U.S.C.G. Merchant Marine Exam

Assistant Engineer, Limited

Q610 Motor Plants

(Sample Examination)

Choose the best answer to the following Multiple Choice Questions.

1. (2.3.1.3-2) Which segment of the two-stroke cycle engine diagram shown in the illustration represents the exhaust event? Illustration MO-0037

- o (A) I
- o (B) II
- o (C) III
- • (D) IV

If choice D is selected set score to 1.

2. (2.3.13.3-1) Which of the air intake systems listed will result in the lowest specific fuel consumption?

- o (A) Natural aspiration
- • (B) Turbocharged
- o (C) Roots blower
- o (D) Piston blower

If choice B is selected set score to 1.

3. (2.3.21.1-7) The PRIMARY function of a waste heat boiler is to _____.

- o (A) reduce engine exhaust noise
- o (B) reduce engine back pressure
- • (C) recover heat which otherwise would be lost
- o (D) increase turbocharger efficiency

If choice C is selected set score to 1.

4. (2.3.12.1-3) In the illustration shown, under what conditions would valves "2" and "3" be closed and valve "6" be opened? Illustration MO-0077

- • (A) When the HFO centrifuges are being run as separators and clarifiers respectively.
- o (B) When the HFO purifier is being run as the DO purifier.
- o (C) When the DO purifier is being run as the HFO purifier.
- o (D) When the HFO purifiers are being run in parallel.

If choice A is selected set score to 1.

5. (2.3.7.1-1) Starting a large low-speed propulsion diesel engine on diesel fuel during cold weather conditions will be made easier by _____.

- o (A) increasing the quantity of starting air
- o (B) increasing the lube oil pressure
- o (C) heating the engine fuel supply
- • (D) heating the engine coolant

If choice D is selected set score to 1.

6. In comparison to exhaust valves, intake valves of diesel engines may be fabricated from low-alloy steels because _____.

- (A) the beveled edges of the intake valves provide for self-centering during seating
- (B) intake valves utilize stellite-coated valve seat inserts which reduce wear
- (C) the effective volume of air passing through intake valves is less than the effective volume of air passing through exhaust valves
- (D) intake valves are less affected by the corrosive action of exhaust gases

If choice D is selected set score to 1.

7. An individual fuel injection pump is designed for variable beginning and constant ending of injection. For diesel engines operating a generator at constant speeds, the start of injection will _____.

- (A) advance as the load increases
- (B) retard as the load increases
- (C) remain unchanged regardless of load
- (D) always occur at top dead center

If choice A is selected set score to 1.

8. On the indicator card shown in the illustration, lines "A" and "B" indicate _____. Illustration MO-0108

- (A) top dead center
- (B) bottom dead center
- (C) the end of injection
- (D) the end of ignition

If choice A is selected set score to 1.

9. 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

If choice C is selected set score to 1.

10. Which of the fuel nozzles listed requires the LEAST maintenance?

- (A) Pintle
- (B) Single hole
- (C) Multi-hole
- (D) Open

If choice A is selected set score to 1.

11. Which of the tanks, shown in the illustration, supplies fuel to the emergency generator? Illustration MO-0058

- (A) Light fuel oil service tank
- (B) Light fuel oil settling tank
- (C) Light fuel oil boiler tank
- (D) Light fuel oil booster tank

If choice A is selected set score to 1.

12. To minimize corrosion, fuel oil strainer disks, spacers and scraper blades are made of _____.

- (A) brass
- (B) copper
- (C) iron
- (D) monel metal or stainless steel

If choice D is selected set score to 1.

13. Starting aids such as glow plugs are installed on _____.

- (A) large, direct drive diesel engines
- (B) diesel engines designed to burn residual fuels
- (C) medium-speed, four-stroke cycle diesel engines
- (D) small diesel engines utilizing electric starting equipment

If choice D is selected set score to 1.

14. What is the function of component "13" shown in the illustration? Illustration MO-0122

- (A) The inlet jumper directs cooling water to the cylinder liner.
- (B) The device delivers the oil for piston cooling, in addition to liner lubrication.
- (C) The water pipe is the mechanism in which the "shaker" method of piston cooling is accomplished.
- (D) The sample tube monitors the cylinder for evidence of piston blow-by.

If choice B is selected set score to 1.

15. Which of the following should always be checked prior to starting a diesel engine?

- (A) Air filters
- (B) Fuel oil strainers
- (C) Crankcase oil level
- (D) Pyrometer readings

If choice C is selected set score to 1.

16. Which of the terms listed below represents the operational speed at which excessive engine vibration is created?

- (A) Non-harmonic speed.
- (B) Critical speed.
- (C) Maximum speed.
- (D) Design maximum speed.

If choice B is selected set score to 1.

17. A three-way thermostatic control valve regulates the diesel engine cooling water temperature by passing a portion of the water _____.

- (A) around the cooler
- (B) around the engine
- (C) overboard
- (D) to the expansion tank

If choice A is selected set score to 1.

18. A multi-orifice fuel injection nozzle is usually used with which of the listed types of combustion chamber?

- (A) Open combustion chamber
- (B) Precombustion chamber
- (C) Turbulence chamber
- (D) Energy cell

If choice A is selected set score to 1.

19. Why will a turbocharged diesel engine produce black smoke if excessive additional load is applied too quickly?

- (A) Exhaust energy would draw excess air.
- (B) The inertia of the turbocharger rotor causes a time lag which delays the turbocharger speed increase.
- (C) Exhaust gas pumping losses are increased due to turbine windage.
- (D) Exhaust gas back pressure falls slightly due to increased nozzle action.

If choice B is selected set score to 1.

20. When a nozzle tester is used to check the spray pattern of a diesel fuel injection nozzle, which of the following statements is true?

- (A) The valve should normally begin to open at 1/2 the popping pressure
- (B) The needle valve spring should always be removed first before testing
- (C) The needle valve should remain open after the nozzle pops open
- (D) A serious hazard of blood poisoning exists if the fuel spray penetrates the skin of the operator

If choice D is selected set score to 1.

21. A diesel engine experiences a sudden loss in speed, accompanied by black exhaust smoke, with the fuel rack at maximum, and the speed remaining below normal. The probable cause is _____.

- (A) engine overload
- (B) leaky valves
- (C) stuck or broken piston rings
- (D) low air injection pressure

If choice A is selected set score to 1.

22. Which of the following test indicators should be considered the most significant factor in determining as to whether or not a diesel-generator's lube oil should be drained and renewed?

- (A) An extremely high neutralization number.
- (B) An extremely low precipitation number.
- (C) The oil appears black in color.
- (D) An increase in flash point.

If choice A is selected set score to 1.

23. What type of bearing is shown in the illustration? Illustration MO-0120

- (A) Axial/radial bearing
- (B) Collar bearing
- (C) Kingsbury thrust bearing
- (D) Michell bearing

If choice D is selected set score to 1.

24. Small amounts of moisture are necessary to trigger the growth of microbiological organisms found in some marine fuels. Some sources of water contamination are _____.

- (A) tank surface leakage
- (B) improper tank washing procedures
- (C) humidity and condensation
- (D) all of the above

If choice D is selected set score to 1.

25. (2.3.1.2-2) The pressure-volume diagrams illustrated are of four internal combustion engine cycles. Which one represents the theoretical diesel cycle? Illustration MO-0102

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

If choice B is selected set score to 1.

26. The device shown in the illustration is classified as a/an _____. Illustration MO-0008

- (A) comparator type mist detector
- (B) exhaust gas vapor condenser
- (C) Ringelmann exhaust gas analyzer
- (D) reflective type explosion meter

If choice A is selected set score to 1.

27. An increase in the air inlet manifold pressure of a diesel engine will result in a/an _____.

- (A) decrease in maximum cylinder pressure
- (B) increase in ignition lag
- (C) decrease in fuel consumption per horsepower-hour
- (D) decrease in exhaust manifold pressure

If choice C is selected set score to 1.

28. Hydraulic couplings will transmit torque equal to the input torque by means of energy changes in a rotating vortex of liquid. For the vortices to form there must be _____.

- (A) slip between the impeller and runner
- (B) less than 2 percent slip between the impeller and runner
- (C) axial thrust generated by the runner pinion shaft
- (D) momentary torsional vibration transmitted by the driving impeller

If choice A is selected set score to 1.

29. The greatest difference between the centrifuge bowl shown in the illustration and that of a tubular bowl, with straight, vertical, interior surfaces, is that the illustrated unit _____. Illustration MO-0012

- (A) is self-desludging
- (B) rotates at 1000 rpm higher than the old tubular bowl type
- (C) rotates at 1000 rpm slower than the old tubular bowl type
- (D) does not require a discharge ring when operated as a separator

If choice A is selected set score to 1.

30. In the starting process of a diesel engine, the main object is to attain the compression conditions sufficient to _____.

- (A) turn the flywheel
- (B) reduce friction
- (C) overcome inertia
- (D) ignite the fuel

If choice D is selected set score to 1.

31. The diesel engine wrist pin in the illustration is indicated by the component labeled _____. Illustration MO-0122

- (A) "7"
- (B) "17"
- (C) "G"
- (D) "S"

If choice A is selected set score to 1.

32. Load control on a diesel engine is accomplished by _____.

- (A) regulating the speed of the turbocharger
- (B) regulating the amount of fuel admitted to the engine
- (C) regulating the speed of the fuel oil transfer pump
- (D) changing engine timing

If choice B is selected set score to 1.

33. Diesel engine cylinder head test cocks are used to _____.

- (A) check cylinder lubrication
- (B) connect the pressure indicator
- (C) pressure test cylinder heads
- (D) connect the exhaust gas pyrometers

If choice B is selected set score to 1.

34. The use of push rods becomes necessary in a diesel engine when _____.

- (A) the camshaft is located some distance below the valve gear
- (B) the rocker arms are pivoted near their centers
- (C) two or more valves must be opened and closed at the same time
- (D) hydraulic valve lash adjusters are used

If choice A is selected set score to 1.

35. White smoke issuing from the exhaust of an auxiliary diesel engine could mean _____.

- (A) the engine is overloaded
- (B) the engine is cold
- (C) there is too much lube oil in the cylinders
- (D) the turbocharger is fouled

If choice B is selected set score to 1.

36. The device used to limit engine torque at various engine speeds is called a _____.

- (A) speed limiting governor
- (B) variable speed governor
- (C) constant speed governor
- (D) load limiting governor

If choice D is selected set score to 1.

37. In the reversing reduction gear shown in the illustration, the forward and reverse main pinions are in constant mesh with the main gear. This means the _____. Illustration MO-0085

- (A) synchromesh coupling will maintain transition torque control
- (B) set that is clutched in will rotate as idlers driven from the main gear
- (C) idling gears rotate in a direction opposite to their rotation when carrying load
- (D) clutches are engaged by a reduction in control air pressure

If choice C is selected set score to 1.

38. The water inlet manifold for the diesel engine shown in the illustration is represented by the letter or number _____. Illustration MO-0122

- (A) "M"
- (B) "N"
- (C) "W"
- (D) "13"

If choice B is selected set score to 1.

39. The principal characteristic of an isochronous governor is it will _____.

- (A) slow the machine down as the load is increased
- (B) shut down the engine if it over speeds
- (C) display excessive speed droop
- (D) maintain a constant speed with variations of load

If choice D is selected set score to 1.

40. Hydraulic starters are installed on many lifeboat diesel engines instead of comparable air start systems, because _____.

- (A) hydraulic starters are the least expensive of all starting systems
- (B) the system does not require high-pressure piping
- (C) hydraulic systems turn diesel engines at higher rates of speed than air starters
- (D) the system can be manually recharged

If choice D is selected set score to 1.

41. Fusible plugs are installed in fire-tube boilers to _____.

- (A) provide a means of draining the boiler
- (B) warn the engineer of low water level
- (C) cool the crown sheet at high firing rates
- (D) open the burners' electrical firing circuits

If choice B is selected set score to 1.

42. The time between injection and ignition of the fuel is known as _____.

- (A) turbulence lag
- (B) afterburning ratio
- (C) injection lag
- (D) ignition delay

If choice D is selected set score to 1.

43. The amount of fuel delivered by a unit injector is controlled by the _____.

- (A) camshaft
- (B) main spring
- (C) rack position
- (D) engine speed

If choice C is selected set score to 1.

44. Excessive alkalinity of the water in an auxiliary boiler can cause _____.

- (A) caustic embrittlement of the boiler metal
- (B) acidic corrosion of the boiler metal
- (C) hard scale deposits on the boiler tubes
- (D) etching of the heat exchange surfaces

If choice A is selected set score to 1.

45. Connecting rods in a diesel engine are used to connect the _____.

- (A) crankshaft to the gear train
- (B) piston to the crankshaft
- (C) engine to the bed
- (D) rocker arm to the camshaft

If choice B is selected set score to 1.

46. One method of constructing large marine diesel engines and reducing the total engine frame weight is through _____.

- (A) casting interlocking components
- (B) welding plates to form sections for assembly
- (C) forging integral components
- (D) case hardening integral components

If choice B is selected set score to 1.

47. Which of the following statements is correct regarding a turbocharged four-stroke cycle diesel-generator?

- (A) At zero load the intake manifold pressure is greater than the exhaust manifold pressure.
- (B) At full load the intake manifold pressure and exhaust manifold pressure are equal.
- (C) At full load the intake manifold pressure is less than the exhaust manifold pressure.
- (D) At full load the intake manifold pressure is greater than the exhaust manifold pressure.

If choice D is selected set score to 1.

48. A magnetic strainer is primarily used in diesel engine reduction gear oil systems to remove small particles of _____.

- (A) copper
- (B) Babbitt
- (C) ferrous materials
- (D) acidic materials

If choice C is selected set score to 1.

49. One of the factors limiting the amount of load which can be put on a modern marine diesel engine is the _____.

- (A) governor sensitivity
- (B) exhaust temperature
- (C) fuel injection pressure
- (D) speed of the camshaft

If choice B is selected set score to 1.

50. In a Roots-type rotary blower, the volume of air delivered is directly proportional to _____.

- (A) engine speed
- (B) engine load
- (C) brake horsepower
- (D) brake specific fuel consumption

If choice A is selected set score to 1.

51. The replacement piping for diesel engine high-pressure fuel systems must be the same length and diameter as the original piping to _____.

- (A) avoid unnecessary parts inventory
- (B) keep torsional vibration constant
- (C) use existing supports and braces
- (D) maintain specified injection characteristics

If choice D is selected set score to 1.

52. Compared to other fuel injection systems, unit injectors operate with virtually no _____.

- (A) injection lag
- (B) ignition delay
- (C) moving parts
- (D) requirement for timing adjustments

If choice A is selected set score to 1.

53. What is the function of the after coolers installed in the diesel engine air intake system?

- (A) Decrease the air density
- (B) Increase the exhaust temperature
- (C) Decrease the lube oil temperature
- (D) Increase the air density

If choice D is selected set score to 1.

54. The diesel engine shown in the illustration is a _____. Illustration MO-0007

- (A) four-stroke cycle engine at the end of the compression stroke
- (B) two-stroke cycle engine at the end of the compression stroke
- (C) four-stroke cycle engine at the end of the exhaust stroke
- (D) two-stroke cycle engine at the beginning of the power stroke

If choice C is selected set score to 1.

55. Which of the following statements is true concerning the cetane number of diesel fuel?

- (A) The cetane number affects the amount of injection lag.
- (B) The cetane number is an indication of the fuel's viscosity.
- (C) Ignition lag is reduced with fuels having a high cetane number.
- (D) The cetane number is of little significance in the combustion process.

If choice C is selected set score to 1.

56. The power consumed during the scavenging process of a diesel engine is known as the _____.

- (A) compression loss
- (B) valve loss
- (C) back pressure loss
- (D) pumping loss

If choice D is selected set score to 1.

57. In a direct cylinder admission air starting system, once the engine begins to fire, the air starting check valve illustrated, is closed by _____. Illustration MO-0107

- (A) the starting air pressure
- (B) the spring force and cylinder pressure
- (C) a valve actuating cam
- (D) a pneumatic bellows assembly

If choice B is selected set score to 1.

58. Fuel injection systems are designed to primarily meter fuel, atomize fuel, and _____.

- (A) create turbulence in the combustion chamber
- (B) aid in completing cylinder scavenging
- (C) inject fuel at the proper time
- (D) minimize fuel penetration into the cylinder

If choice C is selected set score to 1.

59. As shown in the illustration, the function of the component labeled "G" would be to _____. Illustration MO-0128

- (A) provide a source of circulating water into the waste heat boiler
- (B) condense steam exhaust from the turbo-generator
- (C) provide a source of fuel for the fuel oil service system
- (D) provide a reservoir of feed water for the boiler feed pump

If choice D is selected set score to 1.

60. The rate of pressure rise during the period following fuel ignition in a diesel engine is influenced by the length of the ignition delay period and the _____.

- (A) valve overlap
- (B) volumetric efficiency
- (C) turbulence of the air charge
- (D) fuel efficiency

If choice C is selected set score to 1.

61. Component "U" of the diesel engine shown in the illustration is called the _____. Illustration MO-0122

- (A) frequency tuner
- (B) crankshaft counterweight
- (C) frame stiffener
- (D) main bearing support assembly

If choice B is selected set score to 1.

62. Fuel droplets injected into a diesel engine cylinder must have adequate penetration to _____.

- (A) prolong the ignition delay period
- (B) ensure the beginning of fuel injection
- (C) thoroughly utilize the air charge
- (D) allow controlled fuel combustion

If choice C is selected set score to 1.

63. A characteristic of a bearing material which permits small dirt particles to become embedded in the bearing surface is _____.

- (A) desirable, as it will minimize damage to the journal surface
- (B) desirable, as it will assist in keeping the lube oil filters clean
- (C) undesirable, since the embedded particles will score the journal
- (D) undesirable, since the particles will interfere with lube oil flow

If choice A is selected set score to 1.

64. Which of the listed substances can be satisfactorily removed from diesel fuel by centrifuging?

- (A) Sludge
- (B) Gasoline
- (C) Fuel oil
- (D) Lube oil

If choice A is selected set score to 1.

65. As the load is being decreased on the engine controlled by the governor shown in the illustration, the _____. Illustration MO-0092

- (A) right hand end of the floating lever will move up
- (B) speeder rod will move down
- (C) pilot valve plunger will move down
- (D) oil pressure under the power piston will increase

If choice A is selected set score to 1.

66. A main propulsion diesel engine is normally shutdown by _____.

- (A) shutting off the air supply
- (B) over speeding the engine
- (C) securing the fuel supply
- (D) securing the ignition system

If choice C is selected set score to 1.

67. Which of the listed conditions could result in the failure of an auxiliary diesel engine to stop running when a normal shutdown is attempted?

- (A) Supplying high temperature inlet air.
- (B) Maintaining a high exhaust back pressure.
- (C) Lube oil entering in the air intake manifold.
- (D) Carbon buildup on the over speed pawl.

If choice C is selected set score to 1.

68. A water jacket is placed around the exhaust manifolds of propulsion diesel engines to _____.

- (A) reduce heat radiation to the engine room
- (B) aid in preventing turbocharger overheating
- (C) condense and drain moisture from exhaust gases
- (D) dampen exhaust gas pulsations in the manifold

If choice A is selected set score to 1.

69. Auxiliary boilers are divided into several classifications, one of which is _____.

- (A) water-tube supercritical circulation
- (B) water-tube forced circulation
- (C) fire-tube controlled circulation
- (D) fire-tube express circulation

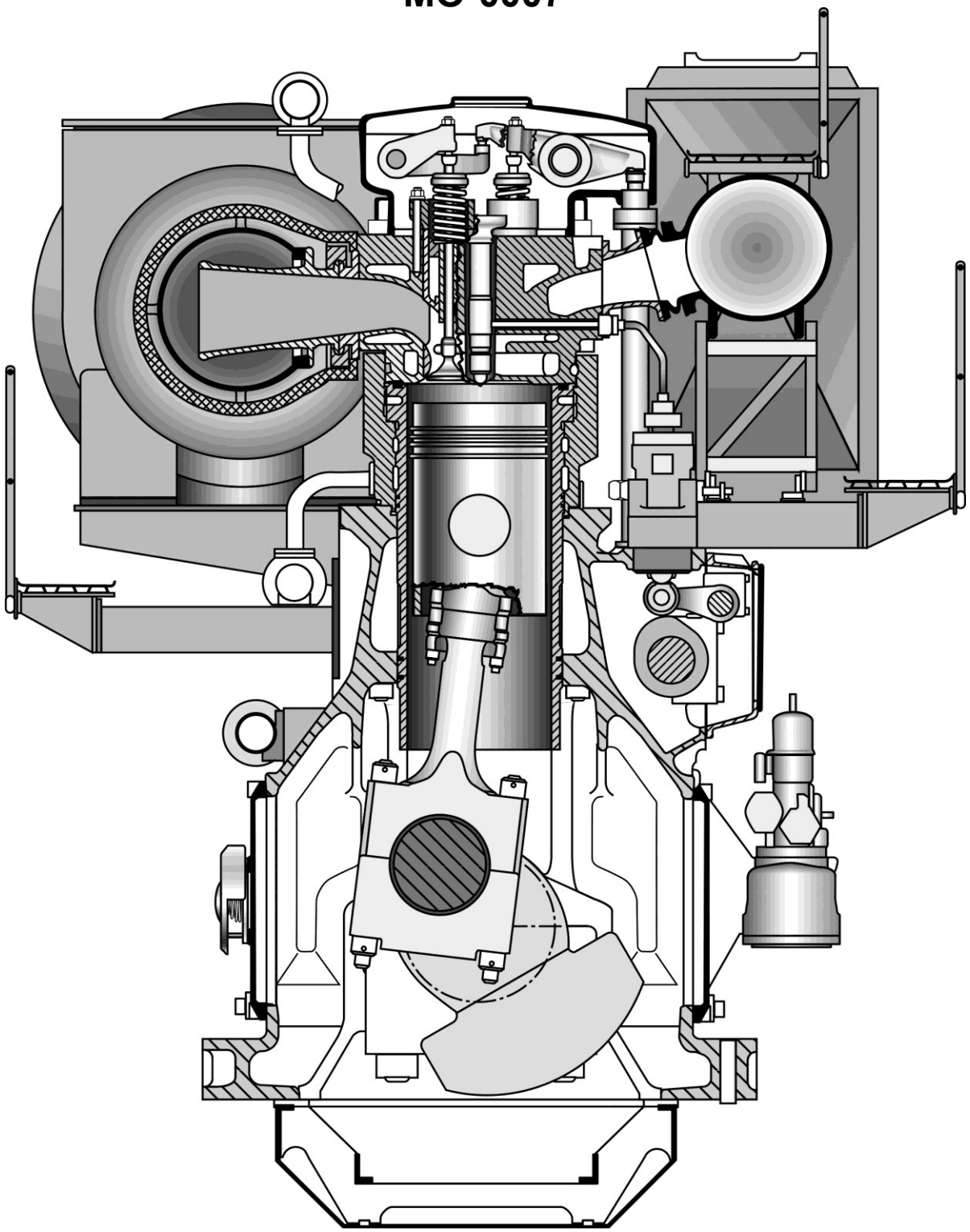
If choice B is selected set score to 1.

70. (2.3.24.8-2) 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) knurling the piston skirt surface
- (C) building up the piston skirt with a liquid epoxy material and then remachining
- (D) increasing the dimensions of the ring land grooves

If choice B is selected set score to 1.

MO-0007



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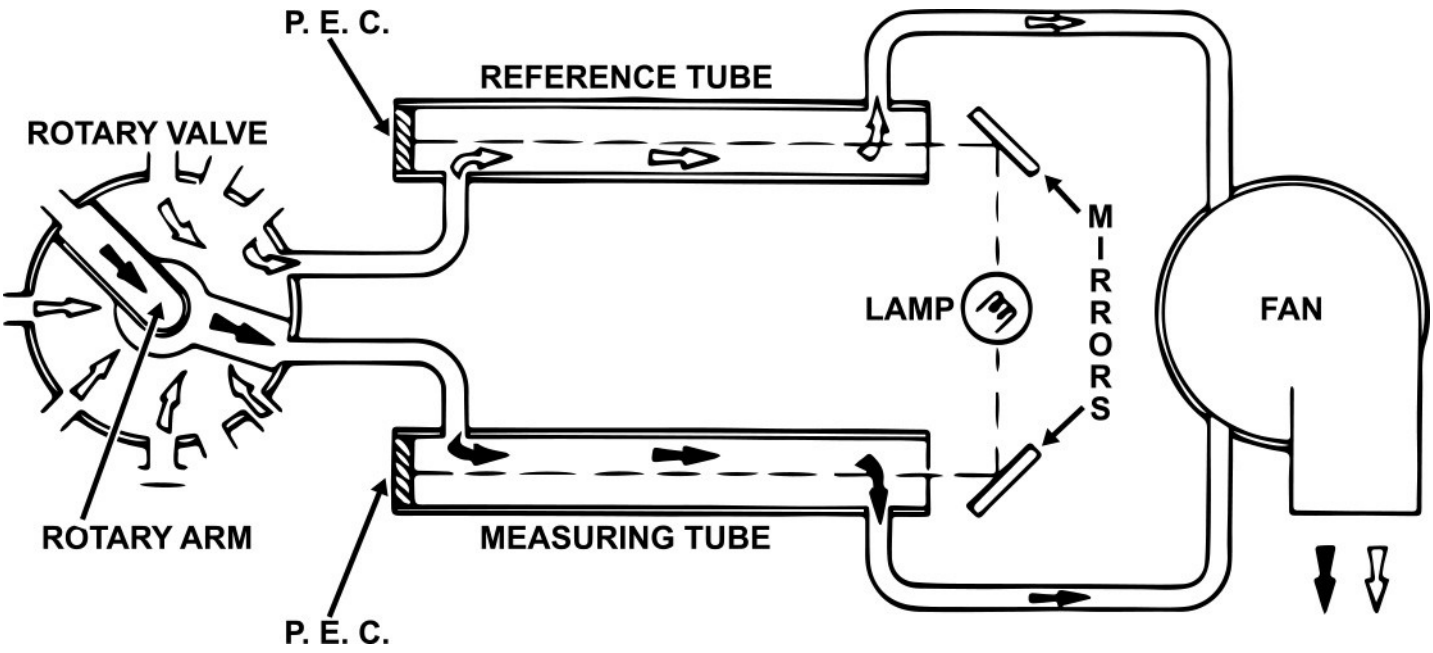

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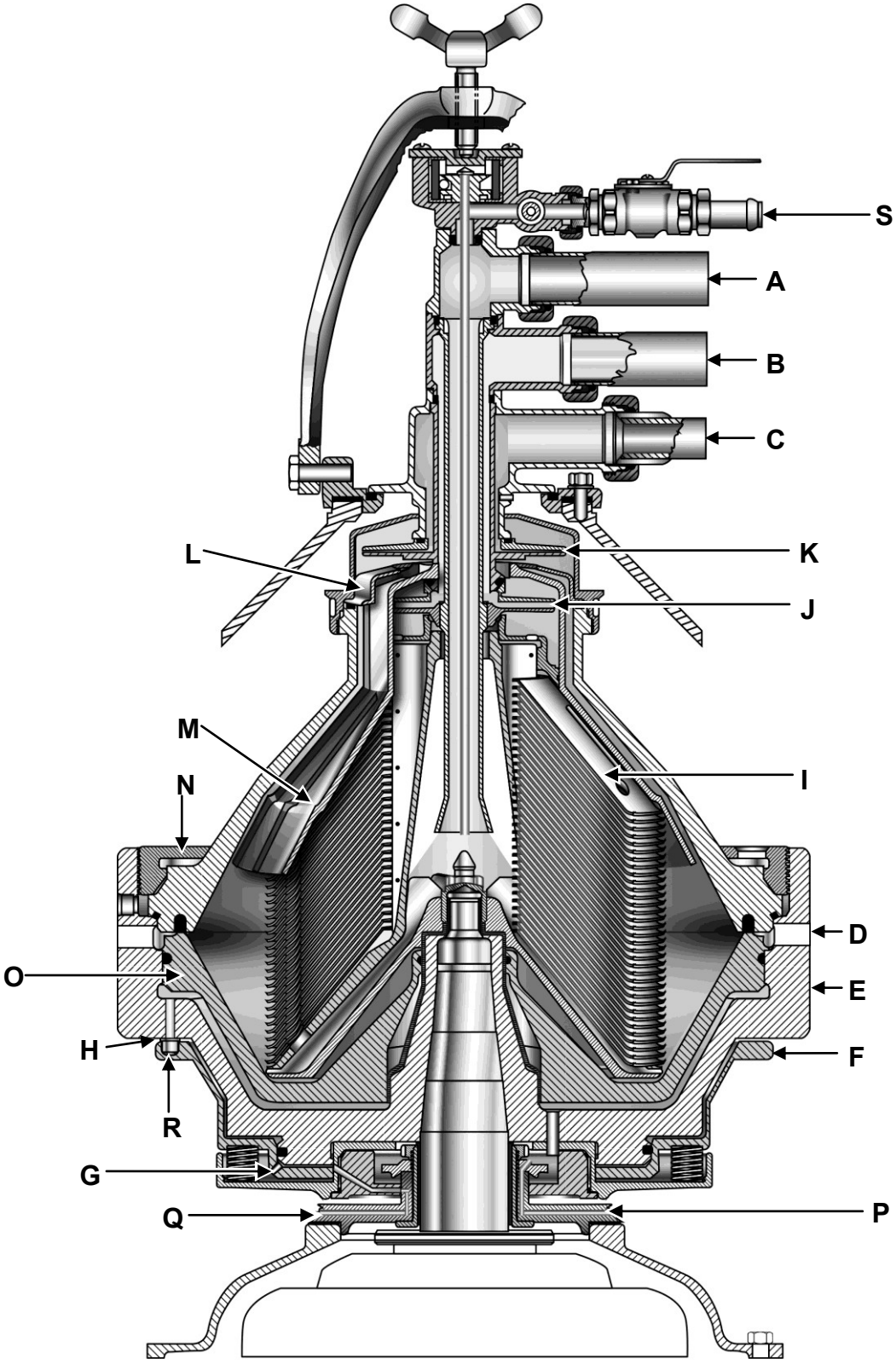

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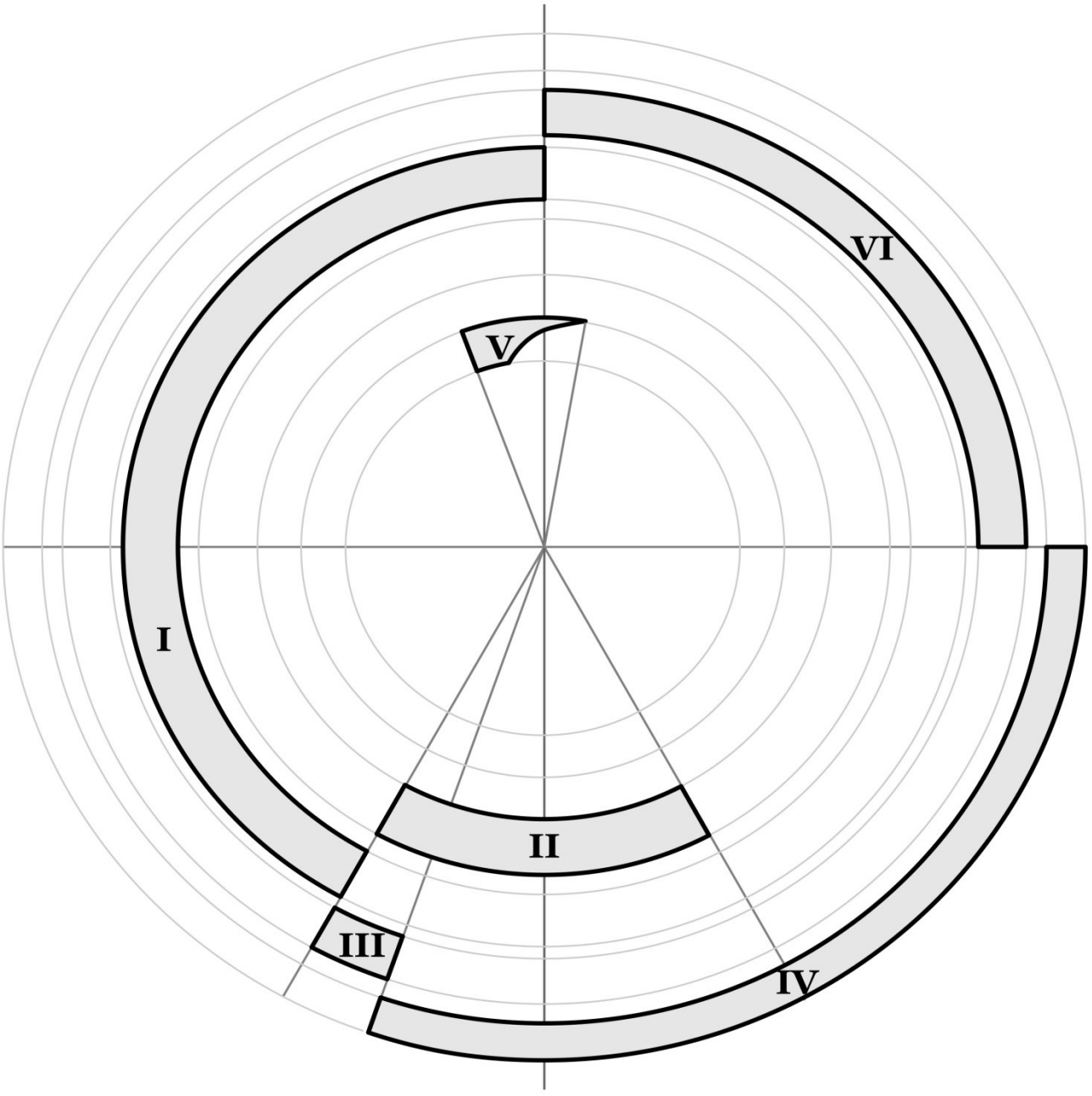

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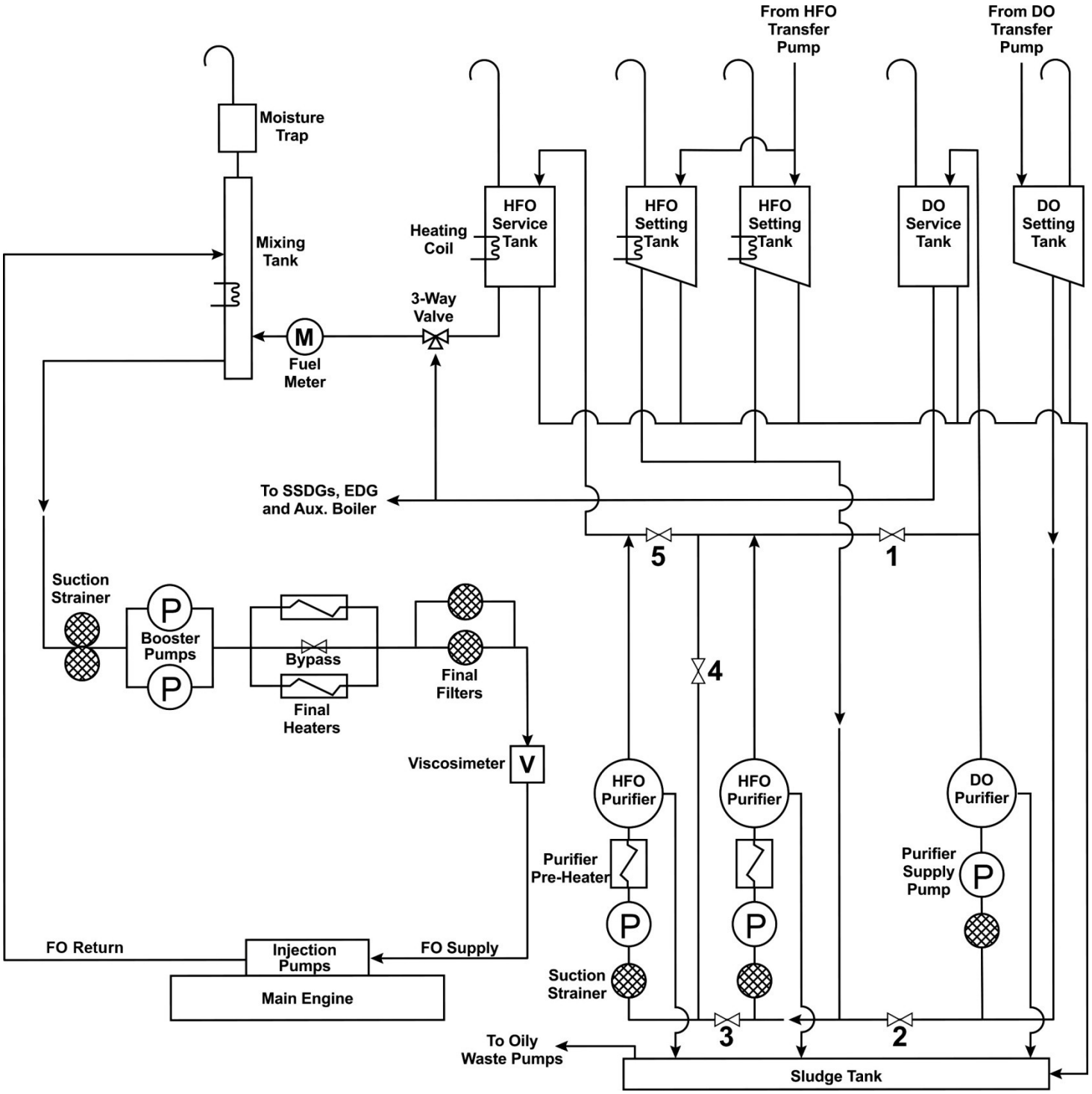

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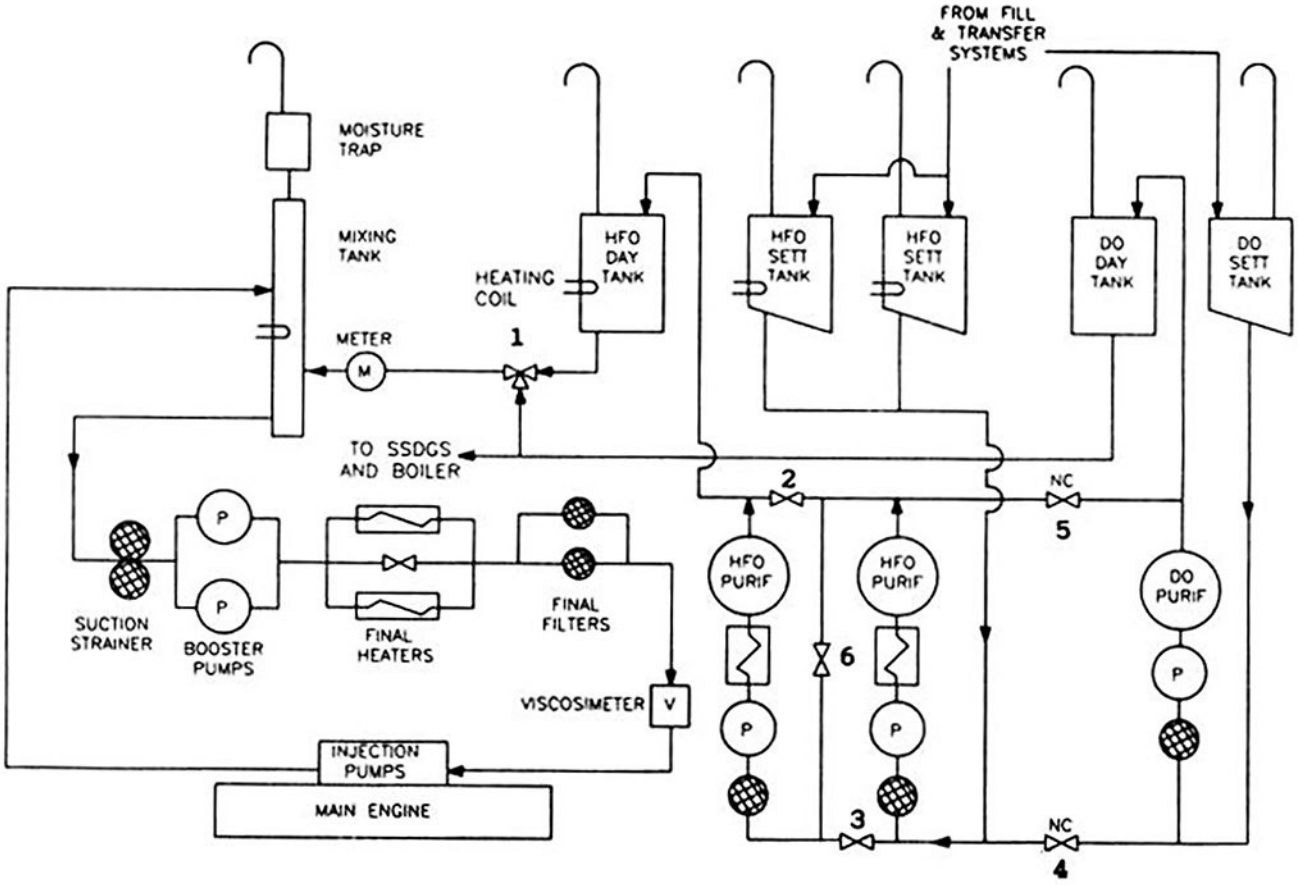

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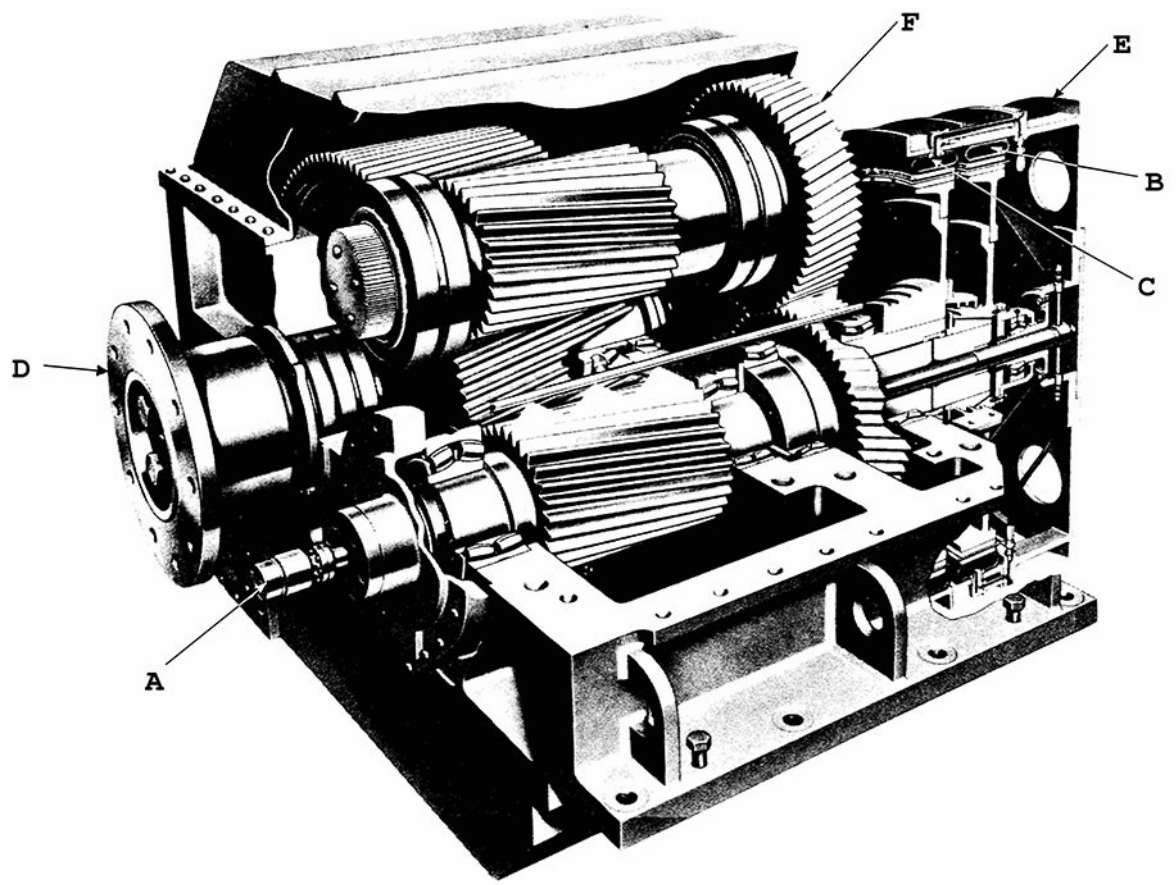

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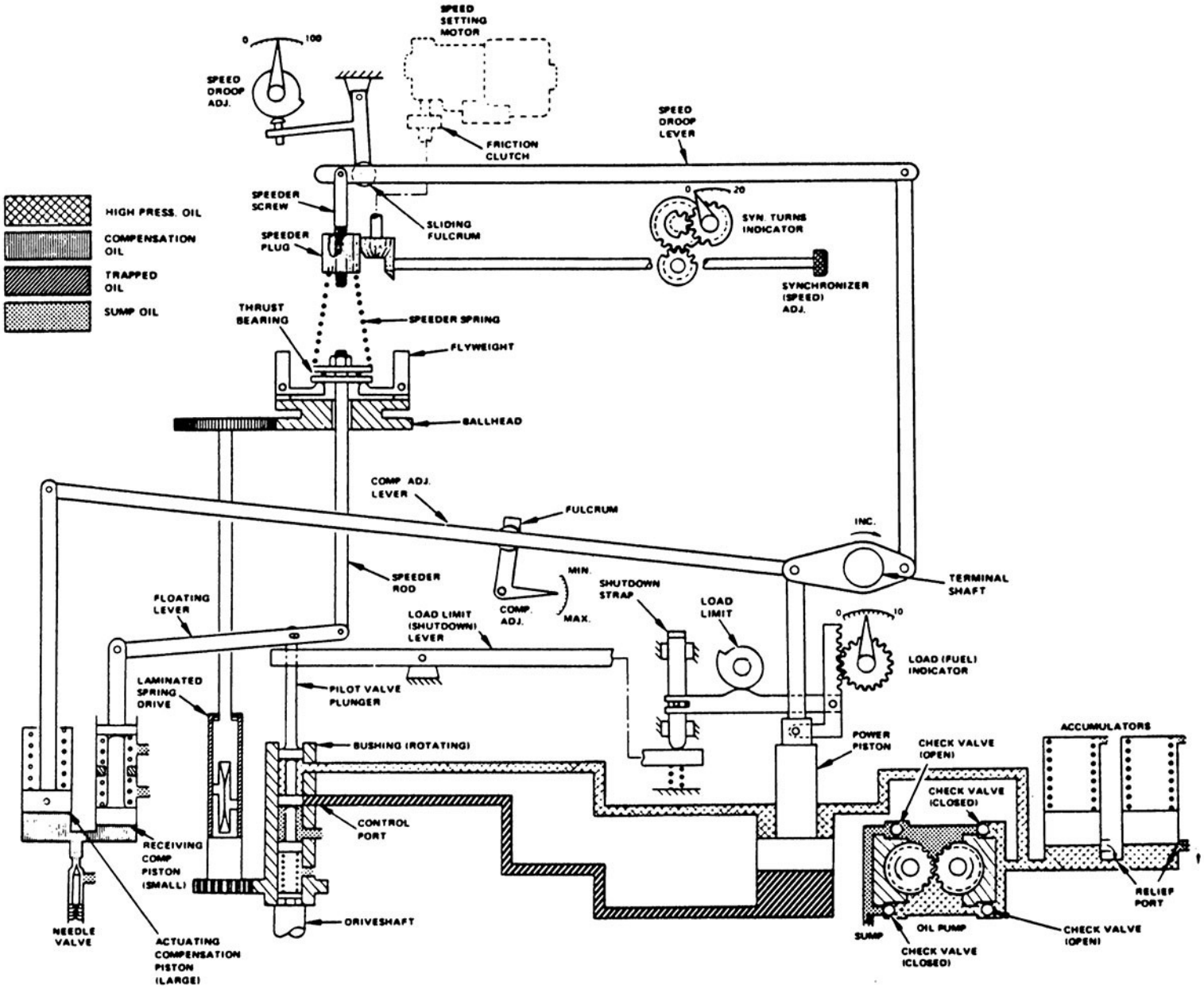

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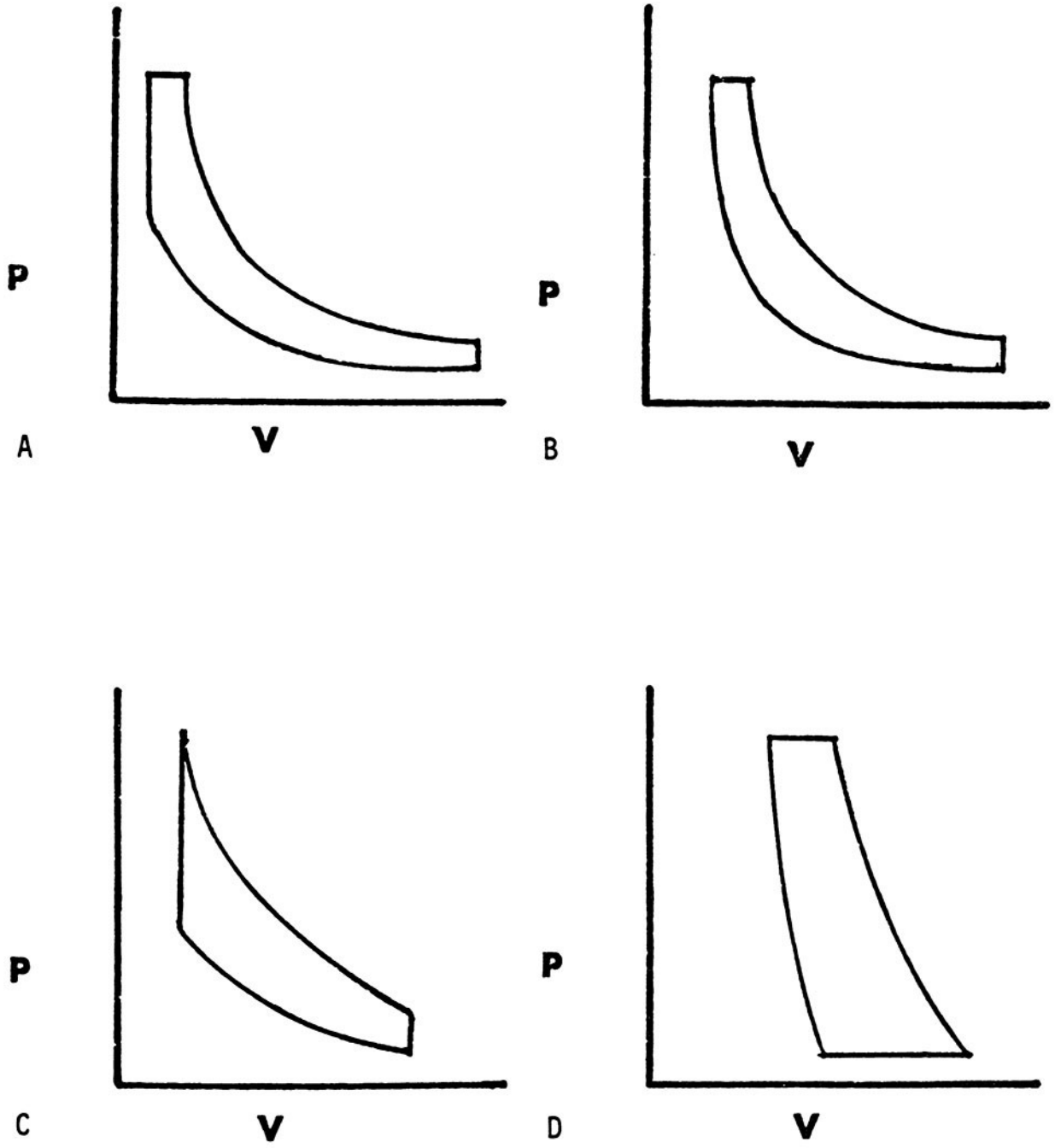

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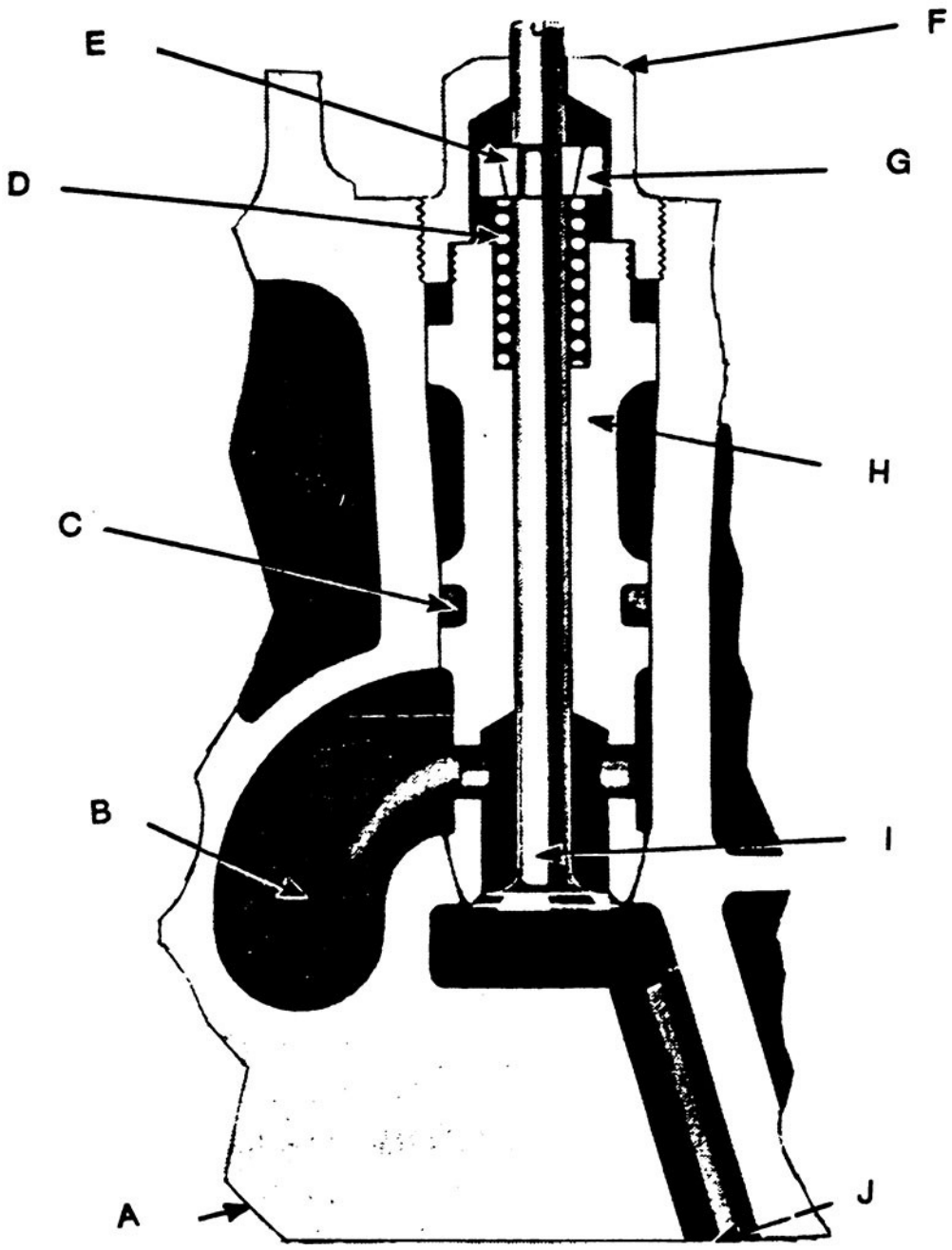

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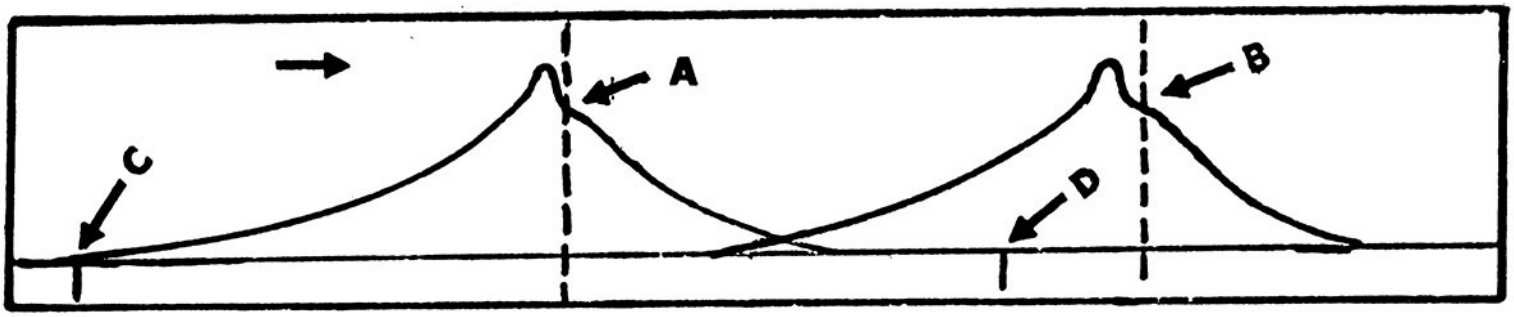

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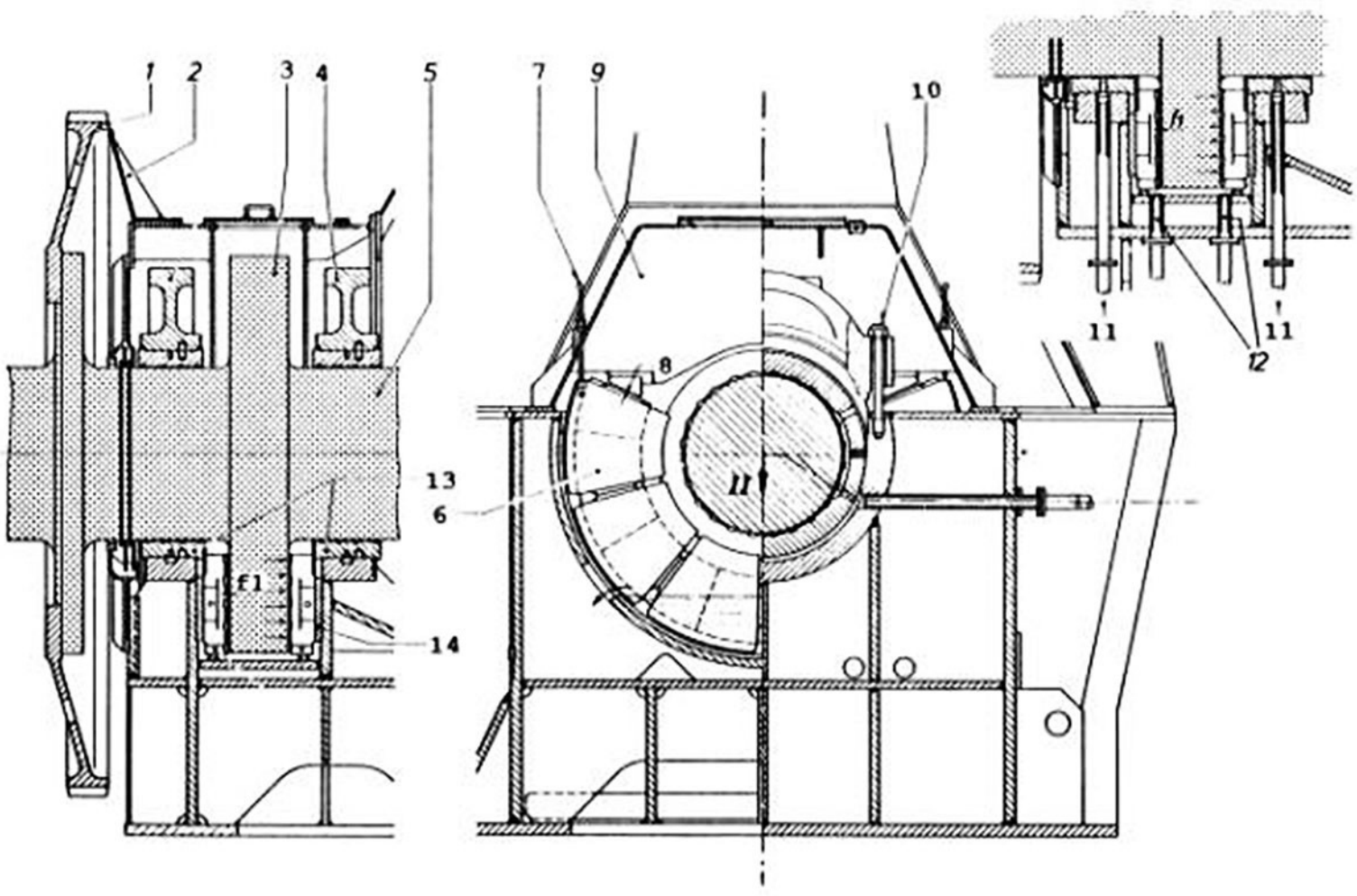

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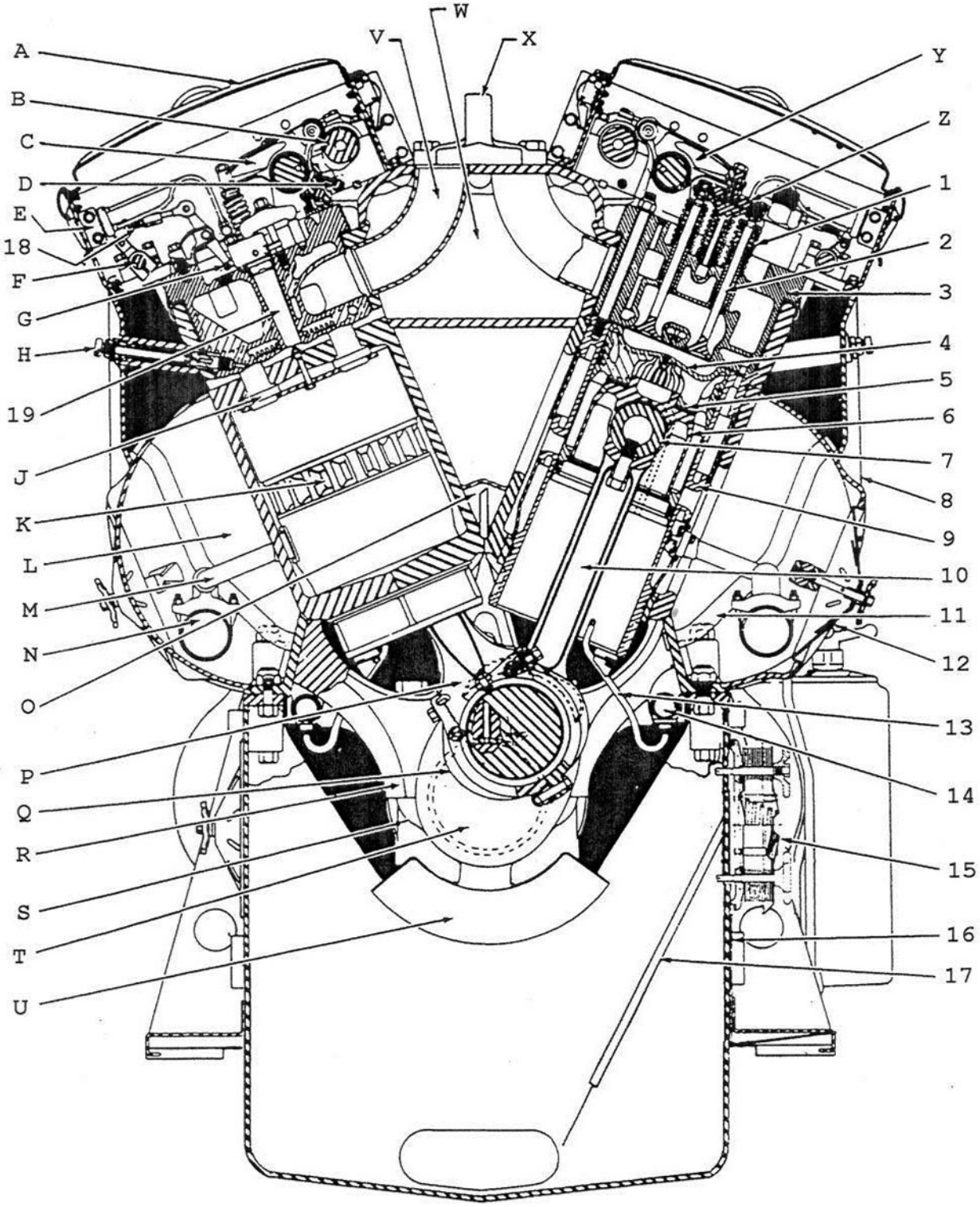

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