

U.S.C.G. Merchant Marine Exam

Third Assistant Engineer

Q538 Steam Plants II

(Sample Examination)

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

1. Treatment of boiler feedwater for the control of hardness is necessary to prevent _____.
- A. waterside scale deposits
 - B. carryover
 - C. foaming
 - D. excessive feedwater alkalinity

Correct answer: A

2. Chemicals are added to boiler water to _____.
- A. maintain an acidic condition in the feedwater
 - B. stabilize feedwater if a boiler becomes salted up
 - C. prevent scale forming deposits
 - D. eliminate the need for blowdowns

Correct answer: C

3. 8 ounces of oxygen, dissolved in 500,000 pounds of water, is a concentration of _____.
- A. 1.0 ppm
 - B. 4.0 ppm
 - C. 8.0 ppm
 - D. 16.0 ppm

Correct answer: A

4. The amount of sodium phosphate in treated boiler water can be measured by a/an _____.
- A. phosphate test
 - B. alkalinity test
 - C. chloride test
 - D. sodium phosphorous test

Correct answer: A

5. In the prevention of moisture carryover from a marine boiler, one important consideration is to _____.
- A. control the amount of boiler water solids
 - B. properly treat the boiler water with hydrazine
 - C. maintain a high boiler water level
 - D. add foaming agents to the boiler water

Correct answer: A

6. Boiler water hardness is increased by _____.
- A. dissolved gases in the water
 - B. improper operation of the DC heater
 - C. scale forming salts in the feedwater
 - D. zero alkalinity in the water

Correct answer: C

7. When the flame scanner senses flame failure during boiler operation, which of the listed events will occur FIRST?
- A. The automatic purge cycle commences.
 - B. The fuel oil service pump is stopped.
 - C. The "trial for ignition" period commences.
 - D. The fuel oil solenoid valve is de-energized.

Correct answer: D

8. In an automatically fired boiler, the steam pressure regulator controls the supply of fuel oil to the burners by responding to variations in the _____.
- A. Burner flame intensity
 - B. Master fuel oil solenoid valve position
 - C. Steam drum water level
 - D. Steam header pressure

Correct answer: D

9. In automated boiler operations, a dirty flame scanner will most likely result in _____.
- A. Securing fuel oil to the burner
 - B. Incomplete purge cycle
 - C. Loss of forced draft air
 - D. Increased fuel oil consumption

Correct answer: A

10. Modern day boiler automation allows bypassing the "flame safeguard" system to permit a burner to have a "trial for ignition" period during burner light off. This period may not exceed _____.
- A. 5 seconds
 - B. 10 seconds
 - C. 15 seconds
 - D. 30 seconds

Correct answer: C

11. 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. deflector rings
 - B. a labyrinth packing ring
 - C. a Babbitt liner
 - D. a fluid seal

Correct answer: B

12. 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

Correct answer: B

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

Correct answer: A

14. Why is superheated steam used in the main propulsion turbines instead of saturated steam?
- A. Less specific energy available per pound of steam
 - B. Lower required specific volume than saturated steam
 - C. Higher pressure available than saturated steam
 - D. Greater heat energy available per pound of steam

Correct answer: D

15. When a turbine is in operation, a rotor position micrometer is used to determine any change in rotor _____.
- A. axial position relative to the casing
 - B. radial position relative to the casing
 - C. radial position relative to the micrometer
 - D. axial position relative to the micrometer

Correct answer: A

16. Which of the devices listed is found on an LP main propulsion steam turbine casing?
- A. Sentinel valve
 - B. Duplex set of relief valves
 - C. Sliding beam
 - D. HP turbine bypass valve

Correct answer: A

17. The purpose of the sentinel valve installed on a turbine casing is to _____.
- A. warn the engineer of backflow of steam from the exhaust trunk
 - B. warn the engineer of excessive pressure in the low-pressure turbine casing
 - C. relieve excess pressure to the turbine extraction points
 - D. vent excess steam to the main condenser

Correct answer: B

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

Correct answer: B

19. Main steam turbine bearings are lined with _____.

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

Correct answer: C

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

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

Correct answer: B

21. 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. turning gears are double reduction worm type and cannot mate with the low-pressure high-speed pinion
- C. greatest gear ratio between the turning gear motor output and bull gear can be obtained
- D. arrangement allows for the use of a muff type coupling for flexibility and smooth engagement

Correct answer: C

22. Operating a steam turbine propulsion unit at medium-speed, in an area with extremely cold sea water and the main circulating pump providing full cooling water flow to the condenser will result in _____.

- A. Excellent plant efficiency due to higher attainable vacuum
- B. Increased plant efficiency due to increased condensate depression
- C. Increased effectiveness of the air ejectors due to the increased main condenser vacuum
- D. Increased condensate aeration due to the inability of the air ejectors to remove excessive air accumulation from the condenser

Correct answer: D

23. 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. remove the excessive amount of non-condensable vapors which accumulated during maneuvering operations
- C. prevent excessive condensate depression
- D. dry out the main turbines

Correct answer: D

24. The FIRST step in breaking vacuum on a main turbine unit should be to _____.

- A. stop the main circulating pump
- B. secure the steam to the gland seal system
- C. stop the main condensate pump
- D. secure the steam to the main air ejector

Correct answer: D

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

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

Correct answer: A

26. To stop the rotor of a main turbine while underway at sea you should _____.

- A. apply the Prony brake
- B. tighten the stern tube packing gland
- C. secure all steam to the turbine
- D. admit astern steam to the turbine after securing the ahead steam

Correct answer: D

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

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

Correct answer: D

28. Which of the following statements describes how the main propulsion turbine overspeed relay initiates closing of the throttle valve?

- A. Excessive centrifugal force causes a spring-loaded weight to trip a valve latch.
- B. Excessive speed causes an oil pump to develop sufficient pressure to open a spring-loaded relay valve which tends to close the steam control valve.
- C. Excessive centrifugal force causes spring loaded flyballs to actuate a control lever.
- D. Excessive speed causes an increase in lube oil control temperature which actuates a solenoid oil dump valve.

Correct answer: B

29. Carbon ring packing segments are secured in a shaft gland assembly of a steam turbine by means of _____.

- A. steam pressure
- B. garter springs
- C. centering rings
- D. labyrinth rings

Correct answer: B

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

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

Correct answer: C

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

- A. amount of cooling water to the condenser is insufficient
- B. lubricating oil pressure is too low
- C. gland seal leakoff pressure is too high
- D. amount of cooling water to the condenser is excessive

Correct answer: A

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

- A. Lifting beam
- B. Steam pressure
- C. Springs
- D. Oil pressure

Correct answer: B

33. 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. Increasing or decreasing operating spring pressure
- C. Changing the vertical location of the pilot valve bushing
- D. Varying the pivot rod stroke length on the governor weight eccentric pad

Correct answer: C

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

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

Correct answer: B

35. When the temperature of the main turbine lubricating oil is lowered, an increase will occur in the _____.

- A. concentration of contaminants
- B. viscosity
- C. flash point
- D. pour point

Correct answer: B

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

- A. Oil whip lubricated
- B. Ring lubricated
- C. Disk lubricated
- D. Pressure lubricated

Correct answer: D

37. 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. Insufficient oil is being pumped to the gravity tank.
- C. Excessive oil is stored in the gravity tank.
- D. Turbine bearing failure has occurred.

Correct answer: A

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

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

Correct answer: B

39. Turbine lube oil suction strainer baskets have _____.

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

Correct answer: D

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

Correct answer: B

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

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

Correct answer: D

42. 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 use of an acme thread screw
- D. the drive pin

Correct answer: A

43. The three-wing device in the unit illustrated is maintained in its position by item _____.
Illustration GS-0124

- A. O
- B. P
- C. Q
- D. R

Correct answer: C

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

Correct answer: B

45. In a steam turbine and reduction gear main propulsion plant, the alarm sensor for low turbine oil pressure is usually installed _____.

- A. at the outlet of the main thrust bearing
- B. at the end of the supply line header to the bearings
- C. at a point on the outlet side of the main bearings as close to the bearings as possible
- D. at a point on the inlet side of the main bearings as close to the bearings as possible

Correct answer: B

46. Water retained in the lube oil system of a main propulsion turbine installation is undesirable because it _____.
- A. raises the flash point of the oil to a dangerously high level
 - B. causes the turbine to overspeed
 - C. results in excessive cooling of bearing surfaces
 - D. causes pitting of the gear teeth

Correct answer: D

47. 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. Excessive water discharge rate from the lube oil purifier
 - D. Corrosion of the journals and bearings

Correct answer: B

48. Babbitt is a metal alloy commonly used for lining _____.
- A. valve seats
 - B. shim stock
 - C. saltwater piping
 - D. precision bearings

Correct answer: D

49. Most main propulsion reduction gear bearings are _____.
- A. self-lubricating, sealed, roller ball type
 - B. rigidly mounted, Babbitt lined, split type
 - C. self-aligning, solid bushings
 - D. spherical-seated, tapered roller type

Correct answer: B

50. 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. gear teeth on the floating member sliding between internal teeth on the shaft ring
 - C. the variable oil clearance in the quill shaft
 - D. each gear sliding on its shaft between retaining collars

Correct answer: B

51. The component shown in the illustration, labeled "I", is the _____. Illustration SE-0013
- A. second reduction gear
 - B. first reduction pinion
 - C. first reduction gear
 - D. second reduction pinion

Correct answer: C

52. After the housing has been bolted down, the final check of reduction gear tooth contact is usually made by _____.
- A. dial indicators
 - B. bluing the teeth
 - C. alignment gauges
 - D. bridge gauges

Correct answer: B

53. In the thrust bearing assembly illustrated the total oil clearance can be correctly decreased by _____. Illustration SE-0007
- A. decreasing the thickness of item #5
 - B. increasing the thickness of item #2
 - C. decreasing the thickness of item #2
 - D. increasing the thickness of item #5

Correct answer: A

54. Which of the following operational practices is helpful in avoiding the accumulation of condensate in the main reduction gear casing?
- A. Avoid applying gland sealing steam to the low-pressure turbine until you are ready to start up the first-stage air ejector.
 - B. The temperature of the lubricating oil should not exceed the gear manufacturer's recommendation when the unit is operating at full load.
 - C. After the main unit is secured, lubricating oil should be circulated until the temperature of the oil and reduction gear casing approximates the engine room temperature.
 - D. Always ensure that the lubricating oil pressure is 14-17 psi when operating in unusually cold waters.

Correct answer: C

55. The slight wavy appearance of the tips of reduction gear teeth is a result of _____.
- A. high lube oil temperatures
 - B. insufficient lube oil pressure
 - C. uneven bearing wear due to gross misalignment
 - D. the method of manufacture and does affect normal operation

Correct answer: D

56. Auxiliary steam at full operating pressure is supplied from the boiler directly to the _____.
- A. sootblowers
 - B. main air ejectors
 - C. turbogenerators
 - D. distilling plants

Correct answer: A

57. Which line in the illustration shown provides live steam to the gland seal regulator? Illustration SE-0019

- A. line "C"
- B. line "D"
- C. line "G"
- D. line "A"

Correct answer: A

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

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

Correct answer: C

59. The primary source of steam to the auxiliary exhaust system is typically supplied directly from _____.

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

Correct answer: B

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

- A. Secure the fuel to the burners
- B. Secure all fireroom ventilation
- C. Secure the forced draft fan
- D. Purge the fuel oil system

Correct answer: A

61. If the water level in one boiler of a two-boiler plant rapidly falls out of sight, which of the following actions should be carried out FIRST?

- A. Raise the feed pump pressure
- B. Blowdown the gauge glass
- C. Secure the steam stop to that boiler
- D. Secure the fuel oil to that boiler

Correct answer: D

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

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

Correct answer: C

63. When setting a propulsion boiler safety valve, in whose presence and satisfaction should this be accomplished?

- A. Master
- B. Chief Engineer
- C. Inspector of the US Coast Guard
- D. Any licensed engineer

Correct answer: C

64. Lube oil pumps taking suction from the sump of most small marine engines are usually _____.

- A. Diaphragm type
- B. Centrifugal type
- C. Positive displacement type
- D. Eductor type

Correct answer: C

65. What may be an indication of white smoke coming from the exhaust of an auxiliary diesel engine?

- A. not enough air
- B. worn piston rings
- C. late injection timing
- D. cracked cylinder liner or head

Correct answer: D

66. In which four stroke diesel engine system are sacrificial zinc anodes most commonly found?

- A. lube oil system
- B. exhaust system
- C. cooling system
- D. fuel system

Correct answer: C

67. When removing a piston, what is a good indication that your lube oil is good and supplied in the proper amount?

- A. liners and piston rings have a bright surface and rings are free
- B. liners and piston rings show an accumulation of lube oil deposits and rings are tight
- C. liners and piston rings have a dull grayish appearance and rings are free
- D. liners and piston rings have a dull grayish appearance and rings are tight

Correct answer: A

68. What may be an indication that you have a leaking injection nozzle?

- A. high exhaust temperature and low compression pressure
- B. high exhaust temperature and low firing pressure
- C. low exhaust temperature and high firing pressure
- D. low exhaust temperature and high compression pressure

Correct answer: B

69. If an auxiliary diesel engine starts firing but does not come up to normal speed, without load or under a small load, one cause may be _____.

- A. excessive compression pressure
- B. incorrect fuel oil
- C. late fuel injection
- D. a clogged fuel filter

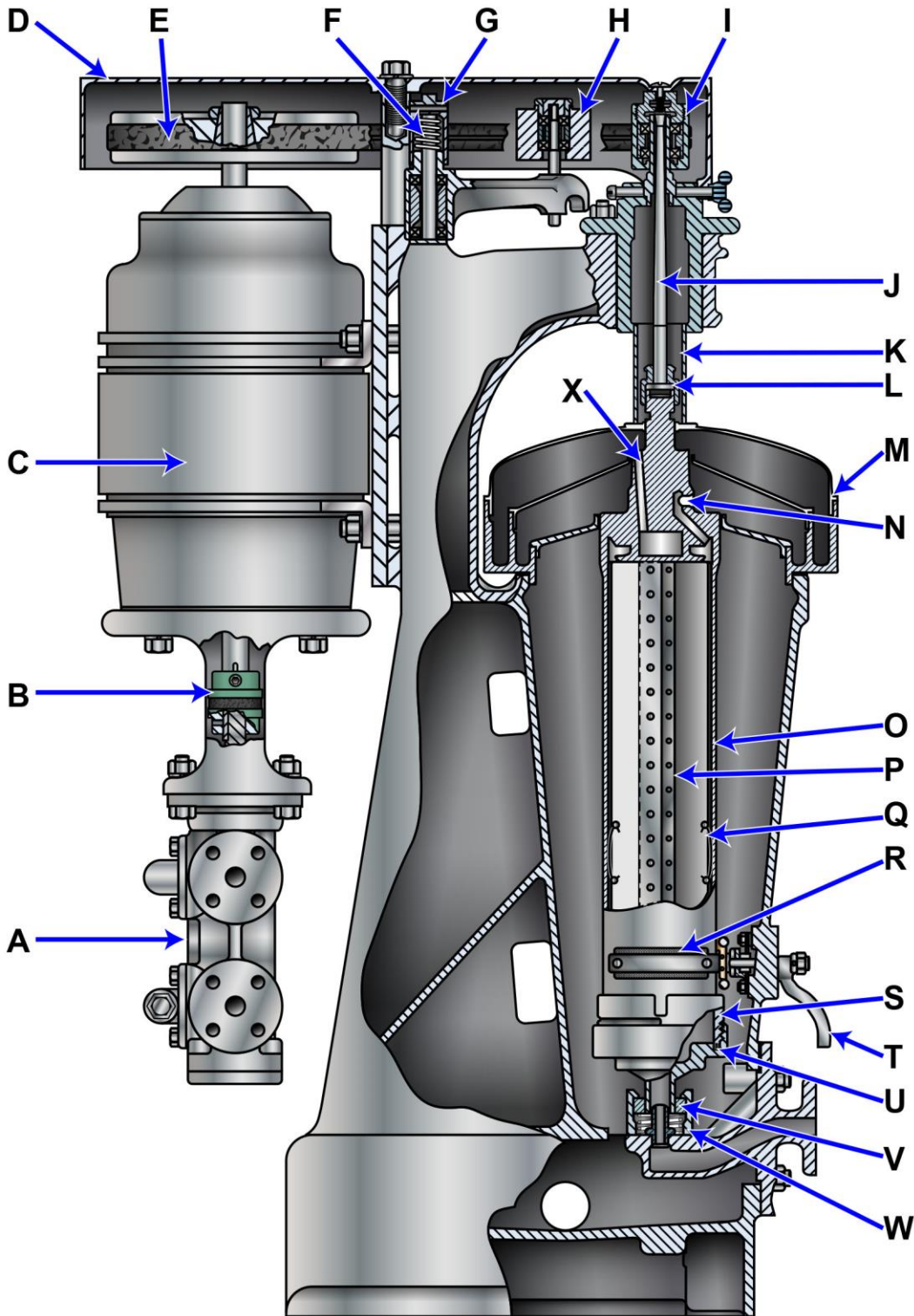
Correct answer: D

70. Your auxiliary diesel engine has an air start system with a Bendix drive. You have the air cocks open to roll over the engine. You push the start button, and nothing happens. What is the FIRST thing that you should suspect?

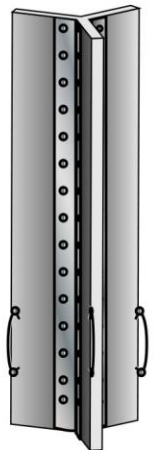
- A. a cylinder is filled with water
- B. the engine needs prelubed
- C. the air tank needs blown down
- D. the relay valve is sticking

Correct answer: D

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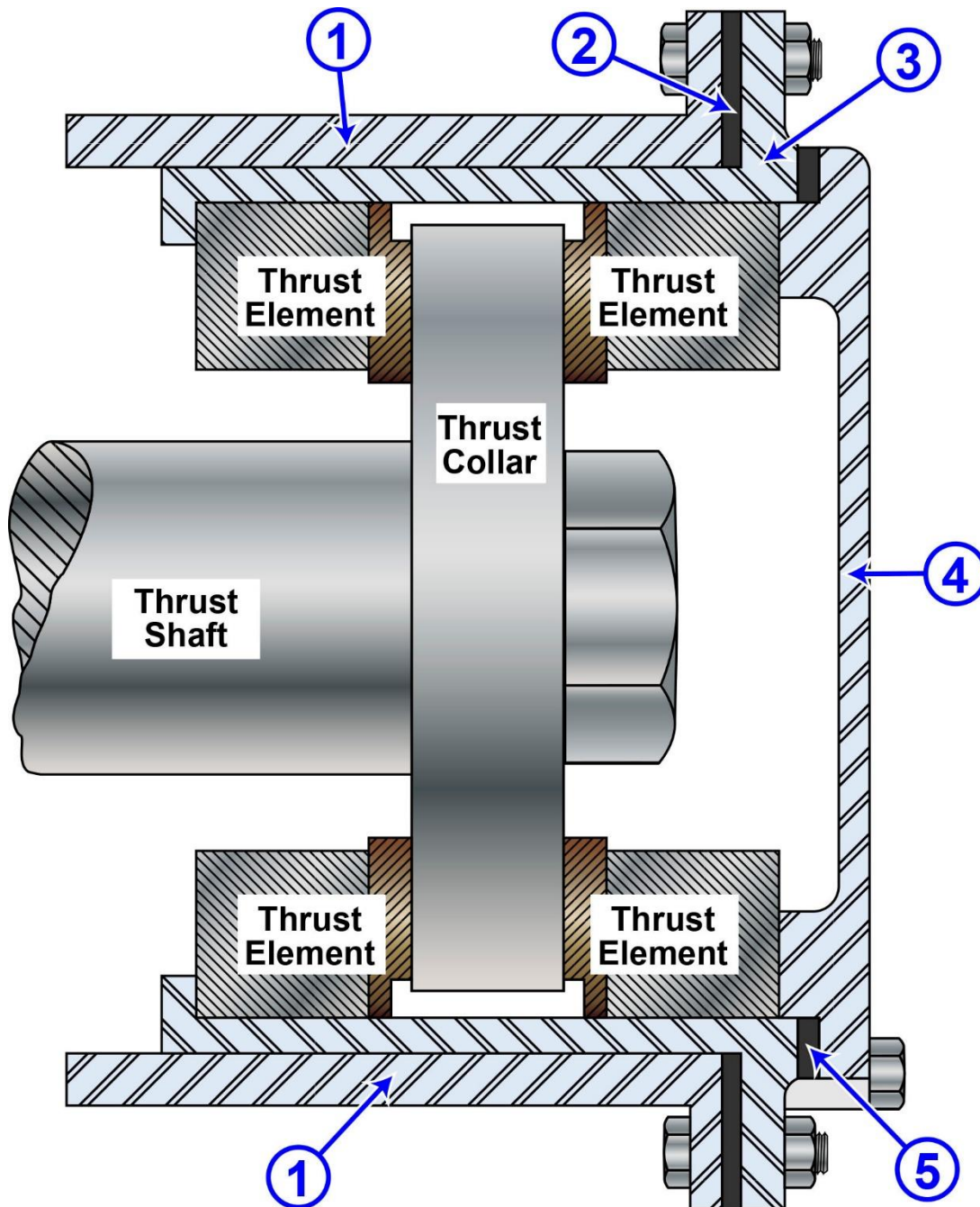


Three-Wing Device

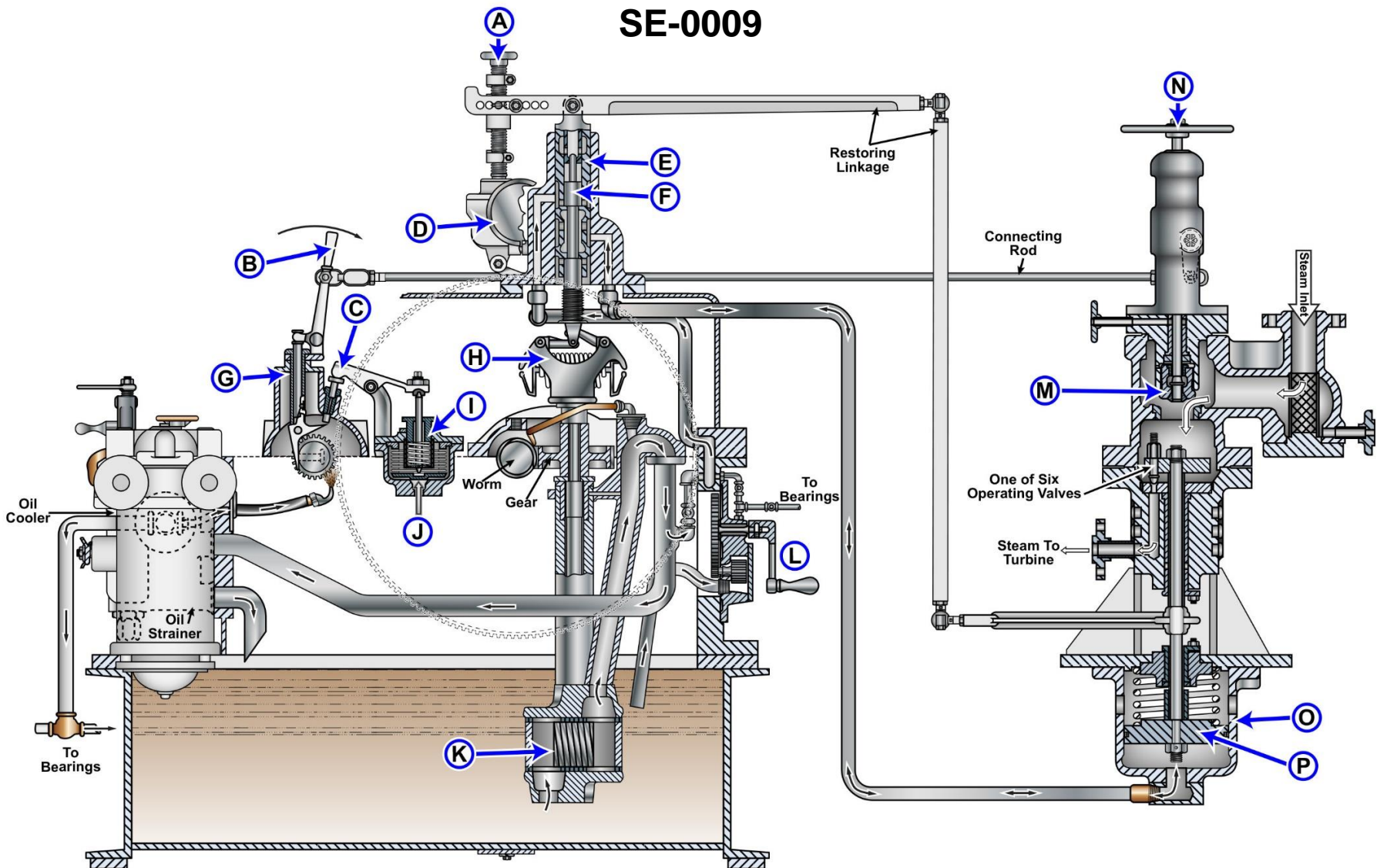


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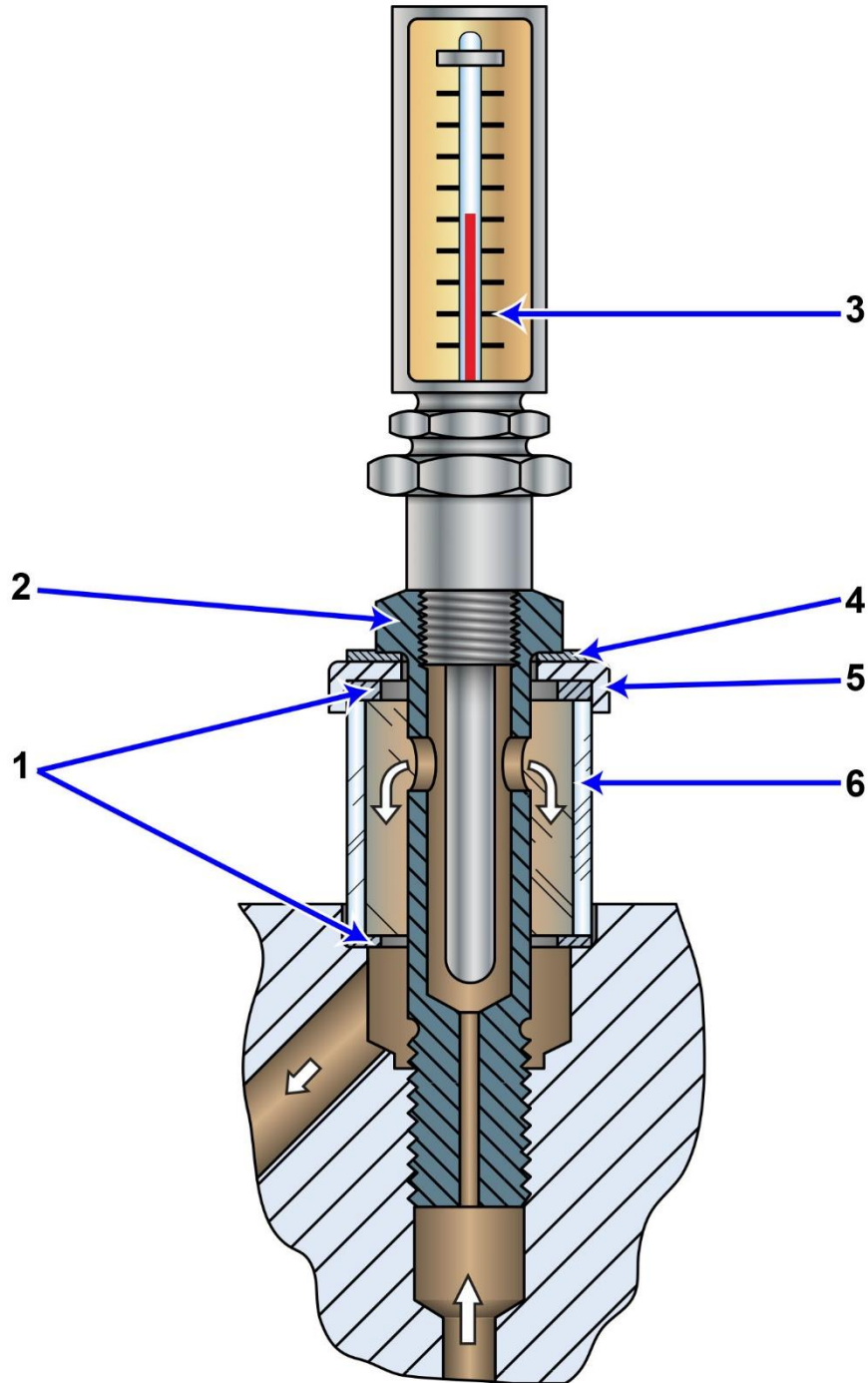


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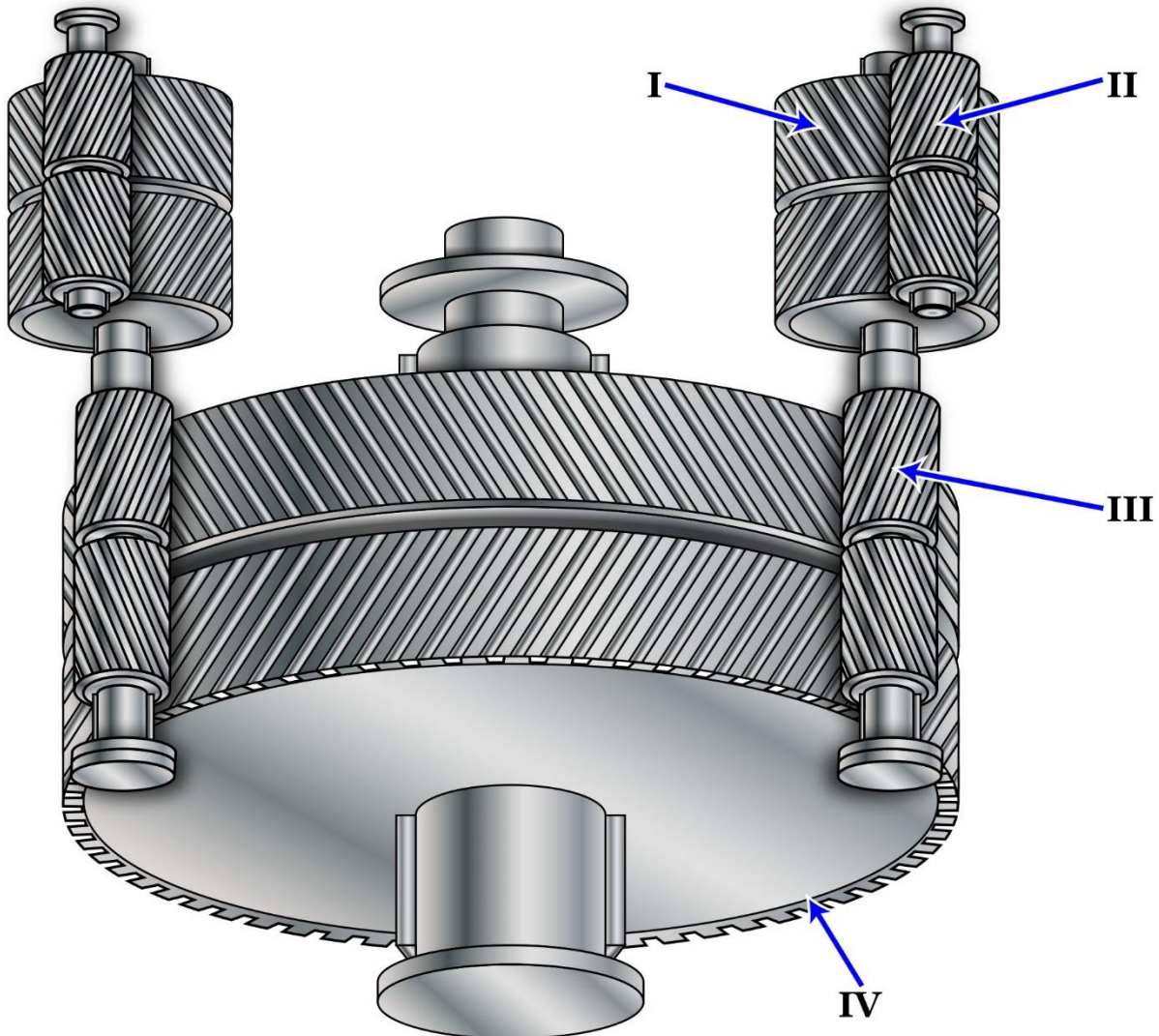
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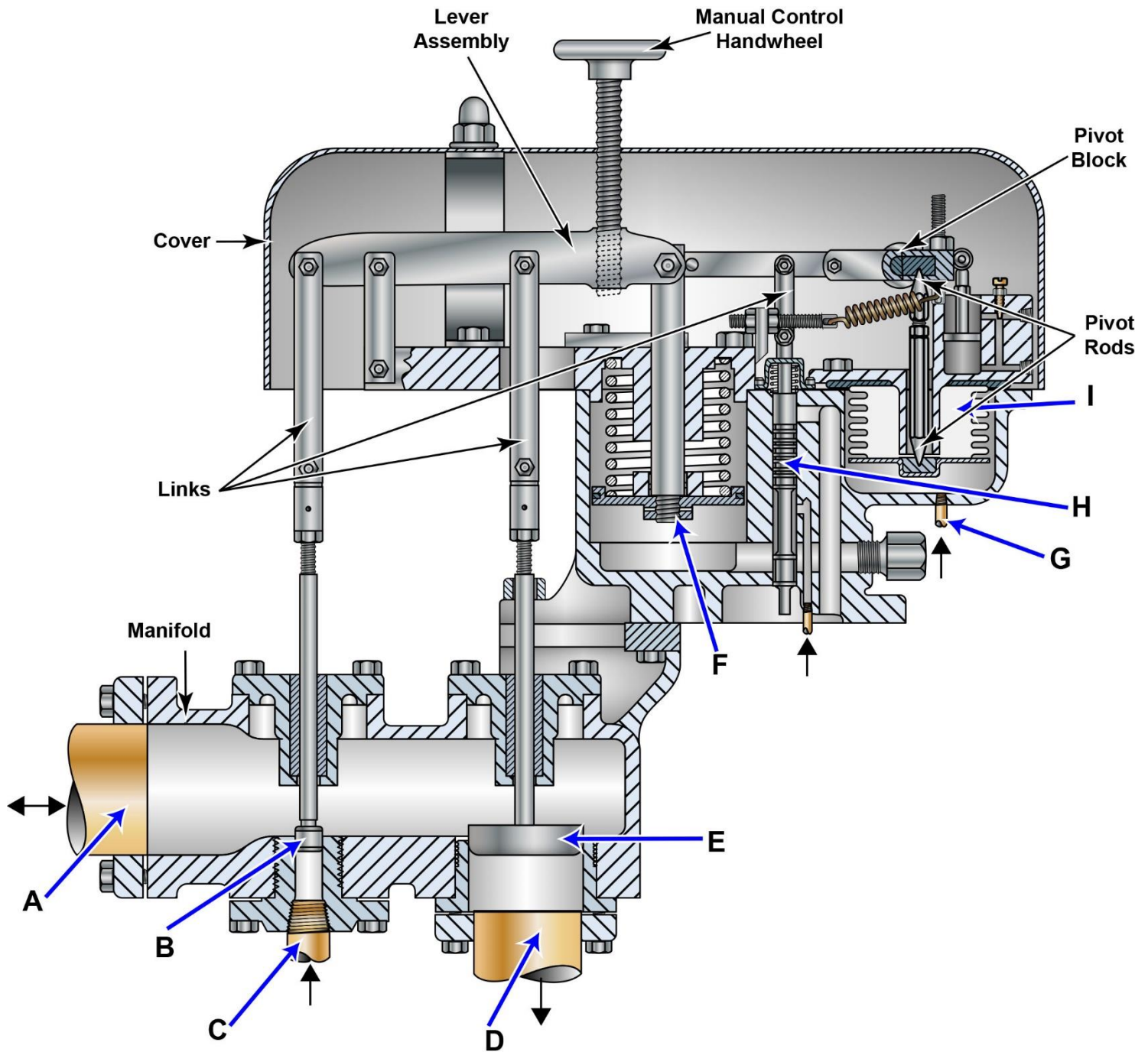
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