U.S.C.G. Merchant Marine Exam

Third Assistant Engineer, Unlimited

Q538 Steam Plants II

(Sample Examination)

Choose the best answer to the following Multiple Choice Questions.

1. The main propulsion shaft turning gear usually connects to the free end of the high-speed high-pressure pinion because the _____.

- (A) lubricating oil from the high-speed pinion can easily supply the turning gears
- (B) arrangement allows for the use of a muff type coupling for flexibility and smooth engagement
- (C) turning gears are double reduction worm type and cannot mate with the low-pressure high-speed pinion
- (D) greatest gear ratio between the turning gear motor output and bull gear can be obtained

If choice D is selected set score to 1.

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

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

If choice D is selected set score to 1.

3. In a cross-compounded turbine propulsion plant, steam enters the _____.

- (A) high-pressure, intermediate and low-pressure units simultaneously
- (B) high-pressure unit and then cross-flows to the condenser
- (C) high and low-pressure units simultaneously
- (D) high-pressure unit and then flows through a crossover to the low-pressure unit

If choice D is selected set score to 1.

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

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

If choice B is selected set score to 1.

5. If oil is found in the main fuel oil heater steam drain system, which of the actions listed should be taken first?

- (A) Change over fuel supply to diesel fuel.
- (B) Shift over to the standby heater and monitor contaminated drain tank for additional traces of oil.
- (C) Shift over to the low fuel oil suction on the day tank.
- (D) Bottom blow the boiler using the continuous blow line.

If choice B is selected set score to 1.

6. Lube oil cannot be efficiently filtered if it's _____.

- (A) pump capacity is greater than the system's needs
- (B) temperature is too low
- (C) viscosity index is too low
- (D) pump discharge pressure is higher than the system pressure

If choice B is selected set score to 1.

7. In a disk-type lubricating oil purifier, _____.

- (A) all dirt and sludge are automatically discharged with the cooling water
- (B) deterioration of the bowl ring gasket will cause the purifier to lose its water seal
- (C) the purifier driving gears are lubricated by the reclaimed oil as it leaves the bowl
- (D) sealing water must never be supplied until after oil is fed to the unit

If choice B is selected set score to 1.

8. Water retained in the lube oil system of a main propulsion turbine installation is undesirable because it _____.

- (A) causes pitting of the gear teeth
- (B) raises the flash point of the oil to a dangerously high level
- (C) causes the turbine to over speed
- (D) results in excessive cooling of bearing surfaces

If choice A is selected set score to 1.

9. 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 J
- (C) F and J
- (D) G and H

If choice C is selected set score to 1.

10. A turbo-generator back pressure trip can be actuated as a result of _____.

- (A) an excessive pressure drop through the turbine
- (B) a steam inlet valve being partially open
- (C) insufficient circulating water flow through the condenser
- (D) excessively low exhaust pressure

If choice C is selected set score to 1.

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

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

If choice D is selected set score to 1.

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

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

If choice B is selected set score to 1.

13. Which steam plant watch operating condition requires priority attention over the other conditions listed?

- (A) Vapor issuing from deaerating heater vent
- (B) High level main condenser
- (C) Low sewage tank chlorination section level
- (D) High lube oil storage tank level

If choice B is selected set score to 1.

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

- (A) salt water piping
- (B) valve seats
- (C) shim stock
- (D) precision bearings

If choice D is selected set score to 1.

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

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

If choice D is selected set score to 1.

16. Which of the steam losses listed would be associated with a multi-stage impulse turbine rather than a multi-stage reaction turbine?

- (A) Diaphragm packing loss
- (B) Blade and nozzle loss
- (C) Radiation loss
- (D) Leaving loss

If choice A is selected set score to 1.

17. A steam driven 750 kW turbo-generator has a rated speed of 1200 RPM. The over speed setting for this unit must not exceed _____.

- (A) 1320 RPM
- (B) 1380 RPM
- (C) 1440 RPM
- (D) 1500 RPM

If choice B is selected set score to 1.

18. The most critical period of main turbine operation is during cold start-up, rather than hot shutdown because _____.

- (A) harmonic vibrations associated with critical speed can easily be reached during start-up
- (B) the danger of blade erosion damage from dry steam impingement is greater during start-up
- (C) lubricant film thickness during start-up is considerably less than the dimensions of gear surface irregularities
- (D) differential expansion can result from the temperature difference between the rotor and rotor casing

If choice D is selected set score to 1.

19. Excessive thrust bearing wear in a main propulsion turbine rotor should FIRST become apparent by _____.

- (A) an intermittent vibration when changing speed
- (B) metal particles in the lube oil purifier
- (C) rubbing noises when jacking over the main unit
- (D) taking rotor position indicator readings

If choice D is selected set score to 1.

20. Which of the following types of bearing lubrication schemes can carry the highest unit loading?

- (A) Ring lubricated
- (B) Disk lubricated
- (C) Pressure lubricated
- (D) Oil whip lubricated

If choice C is selected set score to 1.

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

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

If choice C is selected set score to 1.

22. Turbine lube oil suction strainer baskets have _____.

- (A) frame lined with wire cloth
- (B) coarse perforations
- (C) fine perforations
- (D) self-cleaning design

If choice B is selected set score to 1.

23. In the thrust bearing assembly illustrated the total oil clearance can be correctly decreased by _____. Illustration SE-0007

- (A) increasing the thickness of the filler piece
- (B) decreasing the thickness of the adjusting ring
- (C) decreasing the thickness of the filler piece
- (D) increasing the thickness of the adjusting ring

If choice B is selected set score to 1.

24. 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

If choice A is selected set score to 1.

25. The labyrinth seals used on rotating steam turbine shafts reduces external leakage by causing _____.

- (A) pressure increases through successive seal stages
- (B) successive pressure drops through the seal stages
- (C) increased turbulence through successively larger labyrinth clearances
- (D) successive temperature drops through the seal stages

If choice B is selected set score to 1.

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

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

If choice C is selected set score to 1.

27. The factor which determines the minimum amount of steam superheat required at the steam chest inlet of a main propulsion turbine is the _____.

- (A) moisture content in the steam at the LP end of the turbine
- (B) specific volume of the steam in the low-pressure end of the turbine
- (C) horsepower of the turbine
- (D) vacuum in the condenser

If choice A is selected set score to 1.

28. Main steam turbine bearings are lined with _____.

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

If choice C is selected set score to 1.

29. In an impulse turbine, the fixed blades function to _____.

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

If choice C is selected set score to 1.

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

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

If choice C is selected set score to 1.

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

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

If choice B is selected set score to 1.

32. In what classification of steam turbines are the moving blades and the adjacent fixed rows of blades shaped to act as nozzles?

- (A) Impulse
- (B) Reaction
- (C) Helical flow
- (D) Radial flow

If choice B is selected set score to 1.

33. Because of the pressure drop existing across each diaphragm, the flow of steam between the nozzle diaphragm and the rotor of the turbine is held to a minimum by _____.

- (A) a Babbitt liner
- (B) deflector rings
- (C) a labyrinth packing ring
- (D) a fluid seal

If choice C is selected set score to 1.

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

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

If choice D is selected set score to 1.

35. To prevent damage to the turning gear mechanism, which of the following procedures must be carried out before the turning gear is engaged?

- (A) The brake on the first reduction worm shaft must be set.
- (B) The propeller shaft must be stopped and held stationary until the clutch is engaged.
- (C) The engine order telegraph must be on "stop".
- (D) The speed of the astern turbine must be reduced.

If choice B is selected set score to 1.

36. An auxiliary turbine boiler feed pump should normally be stopped by _____.

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

If choice C is selected set score to 1.

37. Which of the following systems can normally be supplied by auxiliary exhaust steam?

- (A) Air ejectors
- (B) Main feed pump
- (C) Boiler steam atomizers
- (D) Low-pressure evaporator

If choice D is selected set score to 1.

38. Which statement is true concerning drain inspection tanks?

- (A) They collect condensate from the cargo tank heating coils only.
- (B) They are discharged to the condensate system just forward of the feed pump.
- (C) Inspection tanks provide for a visual examination of condensate which could be oil contaminated.
- (D) Inspection tanks collect all HP drains.

If choice C is selected set score to 1.

39. 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) decrease lube oil pressure to the bearing
- (C) increase lube oil pressure to the bearing
- (D) flood the bearing with a higher viscosity oil to provide emergency lubrication and cooling

If choice A is selected set score to 1.

40. In the illustration of a typical ship service turbo-generator control system, the handle labeled "B" is used to _____. Illustration SE-0009

- (A) pump up the lube oil manifold
- (B) reset the over speed trip
- (C) bypass the governor control
- (D) roll over the high-speed pinion

If choice B is selected set score to 1.

41. Packing rings installed on auxiliary turbines are generally lubricated by _____.

- (A) separate lube oil lines
- (B) a water leak off line
- (C) moisture in the turbine steam
- (D) a salt water service line

If choice C is selected set score to 1.

42. The part shown in the illustration would be located between which of the following components of a modern geared turbine main propulsion unit? Illustration SE-0001

- (A) Between the bull gear and line shaft on the side of the gear opposite the thrust bearing.
- (B) Between the rotors and high-speed pinions of the high-pressure and low-pressure turbines.
- (C) Between the bull gear and line shaft on the thrust bearing side of the gear.
- (D) Between the first reduction gears and high-speed pinions of the high-pressure and low-pressure turbines.

If choice B is selected set score to 1.

43. While a vessel is underway, which of the conditions listed would indicate a tube leak associated with the sea water-cooled lube oil cooler on service?

- (A) Contamination of the lube oil.
- (B) Excessive lube oil consumption.
- (C) Corrosion of the journals and bearings.
- (D) Excessive water discharge rate from the lube oil purifier.

If choice B is selected set score to 1.

44. Labyrinth packing rings are installed on turbine diaphragms to minimize _____.

- (A) interstage steam leakage along the turbine rotor
- (B) steam from escaping to the atmosphere
- (C) pressure buildup on both sides of the diaphragm
- (D) air leakage from entering the turbine casing

If choice A is selected set score to 1.

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

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

If choice A is selected set score to 1.

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

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

If choice A is selected set score to 1.

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

If choice D is selected set score to 1.

48. The over speed tripping device installed on an auxiliary turbine is automatically actuated by _____.

- (A) hydraulic pressure
- (B) centrifugal force
- (C) pneumatic force
- (D) high back pressure

If choice B is selected set score to 1.

49. When a turbine is in operation, a rotor position micrometer is used to determine any change in rotor _____.

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

If choice C is selected set score to 1.

50. The main turbine gland sealing system is designed to _____.

- (A) allow minimal steam leakage out of the gland
- (B) regulate steam pressure to the glands when the main turbine is operating at reduced speeds
- (C) seal the turbine shaft against air leakage into the turbine casing
- (D) all of the above

If choice D is selected set score to 1.

51. In any governor there is a small range of speed in which no corrective action occurs. This speed range is called the governor dead band and is caused by _____.

- (A) excessive sensitivity in the governor control valve
- (B) speed droop designed into the governor system
- (C) friction in the governor linkage and control valve
- (D) speeder spring surge in the governor servomotor system

If choice C is selected set score to 1.

52. How is an excess of turbine gland seal steam remedied?

- (A) It is directed to the gland exhaust condenser.
- (B) It is recirculated via the loop seal.
- (C) It exhausts to the atmosphere.
- (D) It drains to the makeup feed tank.

If choice A is selected set score to 1.

53. A ship is equipped with the illustrated turbine gear set and a right hand turning propeller. When steam is admitted to the astern element, with sternway on, the high-speed gear on the high-pressure side is_____. Illustration SE-0016

- (A) turning counter-clockwise as viewed from the aft end of the reduction gear
- (B) turning opposite to the rotation of the high-speed gear on the low-pressure side
- (C) turning the same rotation of the high-speed pinion on the low-pressure side
- (D) rotating the same direction as the low-speed pinion on the low-pressure side

If choice D is selected set score to 1.

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

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

If choice A is selected set score to 1.

55. Reduction gears for main propulsion turbines are lubricated by _____.

- (A) oil flinger rings mounted on the shaft
- (B) grease cups and gravity feed lines
- (C) spray nozzles at the gear meshing points
- (D) leak off lines from the lube oil cooler

If choice C is selected set score to 1.

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

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

If choice B is selected set score to 1.

57. Auxiliary steam at full operating pressure is supplied from the boiler directly to the _____.

- (A) main air ejectors
- (B) distilling plants
- (C) soot blowers
- (D) turbo-generators

If choice C is selected set score to 1.

58. A back pressure trip on a ship's service turbo-generator functions to trip the turbine under what circumstance?

- (A) lubricating oil pressure is too low
- (B) gland seal leak off pressure is too high
- (C) amount of cooling water to the condenser is excessive
- (D) amount of cooling water to the condenser is insufficient

If choice D is selected set score to 1.

59. The main propulsion turbine can be damaged by _____.

- (A) maintaining vacuum too high
- (B) using the jacking gear when there is no vacuum
- (C) water carryover from the boilers
- (D) operating at slow speeds

If choice C is selected set score to 1.

60. 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) Diesel fuel oil
- (B) Metal particles
- (C) Water
- (D) Carbon particles

If choice A is selected set score to 1.

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

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

If choice B is selected set score to 1.

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

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

If choice B is selected set score to 1.

63. A pilot valve and servomotor are utilized in mechanical-hydraulic governing systems on a turbo-generator unit in order to _____.

- (A) provide a means of maintaining a constant load on the turbine unit
- (B) provide sufficient force to operate large steam lifting beam control valves
- (C) allow parallel operation with zero speed droop
- (D) provide a means of maintaining constant output voltage

If choice B is selected set score to 1.

64. The most practical method of determining the condition of a shaft bearing while the shaft is in operation is to _____.

- (A) perform a carbon blot test on an oil sample from the bearing
- (B) check the lube oil temperature
- (C) check the lube oil viscosity
- (D) visually inspect the bearing

If choice B is selected set score to 1.

65. 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) ensure equal cooling of the main turbine bearings
- (B) prevent excessive condensate depression
- (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.

66. 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) sounding the gravity tanks
- (C) observing the overflow sight glass
- (D) observing the flow from the bearings

If choice C is selected set score to 1.

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

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

If choice A is selected set score to 1.

68. Which of the listed procedures should be followed when raising vacuum on the main propulsion plant prior to getting underway?

- (A) Start the lube oil system, start the second stage air ejector and the gland sealing system, start the condensate and circulating pumps, and start the turning gear.
- (B) Start the lube oil system, engage the turning gear, start the condensate and circulating pumps, start the gland sealing system and second stage air ejector.
- (C) Start the condensate and circulating pumps, start the lube oil system, start the air ejectors and the gland sealing system, and engage the turning gear.
- (D) Start the condensate and circulating pumps, engage the turning gear, start the lube oil system, and then start the first and second stage air ejectors and the gland sealing.

If choice B is selected set score to 1.

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

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

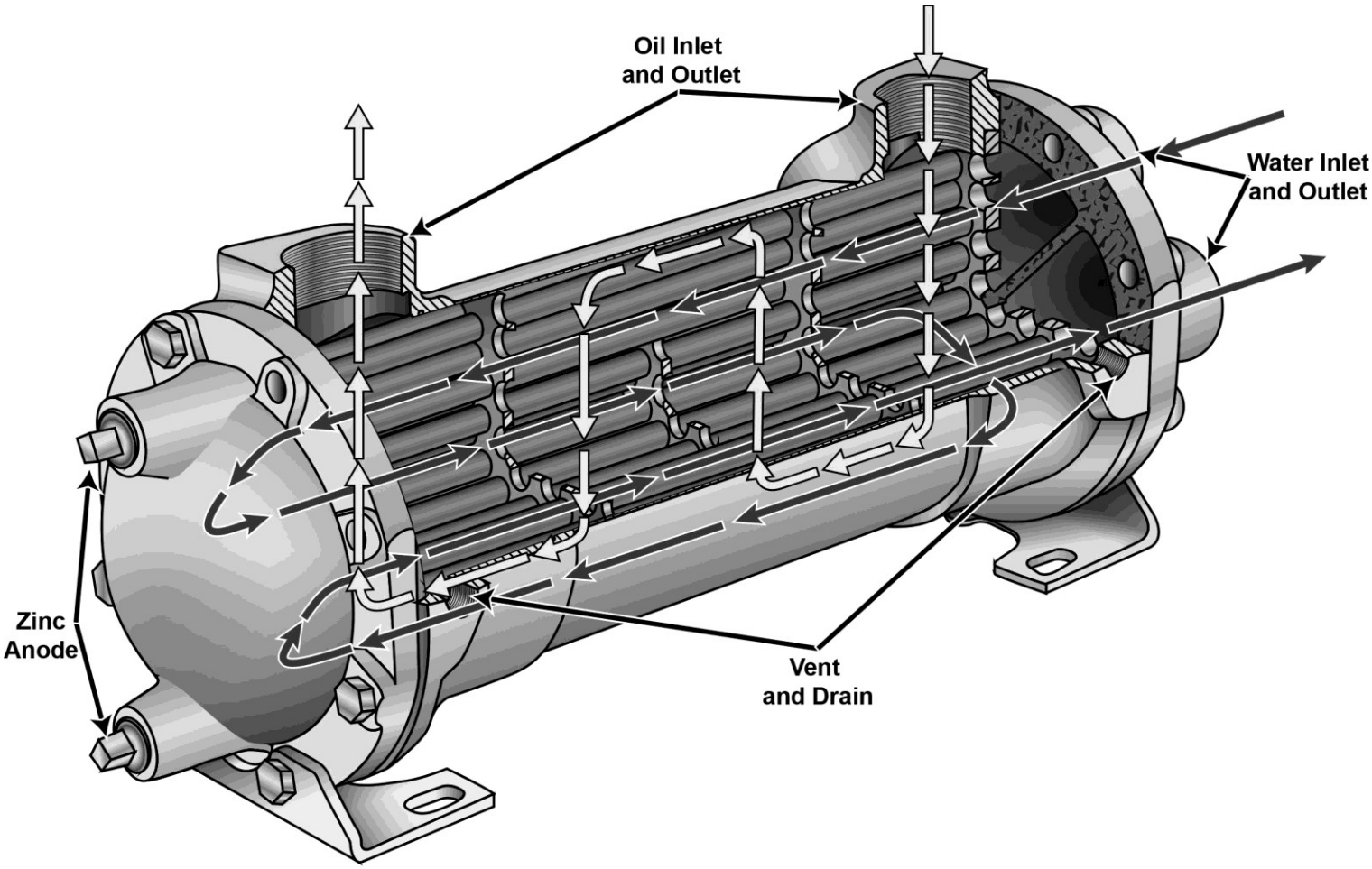
If choice C is selected set score to 1.

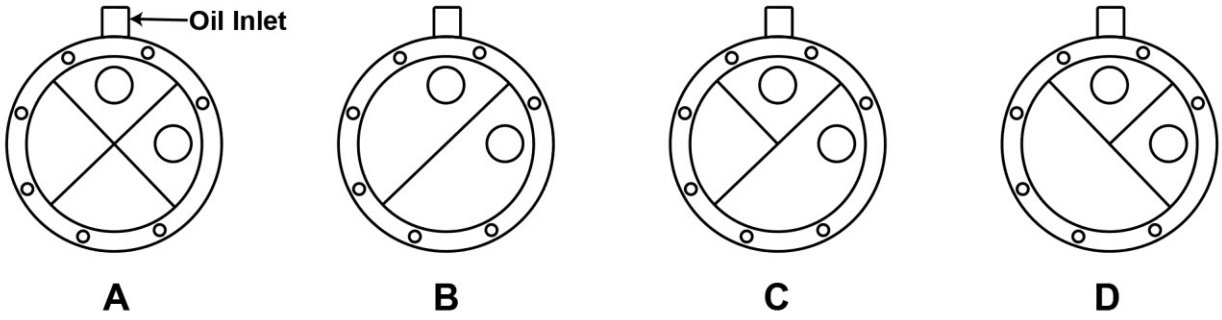
70. As lube oil absorbs moisture its dielectric strength can be expected to _____.

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

If choice D is selected set score to 1.

GS-0122





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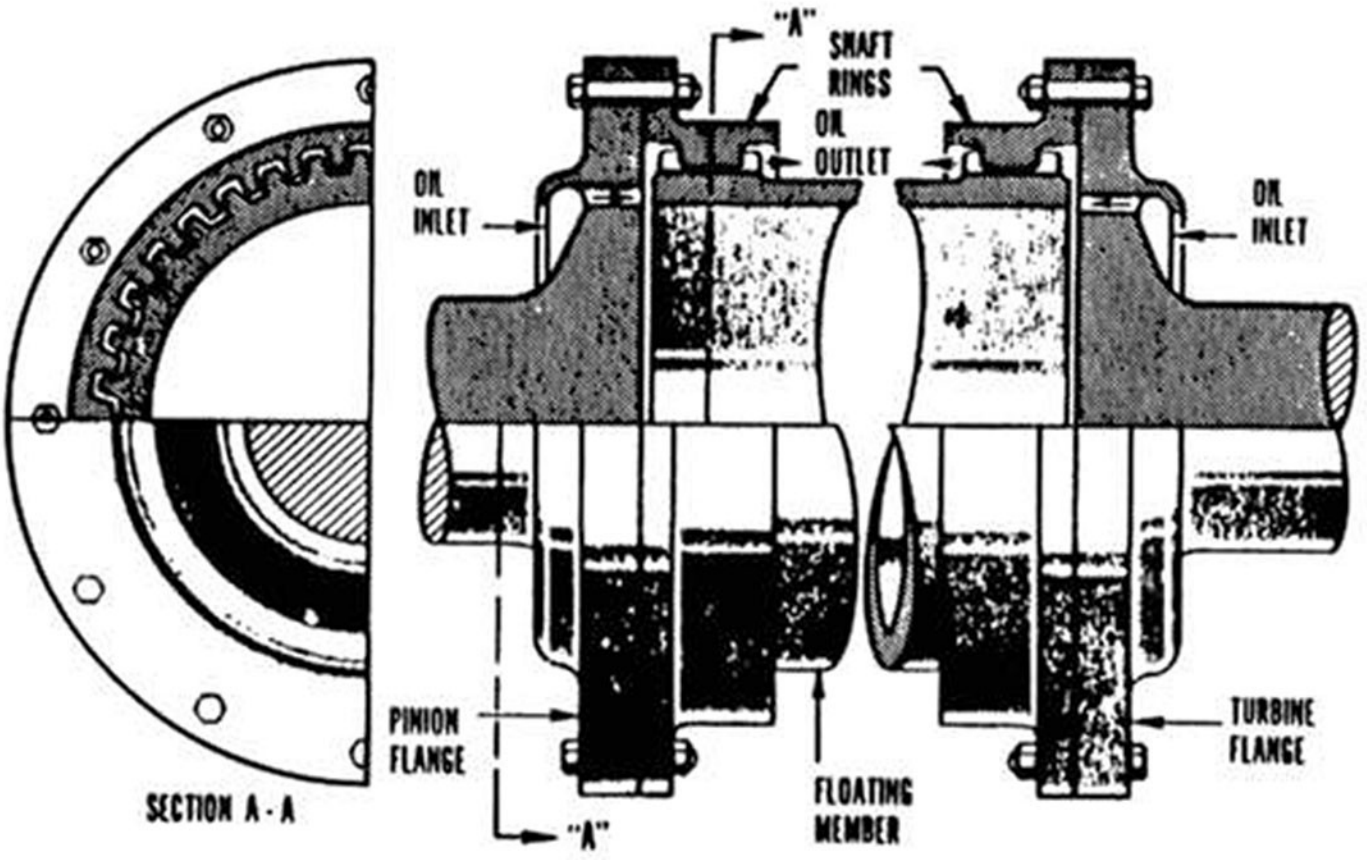

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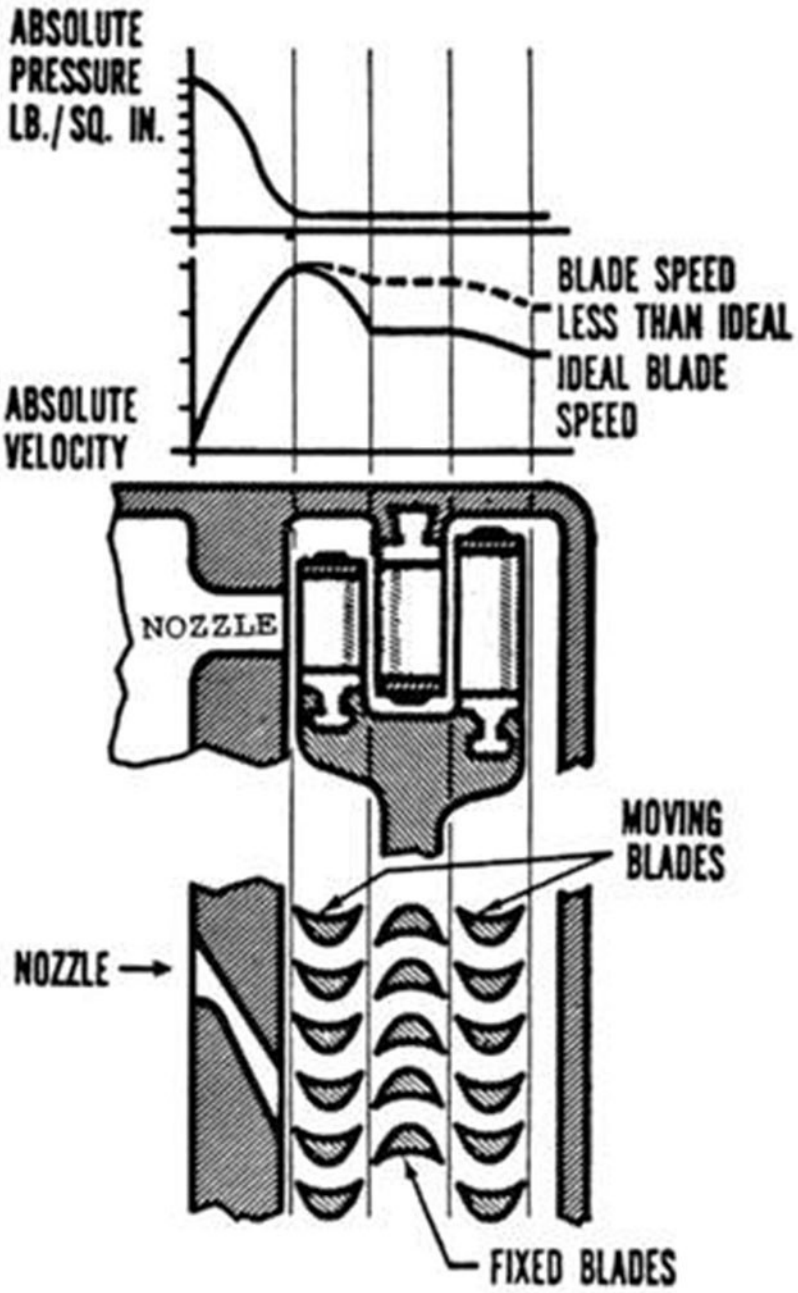

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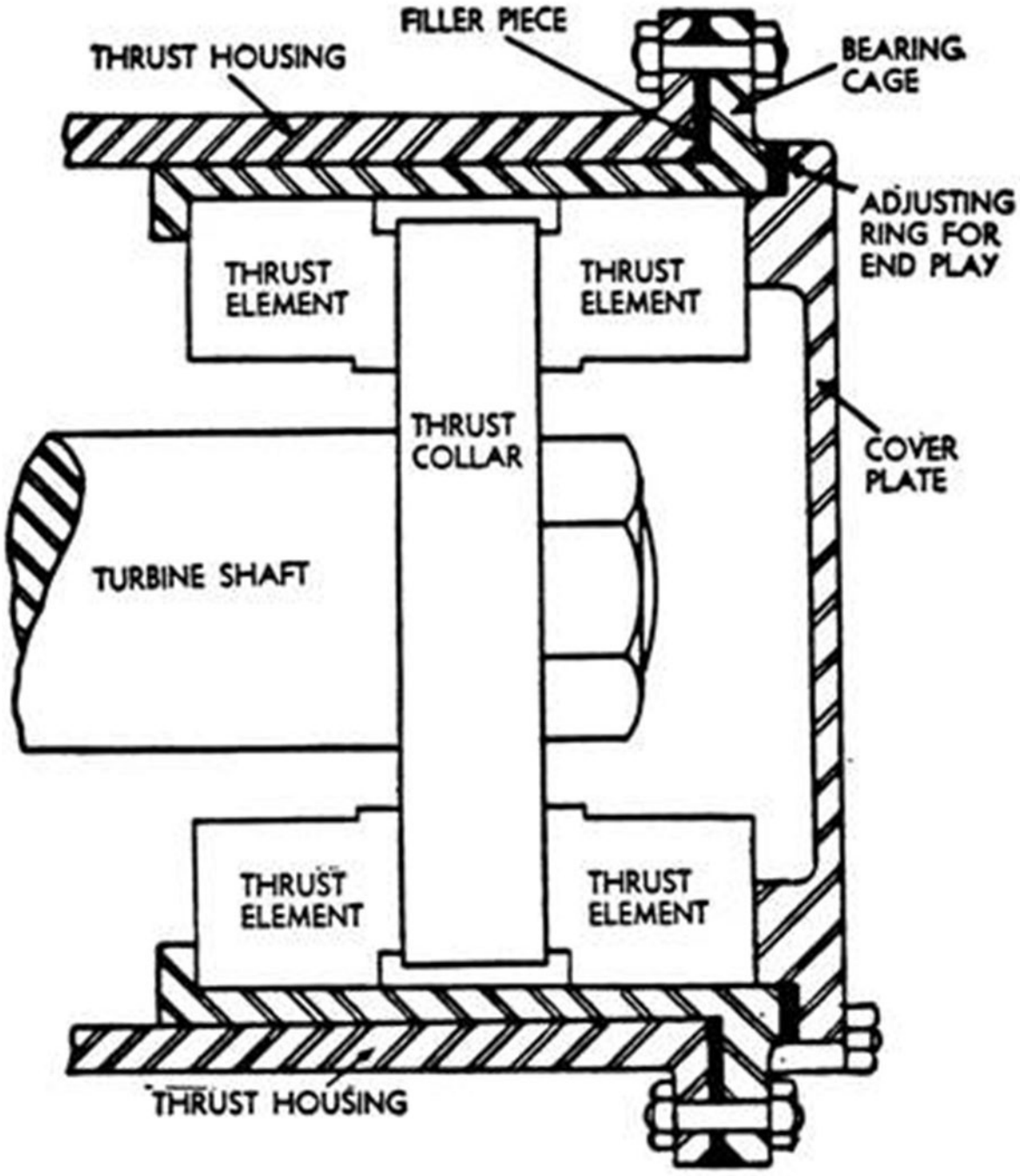

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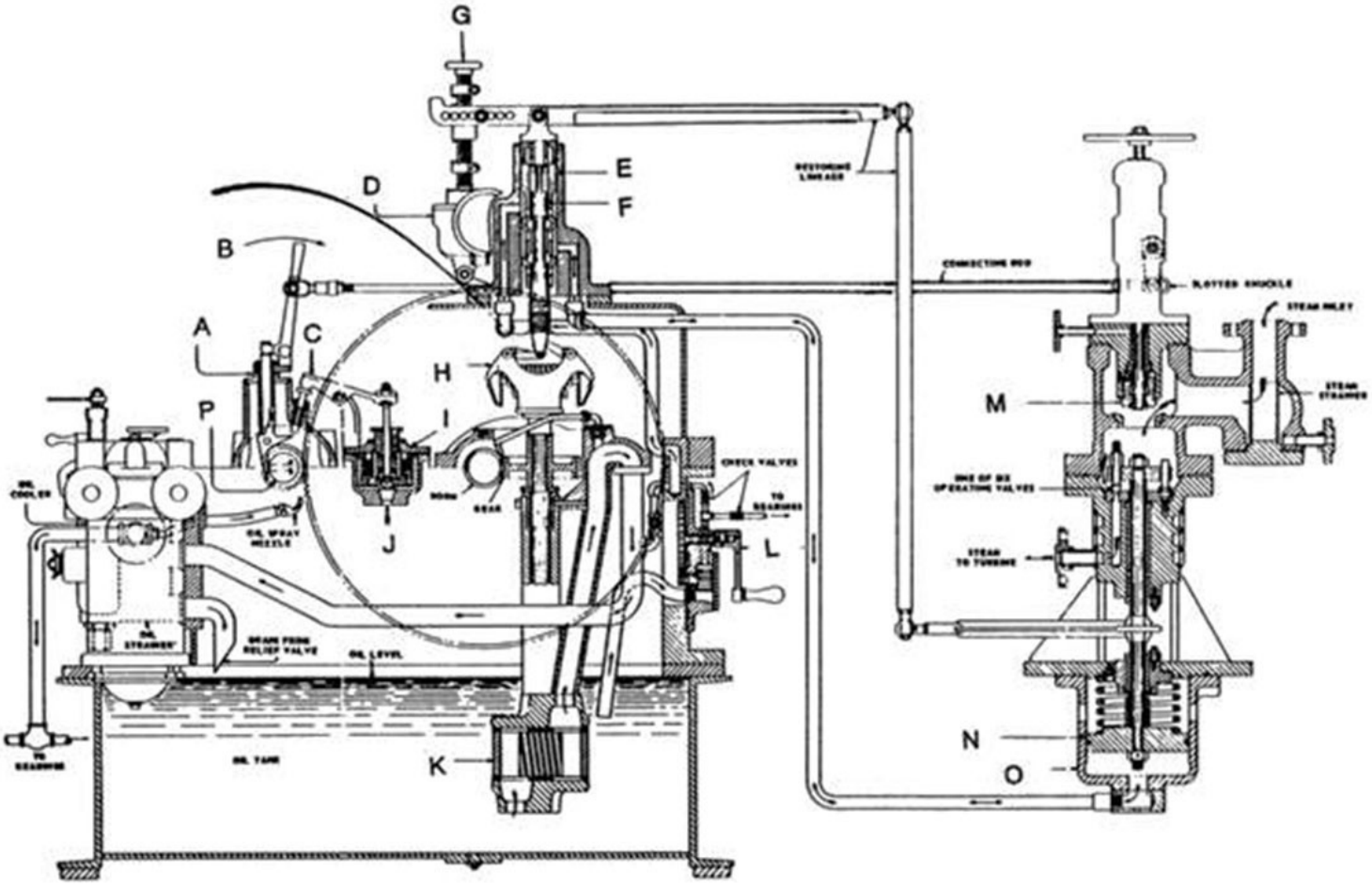

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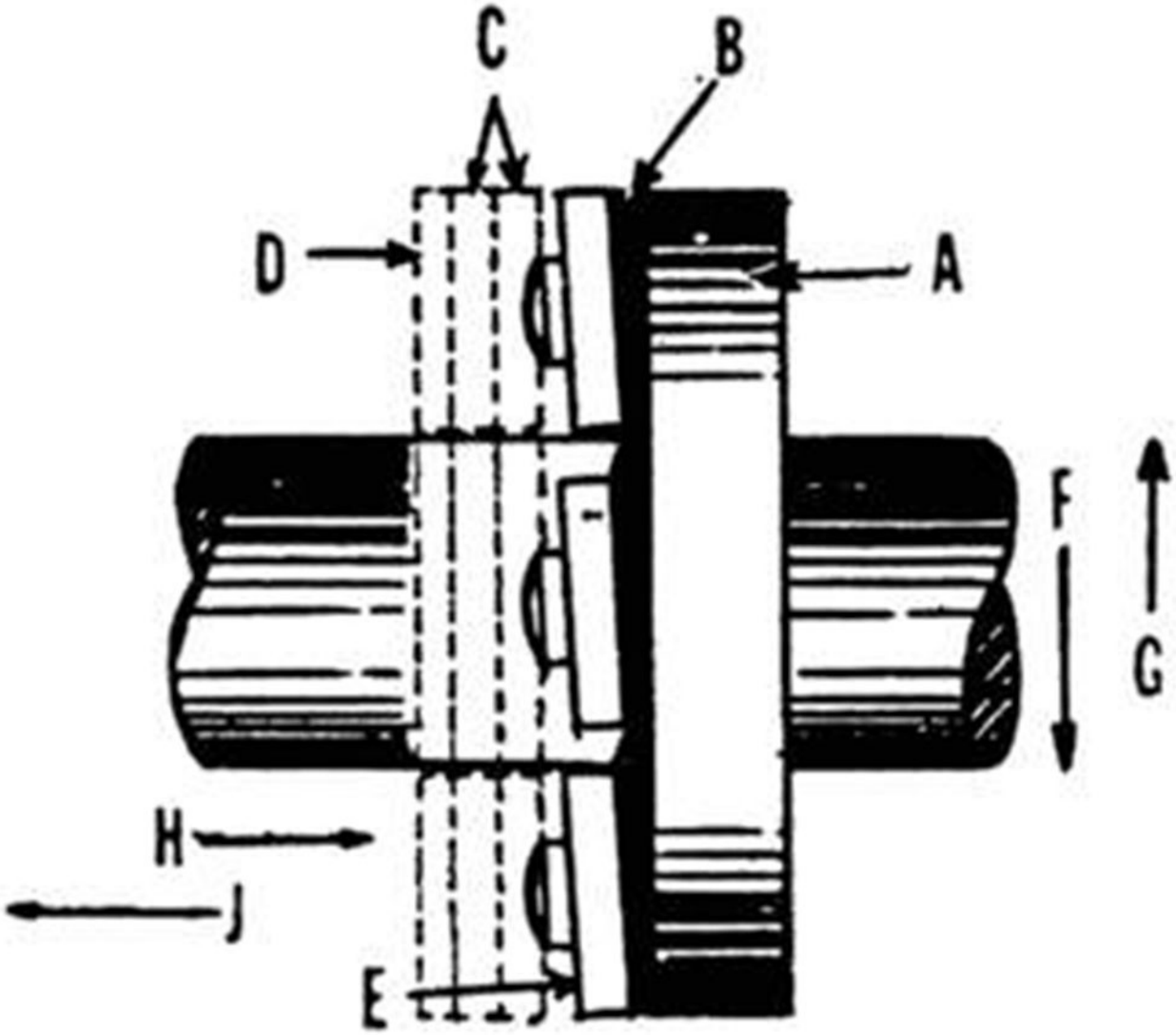

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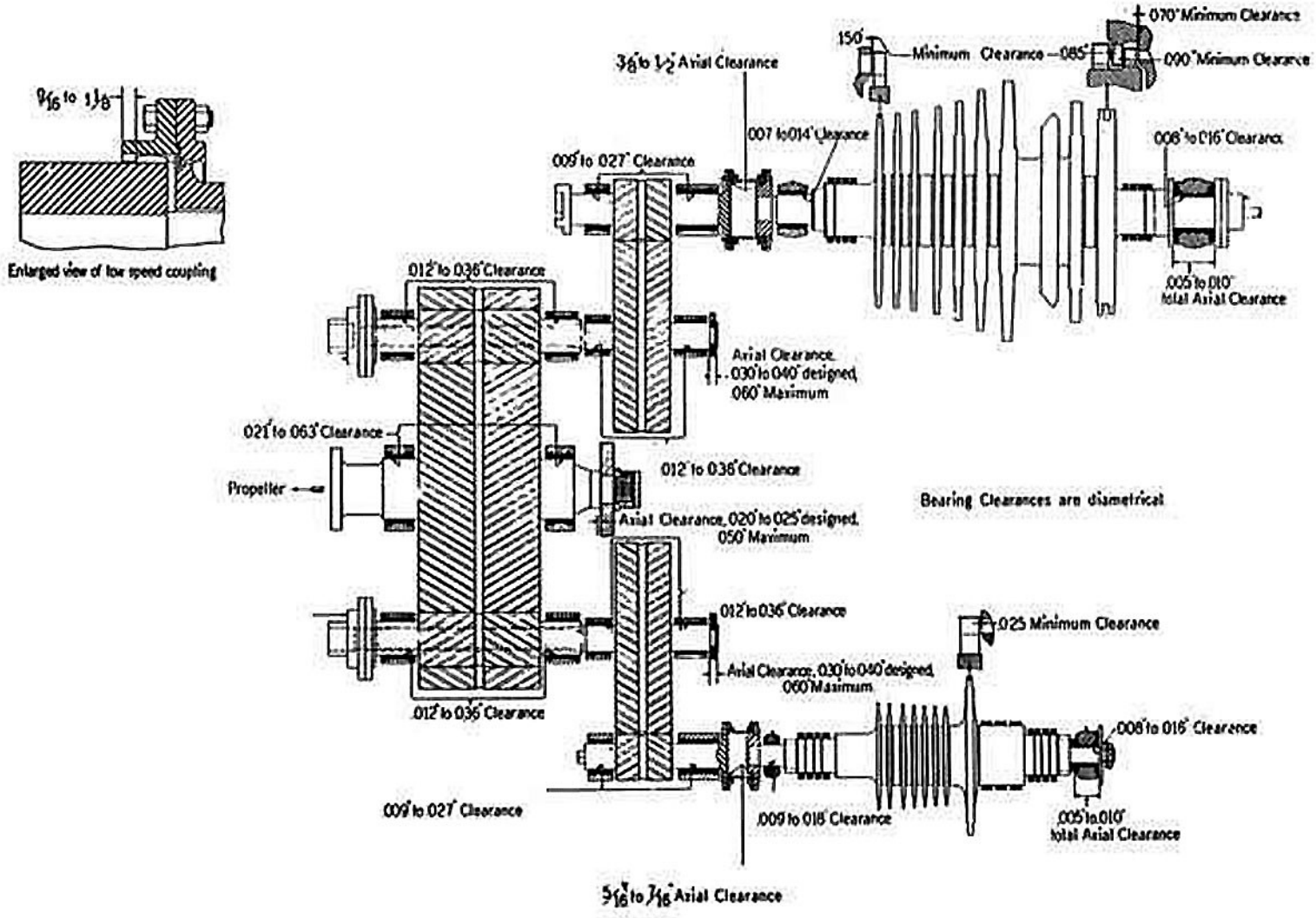

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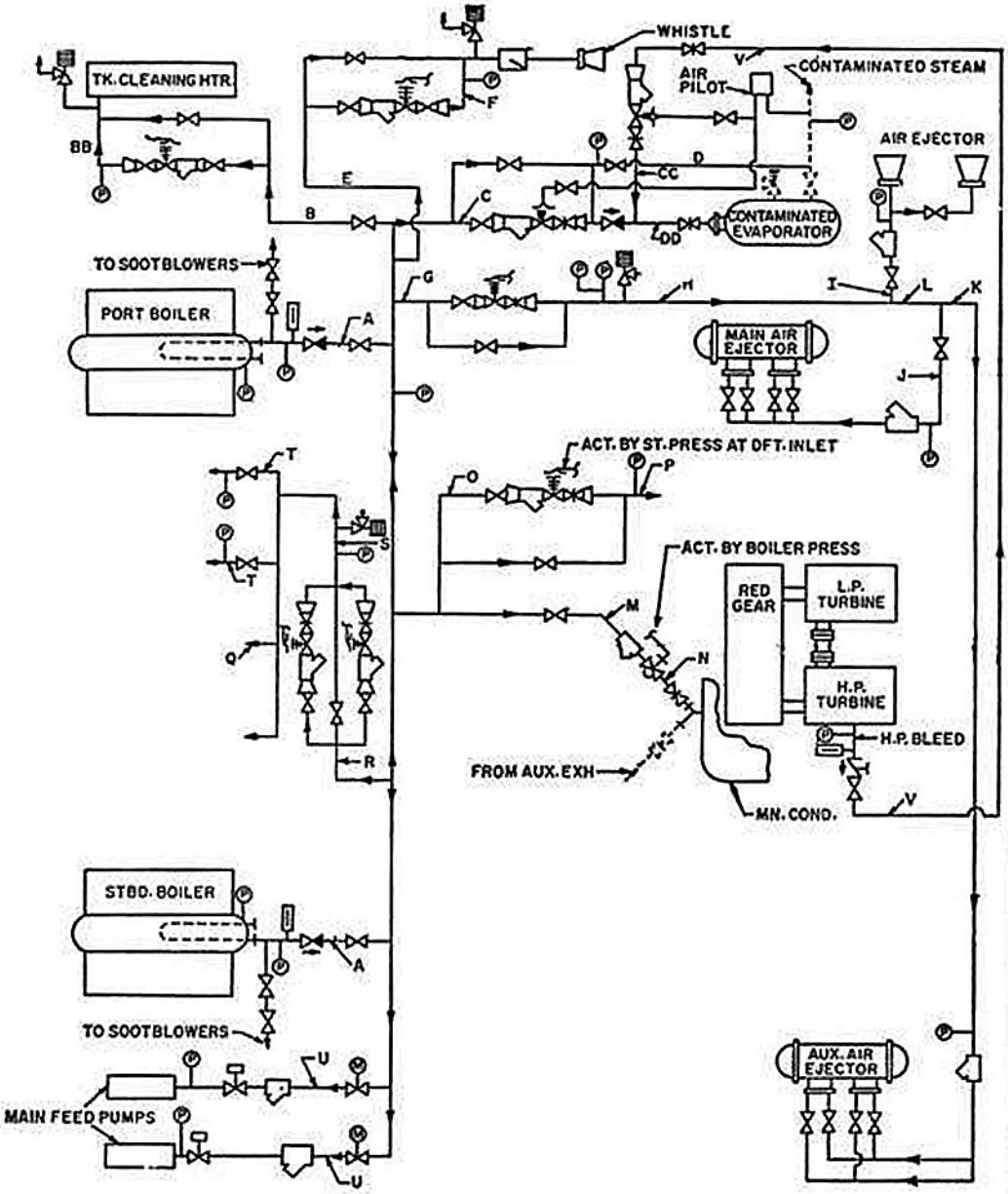

FLOWS AND VELOCITIES						
SYM	IPS	PRESS PSIA	VEL FT/SEC	FLOW LB/HR	CONDITION	SERVICE
A	4	775	45.7	20000	MAXIMUM	DESUPHTR STM. LOOP
B	2½	850	64.1	12000	RATED	850/130 RED. STA.
BB	5	130	81.8	12000	RATED	850/130 RED. STA. TO TK. CLEANING HEATER
C	2½	850	53.4	10000	RATED	850 PSIG TO CONTAM EVAP. RED. STA.
CC	4	185	42.0	4190	FULL POWER	HP TURBINE BLEED TO CONTAM EVAP.
D	4	130	91.3	6500	RATED	CONTAM EVAP BY-PASS
DD	4	350	42.5	10000	RATED	RED. V. TO CONTAM EVAP
E	1	850	47.2	1500	RATED	850/140 RED. STA.
F	2	140	57.0	1500	RATED	850/140 RED. VALVE TO WHISTLE
G	1½	850	16.2	1260	RATED	850/143 RED. STA.
H	2	143	47.0	1260	RATED	850/143 RED. VALVE TO ALL AIR EJECTORS
I	1¼	143	47.6	570	RATED	143 PSIG TO DIST. PLANT AIR EJECTOR
J	1¼	143	41.0	490	RATED	143 PSIG TO MN. AIR EJECTORS
K	1	143	28.9	200	RATED	143 PSIG TO AUX AIR EJECTORS
L	1½	143	42.4	690	RATED	143 PSIG TO MN. & AUX. AIR EJECTORS
M	2	850	202	20000	RATED	850 PSIG TO UNLOADING VALVE
N	4	7.8	1302	20000	RATED	UNLOADING VALVE TO CONDENSER
O	3	850	72.0	21000	ASTERN	850/32 RED. STA.
P	8	32	176	21000	ASTERN	850/32 RED. VALVE TO AUX. EXH. SYSTEM
Q	1¼	143	78.2	935	RATED	143 PSIG TO GLAND SEAL HEADER
R	1½	850	17.4	1355	FULL POWER	850/143 RED. STA.
S	2	143	50.5	1355	FULL POWER	850/143 RED. V. TO GLAND SEAL & BURNER ATOM.
T	1¼	143	35.1	420	FULL POWER	143 PSIG TO BURNER ATOM. STM.
U	2½	850	58.8	11000	RATED	850 PSIG TO MN. FEED PUMP
V	2½	205	101	4190	RATED	HP TURBINE BLEED