel oil pressure at that burner
- (B) bypass the solenoid valve and enter the fact in the logbook
- (C) wedge the valve in the open position and report it to the chief engineer
- (D) secure the burner and determine the cause of the valve failure

If choice D is selected set score to 1.

23. Steam baffles are used in the steam drum of a water-tube boiler to _____.

- (A) reduce the possibility of carryover
- (B) support the drum safety valve nozzles
- (C) remove boiler water dirt deposits
- (D) extend the internal feed pipe

If choice A is selected set score to 1.

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

- (A) High feed water temperature entering the boiler
- (B) High superheater temperature
- (C) Lower than usual air pressure in the furnace
- (D) Low air temperature entering the boiler

If choice B is selected set score to 1.

25. In the auxiliary diesel engine, shown in the illustration, the _____. Illustration MO-0006

- (A) governor is linked to the fuel injection pump by vertical linkage
- (B) explosion relief doors are clearly visible on both sides of the crankcase
- (C) camshaft rotates at the same speed as the crankshaft
- (D) engine oil filter is outboard of the electric starter

If choice A is selected set score to 1.

26. If a line shaft bearing begins to overheat, the shaft speed should be reduced. If overheating persists, you should then _____.

- (A) apply emergency cooling water externally to the bearing
- (B) increase lube oil pressure to the bearing
- (C) flood the bearing with a higher viscosity oil to provide emergency lubrication and cooling
- (D) decrease lube oil pressure to the bearing

If choice A is selected set score to 1.

27. According to the data given in the illustration which of the following would be the physical state of the fluid at a gage vacuum of 25.03 inches Hg, and 126.08 degrees Fahrenheit? Illustration SG-0026

- (A) Superheated vapor.
- (B) Sub cooled liquid.
- (C) Mixture of saturated liquid and vapor.
- (D) Saturated liquid.

If choice B is selected set score to 1.

28. Scavenging air lines are connected to boiler stack periscopes to _____.

- (A) prevent stack gases from contaminating the periscopes internal components
- (B) maintain a negative pressure in the periscope line
- (C) keep the mirrors from misaligning
- (D) keep the periscope tubing from warping

If choice A is selected set score to 1.

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

If choice B is selected set score to 1.

30. When a turbine rotor is not rotating during maneuvering, the heat tends to be concentrated at the _____.

- (A) turbine bleed lines
- (B) exhaust trunk
- (C) top of the turbine
- (D) casing joints

If choice C is selected set score to 1.

31. The primary purpose of a control desuperheater installed in the steam drum of a boiler is to _____.

- (A) regulate the superheater outlet temperature by cooling a portion of the superheated steam
- (B) regulate saturated steam temperature through the desuperheater
- (C) regulate the temperature of superheated steam by adding moisture
- (D) assure a constant volume of steam flow through the entire superheater under all load conditions

If choice A is selected set score to 1.

32. After patching refractory with plastic firebrick, holes are poked in the patch on 1 1/2 inch centers in order to _____.

- (A) allow for expansion
- (B) prevent slag buildup
- (C) prevent spalling
- (D) vent escaping moisture

If choice D is selected set score to 1.

33. Which of the precautions listed should be taken when gagging a boiler safety valve?

- (A) Tighten the gag only finger tight to prevent damage to the valve stem, disc or seat.
- (B) Tighten the gag only with the special wrench supplied with the gag.
- (C) Do not allow the gag to contact the safety valve stem.
- (D) Ensure that all moving parts of the safety valve are free to move before installing the gag.

If choice A is selected set score to 1.

34. In a water-tube boiler, waterside scale formation is caused by _____.

- (A) sodium hydroxide
- (B) sodium phosphate
- (C) calcium sulfate
- (D) magnesium phosphate

If choice C is selected set score to 1.

35. An unusual vibration in the main propulsion turbine unit, accompanied by a rumbling sound in the reduction gear, could be caused by _____.

- (A) a labyrinth seal failure
- (B) a carryover from the boiler
- (C) overloading of the condenser
- (D) a reduction in condenser vacuum

If choice B is selected set score to 1.

36. The constant pressure governor of a turbine-driven feed pump maintains which of the following pressures at a constant value for all capacities?

- (A) Pump discharge
- (B) Turbine inlet
- (C) Turbine exhaust
- (D) Pump suction

If choice A is selected set score to 1.

37. If the main propulsion turbine begins to vibrate severely while you are increasing speed, you should _____.

- (A) stop the turbine and not answer any more bells
- (B) open the throttle wider to pass through the critical speed
- (C) hold the turbine at that speed until vibration stops
- (D) immediately slow the turbine to see if the vibration will stop

If choice D is selected set score to 1.

38. On a boiler safety valve, the blow down adjusting ring is locked in place by a _____.

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

If choice C is selected set score to 1.

39. If boiler water chemicals are decreasing in one boiler and increasing in the other boiler, while both are steaming at normal rates, a leak probably exists in the _____.

- (A) superheater tubes
- (B) economizer tubes
- (C) feed water crossover line
- (D) internal desuperheater flange

If choice D is selected set score to 1.

40. The photoelectric cell installed as part of the combustion safety controls of an automatically fired boiler will _____.

- (A) close the control circuit upon sensing a flame failure
- (B) open the control circuit upon sensing an intense flame
- (C) control the modulating pressure control circuit
- (D) sense light from the burner flame

If choice D is selected set score to 1.

41. Which of the following statements represents the purpose of boiler sliding feet?

- (A) To ensure an airtight seal between the boiler inner and outer casings.
- (B) To compensate for deflection of the hull in way of the boiler supports.
- (C) To accommodate the changing length of the water drum as it expands or contracts with temperature changes.
- (D) To allow for unequal expansion between the wrapper and tube sheets.

If choice C is selected set score to 1.

42. The base ring shown in the illustration is identified by the letter _____. Illustration SE-0012

- (A) A
- (B) E
- (C) C
- (D) D

If choice D is selected set score to 1.

43. One advantage of installing water wall tubes in a boiler furnace is to _____.

- (A) decrease refractory maintenance
- (B) reduce combustion rates
- (C) increase furnace size
- (D) reduce furnace temperature

If choice A is selected set score to 1.

44. Boiler tube failures can result from _____.

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

If choice D is selected set score to 1.

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

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

If choice D is selected set score to 1.

46. If an analysis of boiler flue gas determines there is no excess air for combustion, you should expect the nitrogen content of the flue gas to be approximately _____.

- (A) 10.5%
- (B) 14.0%
- (C) 21.0%
- (D) 79.0%

If choice D is selected set score to 1.

47. What is the significance of pinion deflection in the operation of reduction gears?

- (A) Pinion deflection causes unequal tooth loading.
- (B) Deflection is minimal because a longer pinion is more rigid.
- (C) Deflection causes excessive wear at the center of the pinion.
- (D) Deflection causes excessive wear at both ends of the pinion.

If choice A is selected set score to 1.

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

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

If choice A is selected set score to 1.

49. An efficient seal is normally obtained between the upper and lower halves of a turbine casing by _____.

- (A) copper gaskets
- (B) precision metal-to-metal contact
- (C) flexible steel seal strips
- (D) asbestos gaskets

If choice B is selected set score to 1.

50. Excessive alkalinity of boiler water will cause _____.

- (A) caustic embrittlement
- (B) sodium sulfite reacting with dissolved oxygen
- (C) calcium carbonate precipitation
- (D) scale formation

If choice A is selected set score to 1.

51. Testing boiler water for chloride content will indicate the amount of _____.

- (A) total alkalinity in the water
- (B) methyl orange that should be added
- (C) dissolved salts from sea contamination
- (D) phosphates present in the water

If choice C is selected set score to 1.

52. When you are installing a new furnace floor in an oil fired boiler, the clearance between the firebricks should be large enough to _____.

- (A) allow for expansion without subjecting the joint to flame penetration
- (B) facilitate rebricking at required maintenance intervals
- (C) allow for installation of plastic chrome ore after drying
- (D) allow for proper filling with slag under normal operating conditions

If choice A is selected set score to 1.

53. The boiler economizer provides additional heat to the _____.

- (A) steam leaving the superheater
- (B) air supply entering the furnace
- (C) fuel oil entering the furnace
- (D) feed water entering the boiler

If choice D is selected set score to 1.

54. Where is the superheater located in the boiler shown in the illustration? Illustration SG-0008

- (A) G
- (B) H
- (C) I
- (D) J

If choice A is selected set score to 1.

55. Which of the listed actions will occur when there is an increase in load on a ship service generator equipped with a centrifugal type hydraulic governor? Illustration SE-0009

- (A) The governor weights move outward.
- (B) More oil will enter the operating cylinder (O).
- (C) Steam flow to the turbine decreases.
- (D) The operating piston is forced to move lower.

If choice B is selected set score to 1.

56. High exhaust temperature and black smoke exhausting from an auxiliary diesel engine can be caused by _____.

- (A) plugged fuel nozzle holes
- (B) excessive compression pressure
- (C) engine overload
- (D) low combustion temperature

If choice C is selected set score to 1.

57. Which of the following actions should be taken FIRST when water is found in the fuel oil settling tank?

- (A) Shift pump suction to an alternate settling tank.
- (B) Shift to alternate or standby fuel oil service pump.
- (C) Determine the extent of water contamination by reading the pneumercators.
- (D) Sound the settling tank with water indicating paste.

If choice A is selected set score to 1.

58. Which of the conditions listed occurs when glassy slag, formed by the burning of fuel oil contaminated with salt water, melts and runs over the furnace wall?

- (A) Formation of a protective coating.
- (B) Cracks through the furnace floor.
- (C) Increased furnace temperature.
- (D) Damage to the furnace refractory.

If choice D is selected set score to 1.

59. Which of the conditions listed could cause a boiler economizer to leak?

- (A) High stack gas temperatures.
- (B) High feed water temperatures.
- (C) Water hammer.
- (D) Low feed water pressure.

If choice C is selected set score to 1.

60. As found in a reduction gear drive system, thrust bearings serve to _____.

- (A) transmit the force produced by the propeller to the structure of the ship
- (B) hold the main engine in place
- (C) increase the shaft speed
- (D) limit the radial movement of the shaft

If choice A is selected set score to 1.

61. While your vessel is steaming with one boiler, the automatic combustion control system sensing line for the idle boiler is accidentally opened. How will this affect the steaming boiler?

- (A) The water level will drop.
- (B) The water level will rise.
- (C) The steam pressure will drop.
- (D) The steam pressure will rise.

If choice D is selected set score to 1.

62. Which combustible element in fuel oil is considered a significant and major source of air pollution?

- (A) Hydrogen
- (B) Sulfur
- (C) Vanadium
- (D) Nitrogen

If choice B is selected set score to 1.

63. Which of the following would cause the dowel or locking lip of a split-type, precision insert, main bearing to shear and allow the bearing to rotate with the journal?

- (A) Unequal torque to any two adjacent bearing bolts
- (B) Short periods of above normal operating speeds
- (C) Insufficient bearing crush
- (D) Excessive bearing bolt torque

If choice C is selected set score to 1.

64. In a boiler equipped with an automatic feed water regulator, erratic variations in the water level could be caused by _____.

- (A) high solids content and foaming in the drum
- (B) ruptured feed water control valve diaphragm
- (C) high feed water temperature
- (D) low feed water temperature

If choice A is selected set score to 1.

65. Which of the statements listed applies to the quill shaft shown in the illustration? Illustration SE-0005

- (A) It provides torsional rigidity to help maintain alignment between gear train and the turbine rotor.
- (B) It absorbs the axial thrust generated by the meshing gears.
- (C) It permits axial movement between the high speed gear and low speed pinion.
- (D) It compensates for high speed pinion radial misalignment.

If choice C is selected set score to 1.

66. 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 the shoes to tilt slightly, thereby allowing the formation of a wedge shaped oil film under a thrust load
- (D) for automatically adjusting clearances to the correct value when wear occurs

If choice C is selected set score to 1.

67. An excessively high superheater temperature could be the result of _____.

- (A) soot accumulation on the superheater
- (B) high feed water temperature
- (C) excessive air
- (D) excessive steam demand

If choice C is selected set score to 1.

68. 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

If choice C is selected set score to 1.

69. After restoring the normal water level in a boiler following a high water casualty, you should _____.

- (A) immediately put the boiler on the line
- (B) immediately drain the economizer
- (C) blow down the water gage glass
- (D) completely drain the superheater

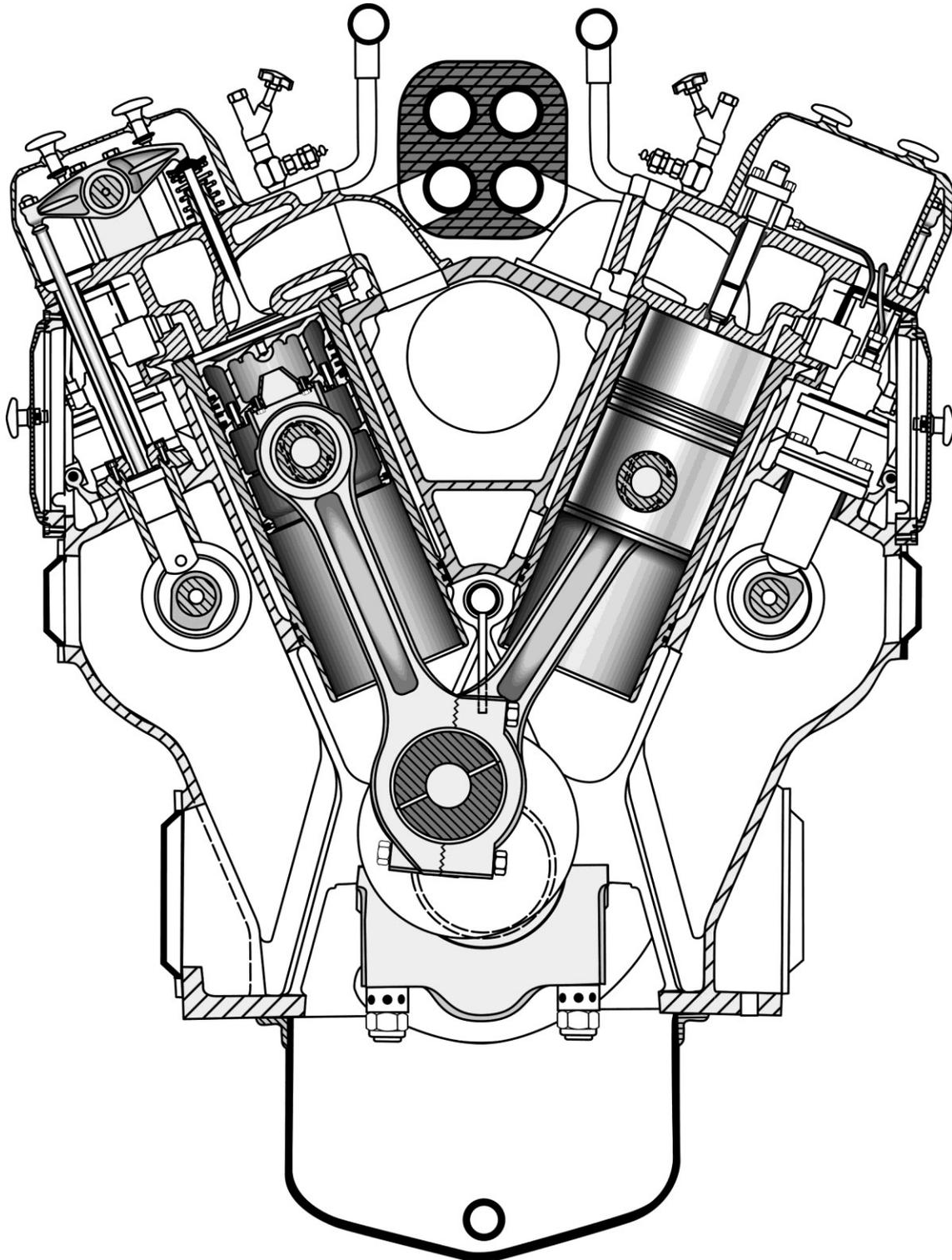
If choice D is selected set score to 1.

70. While a vessel is underway the low-pressure turbine high-speed pinion is damaged. The pinion is then removed from the gear train. Under these circumstances, the main unit is capable of which speed and direction?

- (A) Reduced speed ahead only
- (B) Reduced speed astern only
- (C) Reduced speed ahead and full speed astern
- (D) Reduced speed astern and full speed ahead

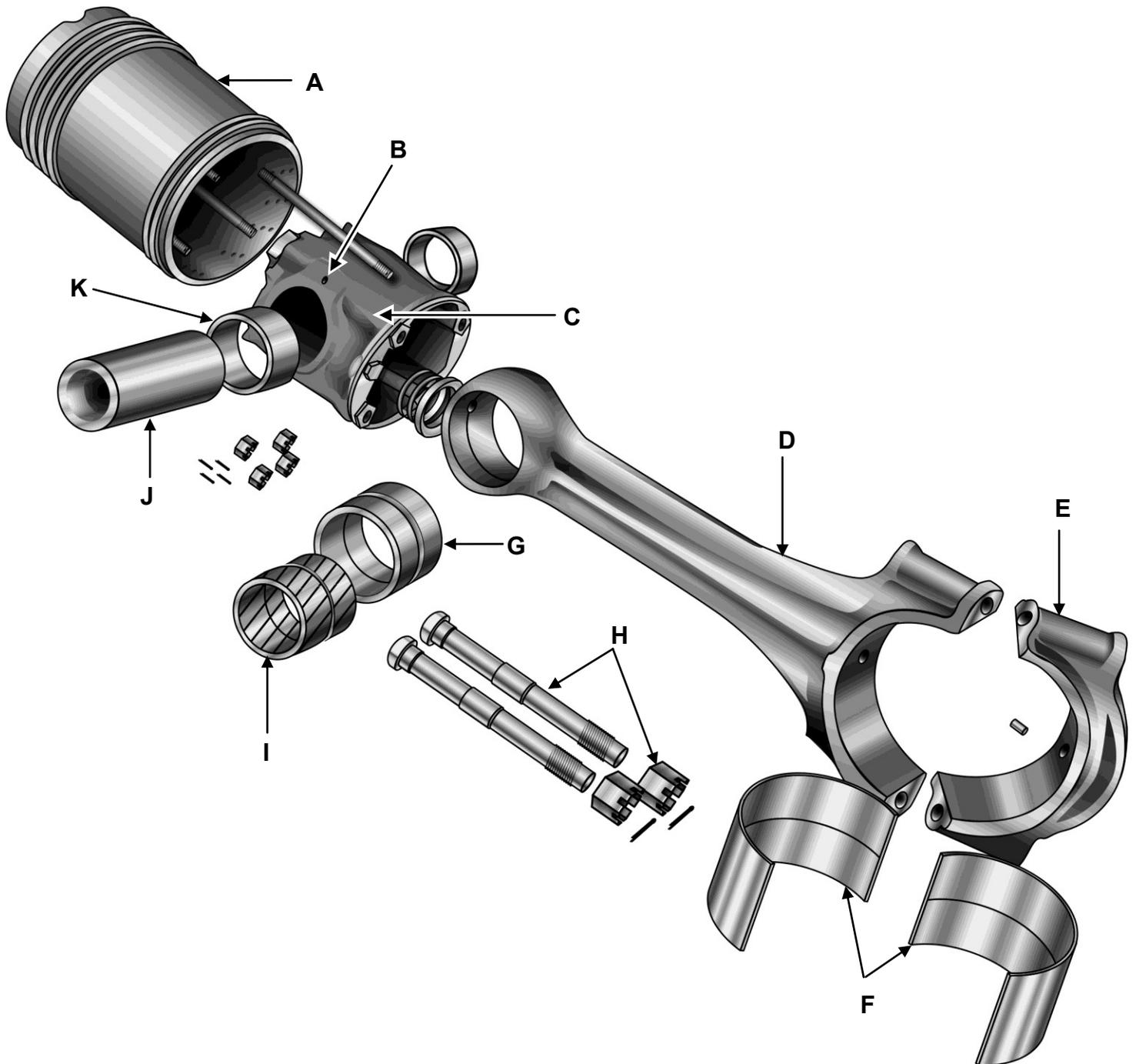
If choice A is selected set score to 1.

MO-0006



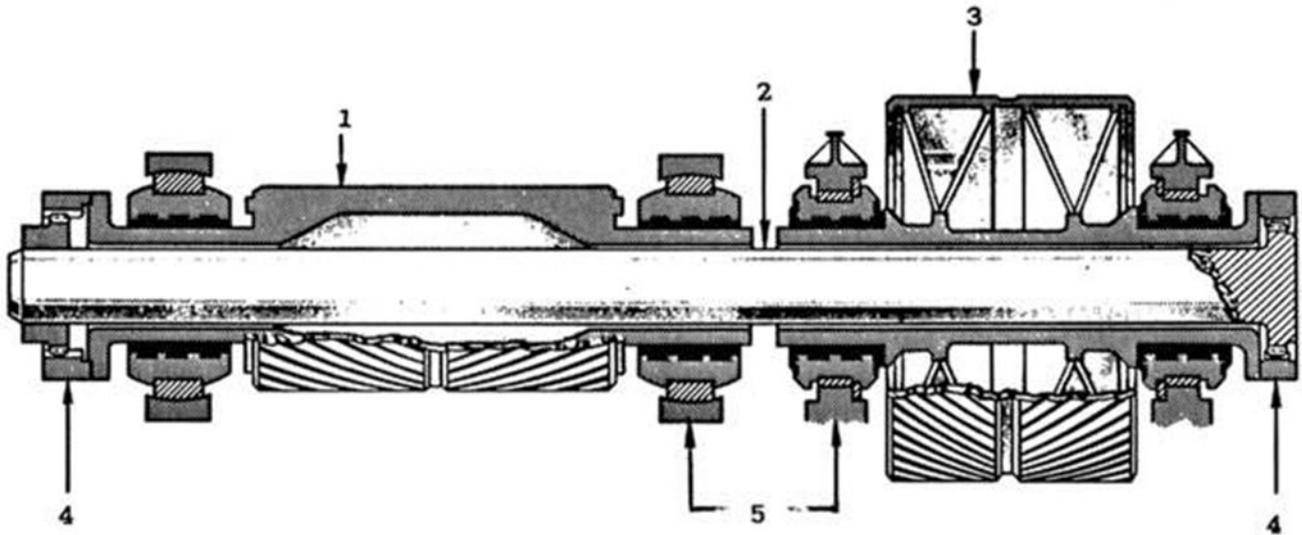
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MO-0040



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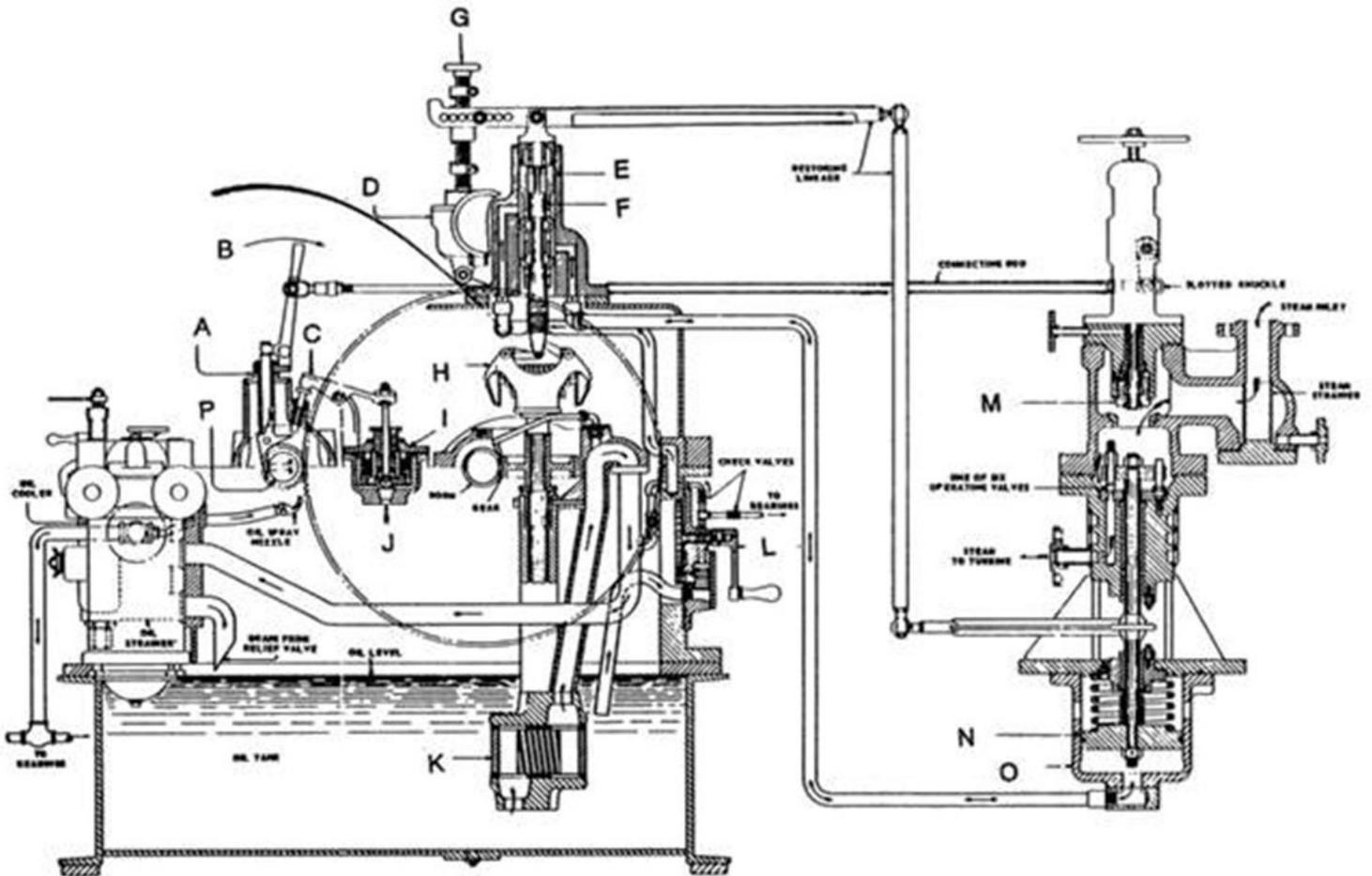
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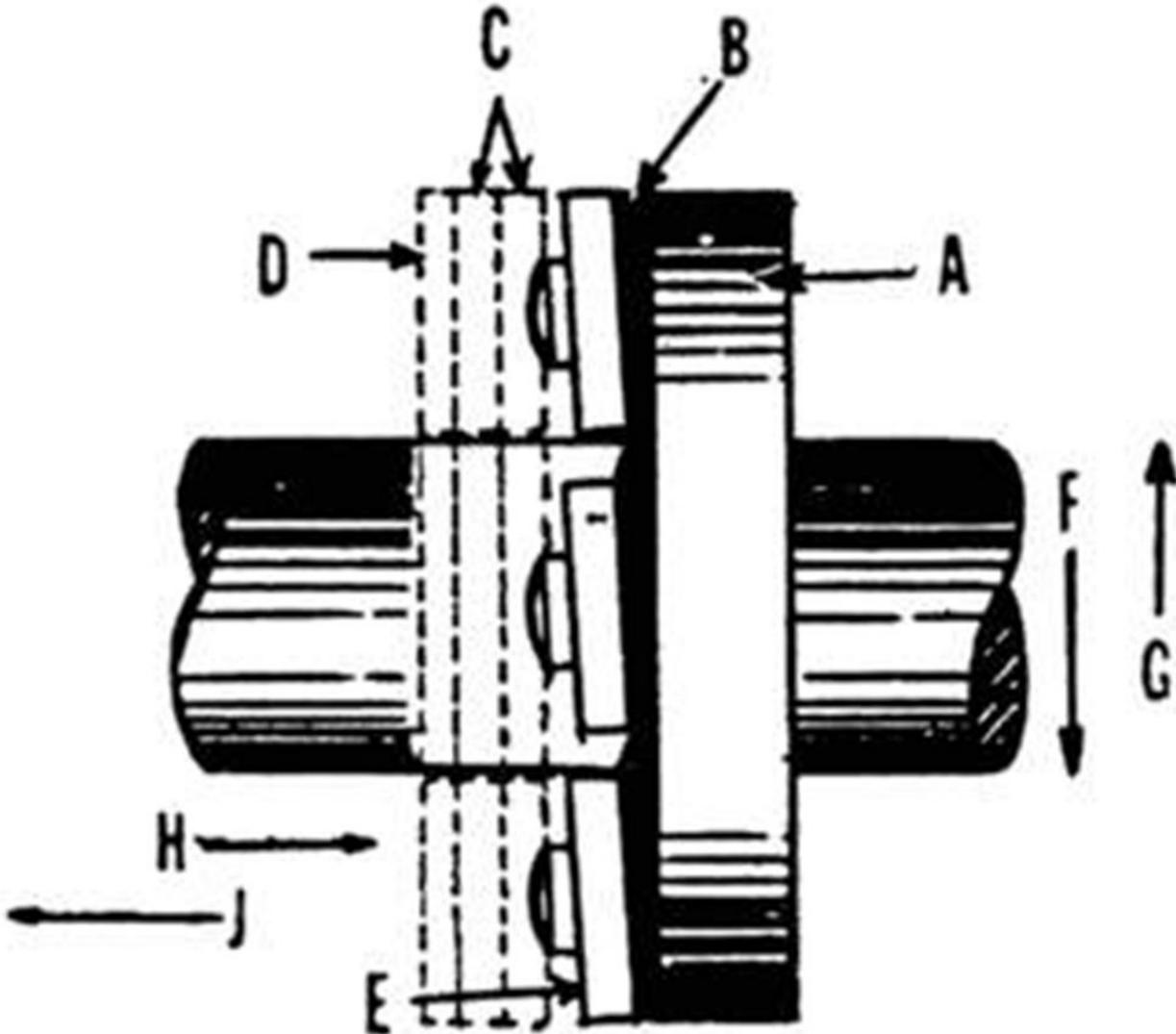
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SE-0009



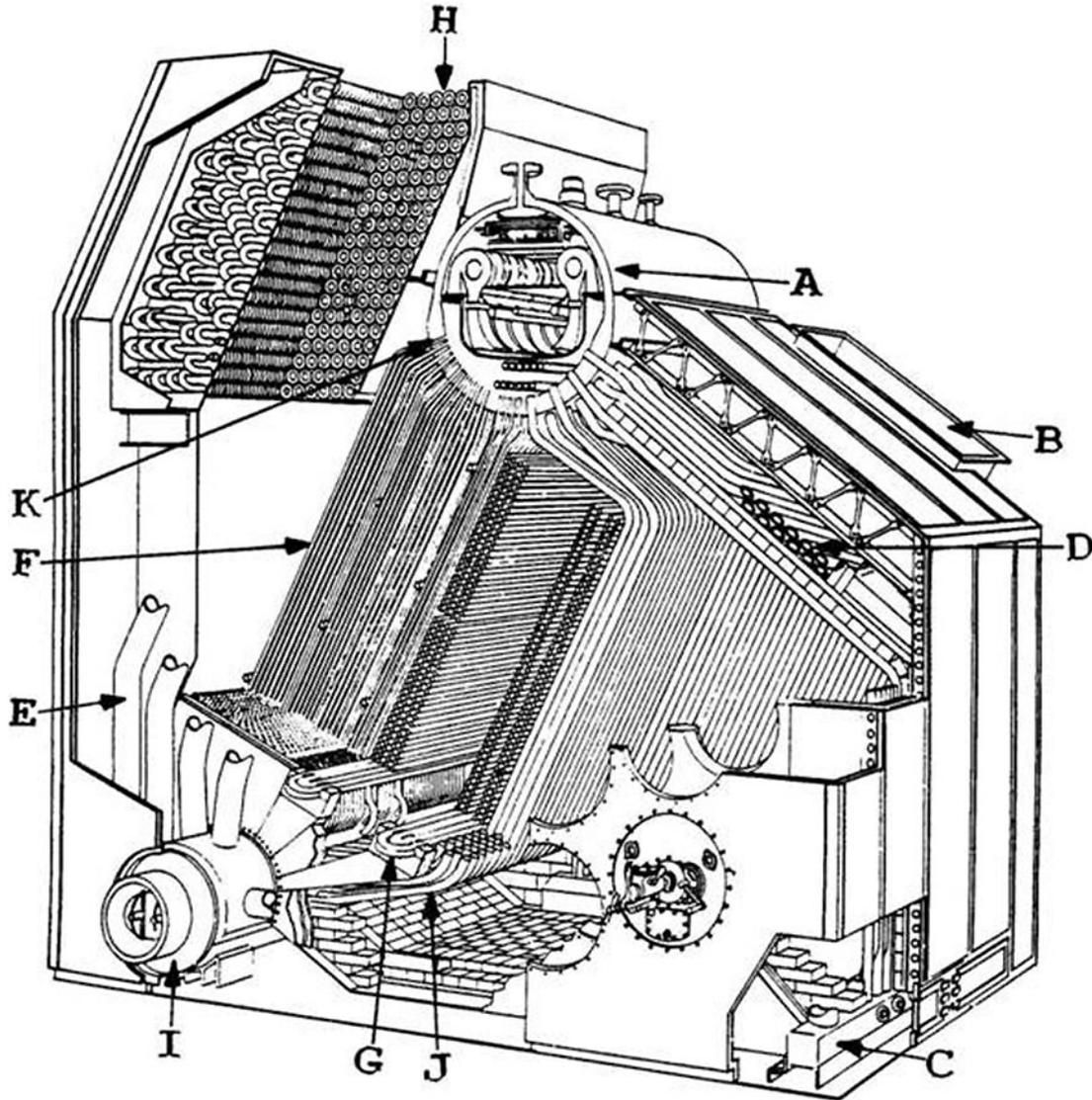
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SE-0012



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SG-0008



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NAVPERS 10788-B

SG-0026

-Properties of Saturated Steam

<u>Absolute Pressure</u>		Vacuum Inches of Hg Gage	<u>Temperature</u>	
Lb. per Sq. In.	Inches of Hg		°C	°F
0.20	0.41	29.51	11.74	53.14
0.25	0.51	29.41	15.17	59.30
0.30	0.61	29.31	18.04	64.47
0.35	0.71	29.21	20.52	68.93
0.40	0.81	29.11	22.70	72.86
0.45	0.92	29.00	24.66	76.38
0.50	1.02	28.90	26.43	79.58
0.60	1.22	28.70	29.56	85.21
0.70	1.43	28.49	32.27	90.08
0.80	1.63	28.29	34.66	94.38
0.90	1.83	28.09	36.80	98.24
1.0	2.04	27.88	38.74	101.74
1.2	2.44	27.48	42.18	107.92
1.4	2.85	27.06	45.14	113.26
1.6	3.26	26.66	47.77	117.99
1.8	3.66	26.26	50.13	122.23
2.0	4.07	25.85	52.27	126.08
2.2	4.48	25.44	54.23	129.62
2.4	4.89	25.03	56.05	132.89
2.6	5.29	24.63	57.74	135.94
2.8	5.70	24.22	59.33	138.79
3.0	6.11	23.81	60.82	141.48
3.5	7.13	22.79	64.21	147.57
4.0	8.14	21.78	67.21	152.97
4.5	9.16	20.76	69.91	157.83
5.0	10.18	19.74	72.36	162.24
5.5	11.20	18.72	74.61	166.30
6.0	12.22	17.70	76.70	170.06
6.5	13.23	16.69	78.64	173.56
7.0	14.25	15.67	80.47	176.85
7.5	15.27	14.65	80.52	176.94
8.0	16.29	13.63	83.81	182.86
8.5	17.31	12.61	85.36	185.64
9.0	18.32	11.60	86.82	188.28
9.5	19.34	10.58	88.22	190.80
10.0	20.36	9.56	89.57	193.21
11.0	22.40	7.52	92.08	197.75
12.0	24.43	5.49	94.42	201.96
13.0	26.47	3.45	96.60	205.88
14.0	28.50	1.42	98.64	209.56

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