U.S.C.G. Merchant Marine Exam

OSV-Assistant Engineer

Q650 Motor Plants

(Sample Examination)

Choose the best answer to the following Multiple Choice Questions

1. If a particular liquid has a specific gravity of 0.96 kg/dm^3 at 77°F, what will be the specific gravity of the liquid, as determined from the graph shown in the illustration, if the temperature is increased to 167°F? Illustration MO-0113

- (A) 0.910 kg/dm^3
- (B) 0.915 kg/dm^3
- (C) 0.920 kg/dm^3
- • (D) 0.925 kg/dm^3

If choice D is selected set score to 1.

2. Maintaining the proper fuel oil temperature will result in _____.

- (A) the elimination of valve wear
- • (B) improved atomization
- (C) a decrease in cylinder blow-by
- (D) a decrease in cylinder mean effective pressure

If choice B is selected set score to 1.

3. Integral cylinder liners constructed as part of the cylinder block, are characterized by which of the following disadvantages?

- (A) They conduct heat poorly.
- (B) They must operate with lower mean effective pressures.
- • (C) They cannot be replaced.
- (D) They require special tools for removal.

If choice C is selected set score to 1.

4. 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.

5. An accumulator used in a hydraulic starting system is generally located between the _____.

- (A) pump and the compressor
- (B) storage tank and the pump
- (C) starting motor and the reserve tank
- • (D) pump and the starting motor

If choice D is selected set score to 1.

6. The direct acting mechanical governor used with some small diesel engines, controls fuel flow to the engine by _____.

- (A) governor flyweight action on a pilot valve which controls fuel injection
- (B) governor flyweight motion acting on fuel controls through suitable linkage
- (C) positioning a butterfly valve in the fuel delivery system
- (D) positioning a servomotor piston attached to the fuel controls

If choice B is selected set score to 1.

7. In a Bendix starter drive, the pinion engagement with the flywheel ring gear is initiated by _____.

- (A) Bendix spring pressure
- (B) starter drive shaft rotation
- (C) a differential spring
- (D) solenoid throw out action

If choice B is selected set score to 1.

8. 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.

9. Carbon deposit buildup on the injection nozzle orifice is least likely to occur when using which type of fuel injector nozzle?

- (A) Hole
- (B) Multi-hole
- (C) Pintle
- (D) Multi-pintle

If choice C is selected set score to 1.

10. A naturally aspirated diesel engine at full throttle will have an intake manifold pressure _____.

- (A) slightly less than atmospheric pressure
- (B) approximately equal to exhaust manifold pressure at all times
- (C) that is widely fluctuating
- (D) constantly decreasing as engine load increases

If choice A is selected set score to 1.

11. During the starting of a diesel engine, compression gases are prevented from backing into the air starting system, shown in the illustration, by the _____. Illustration MO-0046

- (A) cylinder air starting check valves
- (B) individual distribution valves
- (C) high-pressure in the starting air manifold
- (D) air starting control valve

If choice A is selected set score to 1.

12. 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.

13. The degree of fuel atomization in a diesel engine cylinder depends primarily on _____.

- (A) the size of the holes in the fuel nozzle
- (B) timing of the pump
- (C) supply pressure to the pump
- (D) shape of the combustion chamber

If choice A is selected set score to 1.

14. The intake ports of a two-stroke cycle diesel engine are opened and closed by the action of the _____.

- (A) camshaft
- (B) piston movement
- (C) exhaust valves
- (D) vertical drive

If choice B is selected set score to 1.

15. In an auxiliary boiler steam and water system, the highest pressure will be in the _____.

- (A) steam stop valve
- (B) dry pipe
- (C) feed water system
- (D) generating tubes

If choice C is selected set score to 1.

16. Diesel engine automated control systems may utilize sensing devices of dual function, with sensing ranges providing both alarm and engine shut down capability. Which of the key points listed would only require an alarm sensor?

- o (A) Lube oil pressure and temperature
- o (B) Jacket water pressure and temperature
- o (C) Engine over speed
- • (D) Lube oil sump level

If choice D is selected set score to 1.

17. In the illustration, the intake valve closes at what point on the four-stroke cycle engine diagram shown? Illustration MO-0084

- • (A) 45 degrees after BDC
- o (B) 55 degrees before BDC
- o (C) 75 degrees before TDC
- o (D) 85 degrees after TDC

If choice A is selected set score to 1.

18. Heat for igniting the fuel oil in the cylinder of a diesel engine is generated by the _____.

- o (A) electronic ignition system
- • (B) compression of air by the piston
- o (C) friction in the fuel injector
- o (D) fuel oil heating system

If choice B is selected set score to 1.

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

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

20. Which of the following is an example of a solid bearing?

- o (A) Thrust bearing
- o (B) Spring bearing
- • (C) Piston pin bushing
- o (D) Turbo-generator turbine bearing

If choice C is selected set score to 1.

21. A diesel engine exposed to widely varying ambient temperatures should use lubricating oil with _____.

- (A) a high viscosity index
- (B) a low viscosity index
- (C) extreme pressure additives
- (D) no additives

If choice A is selected set score to 1.

22. If point #1 in the diagram shown is the beginning of gas compression, which of the cycles listed is being illustrated? Illustration MO-0036

- (A) Otto
- (B) Diesel
- (C) Gas Turbine
- (D) Rankine

If choice B is selected set score to 1.

23. The piston pin shown in the illustration should be classified as _____. Illustration MO-0011

- (A) fixed
- (B) full floating
- (C) semi-floating
- (D) anchored

If choice C is selected set score to 1.

24. 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.

25. 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.

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

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

If choice D is selected set score to 1.

27. 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.

28. One advantage of electromagnetic slip couplings is _____.

- (A) torsional vibrations are reduced
- (B) torque increases with a decrease in excitation current
- (C) the coupling rapidly responds to sudden changes of load
- (D) excitation and induction power losses appear as a change in torque instead of rotational speed between the primary and secondary elements

If choice A is selected set score to 1.

29. The exhaust system for a turbocharged diesel engine functions to _____.

- (A) power the after coolers
- (B) power the turbocharger
- (C) reduce the cylinder scavenge effect
- (D) cool the turbocharger

If choice B is selected set score to 1.

30. For optimum results, centrifugal purification of heavy fuel oil should be accomplished with the fuel at the lowest practicable _____.

- (A) throughput
- (B) additive percent
- (C) cetane number
- (D) TBN number

If choice A is selected set score to 1.

31. The item labeled #16 in the illustration is a stack of spring washers. Their function is to _____.
Illustration MO-0062

- (A) absorb the high-pressure pulses developed during the fuel injection process
- (B) permit accurate stretch gauge measurement of bolt elongation during installation
- (C) prevent bolt failure by allowing limited movement of the injector when excessively high cylinder pressures are developed
- (D) maintain the same hold-down force on the injector regardless of varying engine operating temperatures

If choice D is selected set score to 1.

32. A waste heat boiler is installed on some diesel propelled vessels to _____.

- (A) provide steam for emergency propulsion
- (B) provide steam for the turbo-generator
- (C) provide steam for heating waste water tanks
- (D) provide steam for warming engines

If choice B is selected set score to 1.

33. A diesel engine with a combustion chamber located between the crowns of two pistons is known as a/an _____.

- (A) double-acting engine
- (B) opposed-piston engine
- (C) single-acting engine
- (D) horizontal acting engine

If choice B is selected set score to 1.

34. If the jacket water temperature rises rapidly above normal in a diesel engine, you should FIRST _____.

- (A) clean sea water strainer
- (B) reduce engine load
- (C) call the chief engineer
- (D) check thermostatic valve

If choice B is selected set score to 1.

35. A photoelectric cell installed in an automatically fired auxiliary boiler burner management system _____.

- (A) opens the burner circuit upon sensing a flame failure
- (B) detects a flame failure by monitoring radiant heat from glowing refractory
- (C) requires mechanical linkage to secure the burner fuel supply
- (D) must be bypassed at low firing rates

If choice A is selected set score to 1.

36. Which area of the indicator diagram illustrated, indicates the ignition delay period in a diesel engine cylinder? Illustration MO-0033

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

If choice C is selected set score to 1.

37. The satisfactory operation of diesel engine exhaust valves usually depends on _____.

- (A) the proper back pressure
- (B) the cooling water temperature
- (C) correct timing and proper seating
- (D) accurate metering and the exhaust temperature

If choice C is selected set score to 1.

38. Which of the following statements concerning fire-tube boilers is correct?

- (A) Combustion gases flow through the tubes.
- (B) Flames impinge on the tubes.
- (C) Combustion occurs in the tubes.
- (D) Water flows through the tubes.

If choice A is selected set score to 1.

39. The process of scavenging a two-stroke cycle diesel engine serves to _____.

- (A) improve fuel flow volume
- (B) cool the exhaust valves
- (C) reduce the intake air charge density
- (D) increase the temperature of exhaust gases

If choice B is selected set score to 1.

40. In a naturally aspirated diesel engine, the volume of air intake is directly associated with engine _____.

- (A) compression ratio
- (B) displacement
- (C) fuel pressure
- (D) cylinder clearance volume

If choice B is selected set score to 1.

41. With respect to diesel fuel, the ease with which a cold engine will start is dependent upon the _____.

- (A) ignition quality of the fuel
- (B) high heating value of the fuel
- (C) amount of carbon residue after combustion
- (D) internal flow resistance in the injectors

If choice A is selected set score to 1.

42. The concentration of total dissolved solids in the water of an auxiliary boiler can increase as a result of _____.

- (A) sea water contamination
- (B) frequent surface blows
- (C) dissolved oxygen deaeration
- (D) frequent bottom blows

If choice A is selected set score to 1.

43. Before being shut down, a diesel engine should idle a few minutes in order to _____.

- (A) prevent governor surging at shutdown
- (B) make sure the fuel nozzles are flushed clean
- (C) prevent pressure buildup in the fuel lines
- (D) prevent damage from localized overheating

If choice D is selected set score to 1.

44. The camshaft drive is designed to maintain proper camshaft speed relative to crankshaft speed. In maintaining this relationship, the camshaft drive causes the camshaft to rotate at _____.

- (A) one-fourth crankshaft speed in a four-stroke cycle diesel engine
- (B) one-half crankshaft speed in a two-stroke cycle diesel engine
- (C) crankshaft speed in a two-stroke cycle diesel engine
- (D) two times crankshaft speed in a two-stroke cycle diesel engine

If choice C is selected set score to 1.

45. Which of the automatic boiler controls listed should be tested prior to lighting off an auxiliary boiler?

- (A) Automatic bottom blow valve
- (B) Low water level cutoff switch
- (C) Voltage output of the ignition transformer
- (D) Insulation resistance readings in the ignition system high tension leads

If choice B is selected set score to 1.

46. The purpose of the delivery check valve used in a diesel fuel injection jerk pump is to _____.

- (A) assist in a quick cutoff of fuel injection
- (B) allow oil backflow from the injector to the helix
- (C) reduce fuel oil pressure between injection strokes
- (D) meter the quantity of fuel delivered

If choice A is selected set score to 1.

47. Shaker, circulation, and spray are the three general methods used in _____.

- (A) pre-injection fuel oil treatment
- (B) lube oil filtration
- (C) lube oil purification
- (D) piston cooling

If choice D is selected set score to 1.

48. Pre-combustion chambers and energy cells in high-speed, small bore diesel engines all serve to increase _____.

- (A) firing pressure
- (B) ignition quality of fuel
- (C) fuel/air ratio during compression
- (D) turbulence

If choice D is selected set score to 1.

49. In addition to the main starting air compressor, another air compressor, driven by a separate power source, is installed to _____.

- (A) provide air for engine scavenging
- (B) provide air for engine supercharging
- (C) supply a backup source of starting air
- (D) supply the independent source of reversing air

If choice C is selected set score to 1.

50. The expansion tank for a diesel engine closed cooling system is designed to maintain a constant head on the system and _____.

- (A) provide an air-cushion
- (B) reduce water turbulence
- (C) allow for an increase in water volume as the engine warms up
- (D) reduce water temperature

If choice C is selected set score to 1.

51. Reduction gear casings are vented in order to _____.

- (A) allow windage to exist for cooling the gears
- (B) avoid a buildup of pressure within the gear case
- (C) minimize lube oil foaming within the case
- (D) allow for axial clearance between the gears

If choice B is selected set score to 1.

52. 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.

53. The over speeding of the diesel engine driving an electric generator could cause _____.

- (A) low voltage trip to trip
- (B) reverse power trip to trip
- (C) damage to the field windings
- (D) excessive exhaust temperatures

If choice C is selected set score to 1.

54. In a modern internal combustion diesel engine, the load carrying part of the engine is referred to as the _____.

- (A) bedplate or base
- (B) sump or oil pan
- (C) cylinder block
- (D) frame

If choice A is selected set score to 1.

55. Crankcase explosions in propulsion diesel engines result from _____.

- (A) the splashing of lubrication oil by the crankshaft
- (B) the dilution of crankcase oil with particles of combustion
- (C) broken fuel lines spraying oil on the crankcase
- (D) the ignition of unburned fuel and air in the crankcase

If choice D is selected set score to 1.

56. 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.

57. Lube oil filters remove contaminants more efficiently if the oil being filtered is _____.

- (A) under high-pressure
- (B) under low-pressure
- (C) heated to reduce viscosity
- (D) cooled to increase viscosity

If choice C is selected set score to 1.

58. As shown in the illustration of the fuel injection pump, the component labeled "J" would be identified as the _____. Illustration MO-0061

- (A) delivery check valve assembly
- (B) control rack and sleeve
- (C) plunger and barrel spring
- (D) control rack and pinion

If choice A is selected set score to 1.

59. The rate of heat transfer in a water-tube auxiliary boiler can be increased by _____.

- (A) operating the boiler at less than normal water level
- (B) installing fins on the firesides of water-tubes
- (C) increasing the amount of excess air to the burners
- (D) treating the boiler water with chemical oxygen scavengers

If choice B is selected set score to 1.

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

If choice D is selected set score to 1.

61. The inlet valves for the diesel engine shown in the illustration are indicated by the letter or number _____. Illustration MO-0122

- (A) "2"
- (B) "19"
- (C) "H"
- (D) none of the above are correct

If choice D is selected set score to 1.

62. Which of the operating characteristics listed is correct concerning the blower shown in the illustration? Illustration MO-0082

- (A) Each of the lobes are in constant contact with each other.
- (B) Air delivery is inversely proportional to engine speed.
- (C) Air delivery is approximately proportional to engine speed.
- (D) The blower is driven by engine exhaust gases.

If choice C is selected set score to 1.

63. Regarding the fuel injector shown in the illustration, the purpose of piece #38 is to _____. Illustration MO-0059

- (A) adjust the fuel rack spring tension
- (B) filter the fuel
- (C) maintain fuel pressure at a preset level
- (D) relieve excess fuel pressure to the suction side of the pump

If choice B is selected set score to 1.

64. The most common cause of scale formation in an auxiliary boiler is _____.

- (A) concentrations of calcium sulfate in the boiler water
- (B) fuel oil in the feed water
- (C) improper treatment of the feed water with calcium sulfate
- (D) excessive feed water alkalinity

If choice A is selected set score to 1.

65. One cause of diesel engine fuel ignition delay is _____.

- (A) mechanical flexibility in the pump mechanism
- (B) low fuel booster pump pressure
- (C) high fuel rack setting
- (D) ignition quality of the fuel oil

If choice D is selected set score to 1.

66. 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.

67. As shown in the illustration of the fuel injection pump, the component labeled "N" would be identified as the _____. Illustration MO-0061

- (A) sleeve
- (B) control rack
- (C) barrel
- (D) plunger

If choice C is selected set score to 1.

68. Auxiliary diesel engines can be automatically shut down as a result of _____.

- (A) low lube oil temperature
- (B) low lube oil pressure
- (C) high exhaust temperature
- (D) high cooling water pressure

If choice B is selected set score to 1.

69. Exhaust pipes for separate main propulsion diesel engines can be combined only when _____.

- (A) space limitations prevent separately run pipes
- (B) the engines are small auxiliary units
- (C) they are arranged to prevent gas backflow to each engine
- (D) a waste heat boiler is installed

If choice C is selected set score to 1.

70. Most large main propulsion diesel engines use a duplex lube oil strainer to _____.

- (A) decrease the time required between cleanings
- (B) remove all large and small foreign objects
- (C) ensure a positive flow of oil at all times
- (D) ensure that all lube oil has been treated twice

If choice C is selected set score to 1.

MO-0011

Fig. A

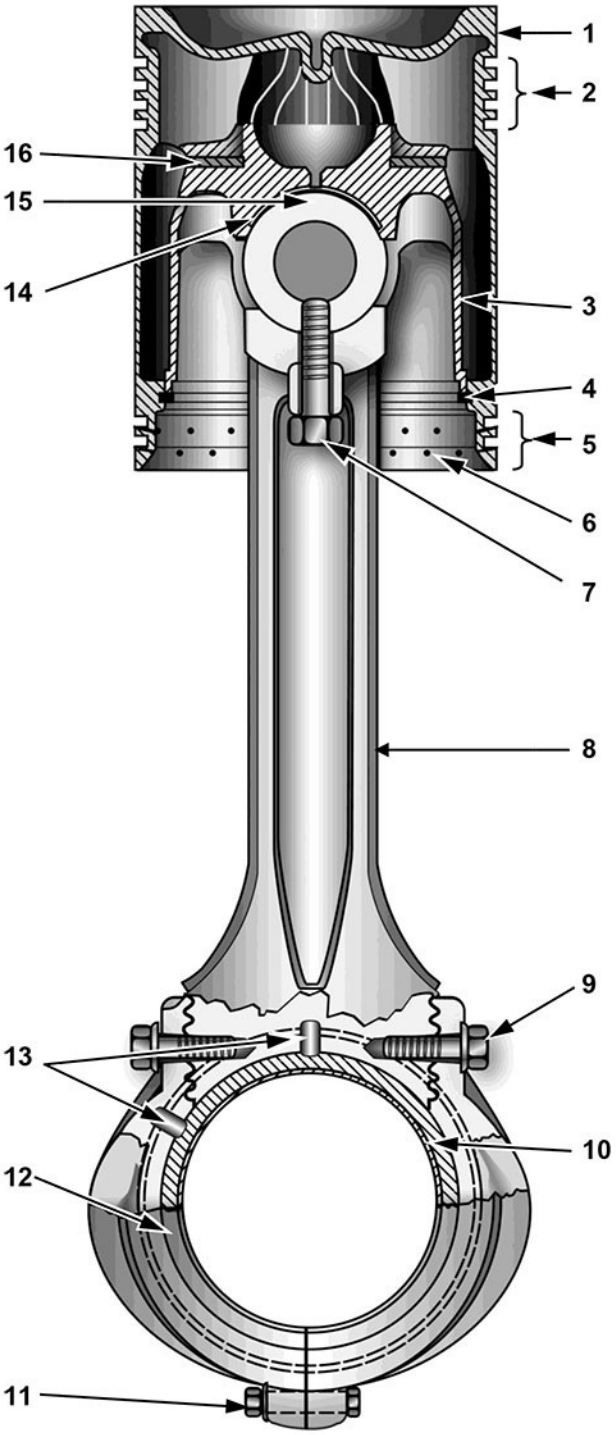
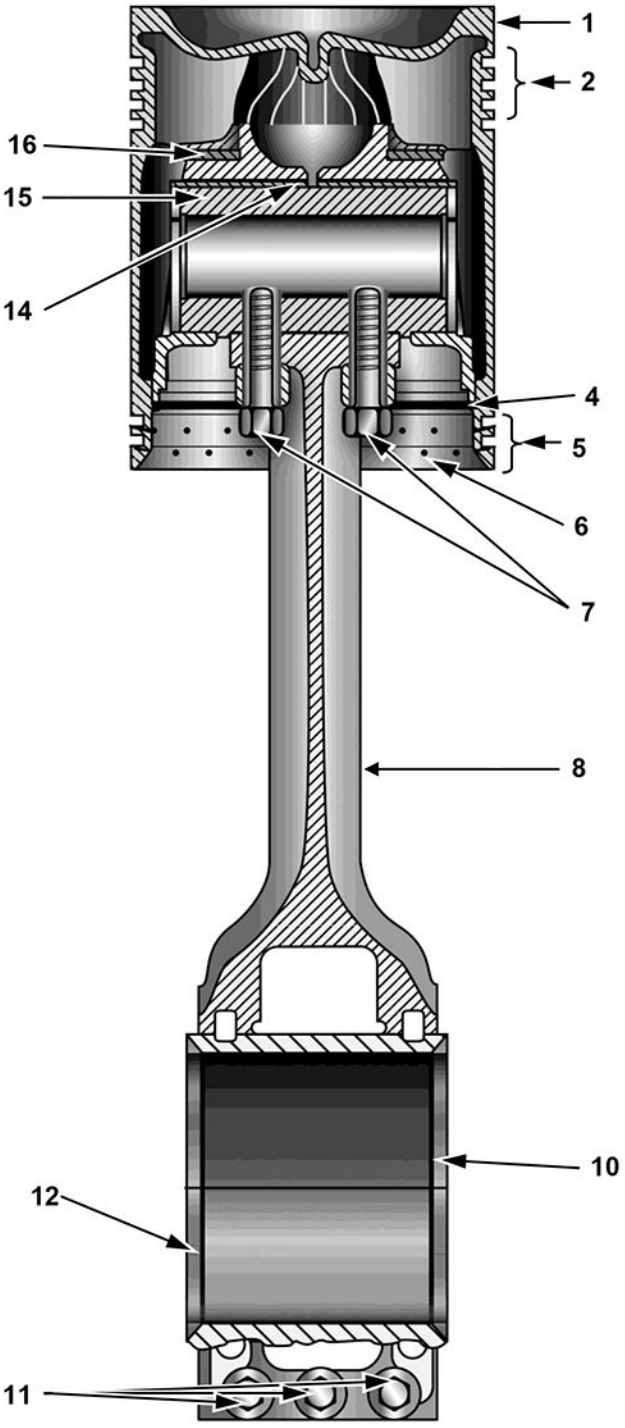
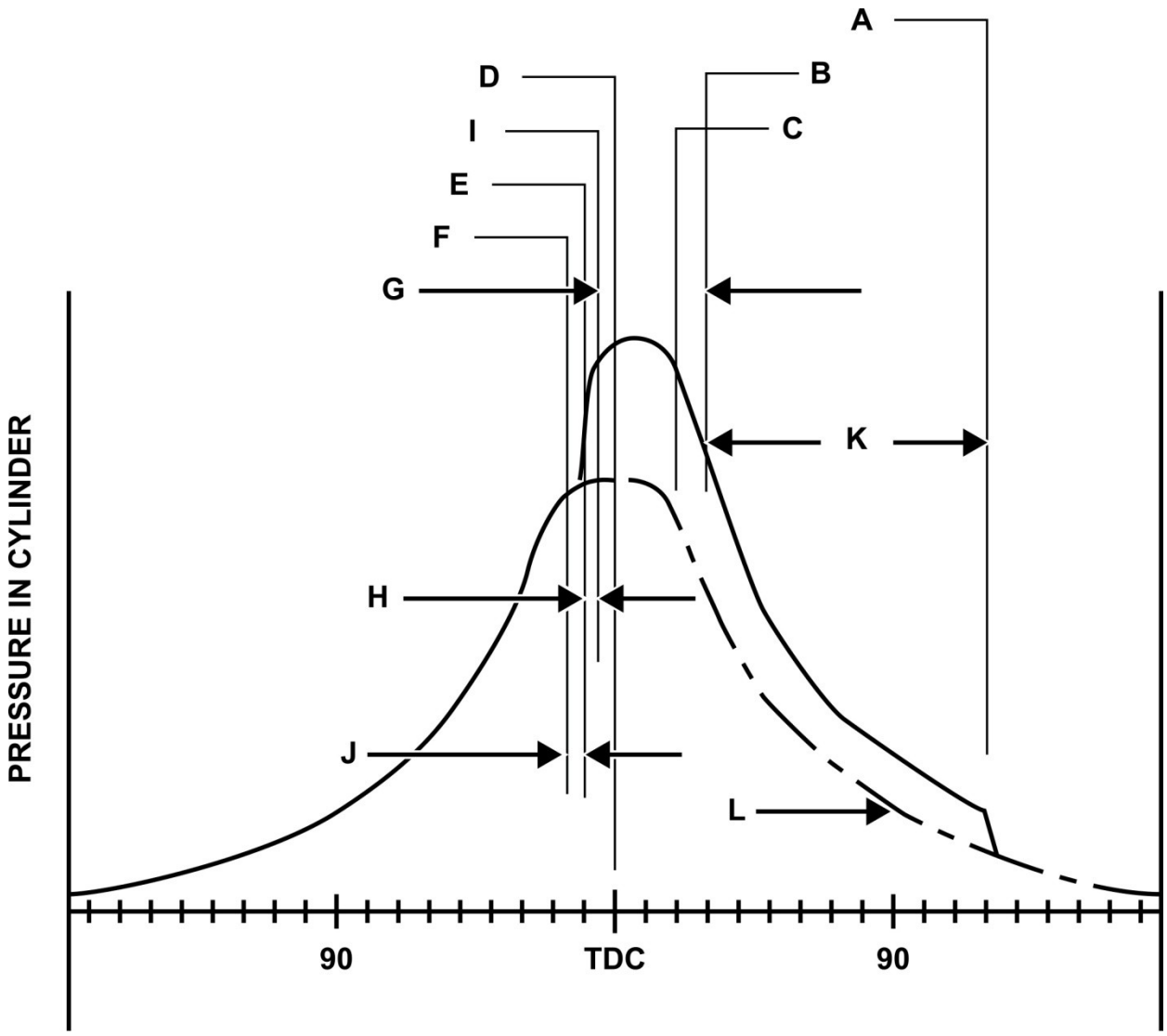


Fig. B



MO-0033



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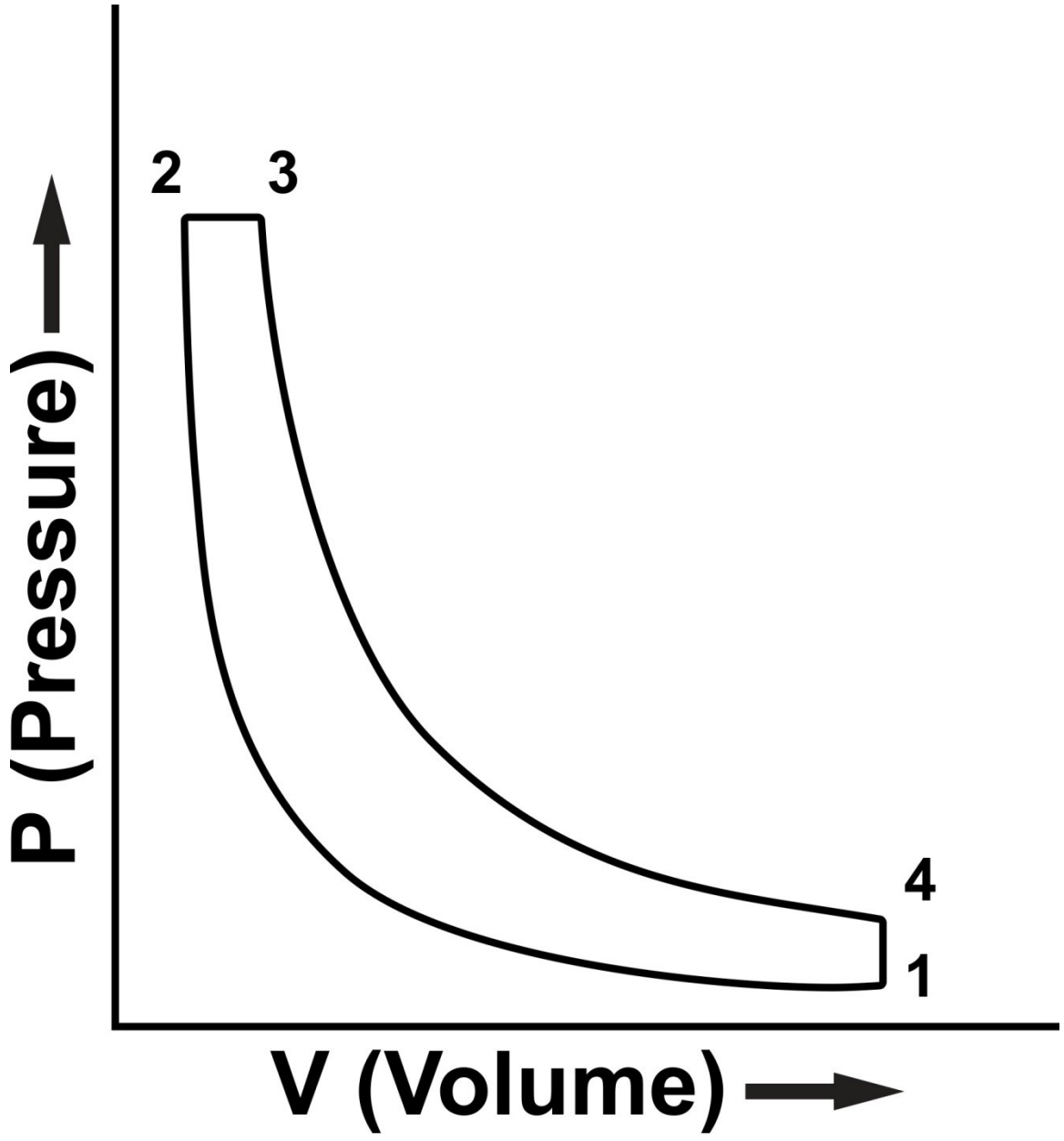

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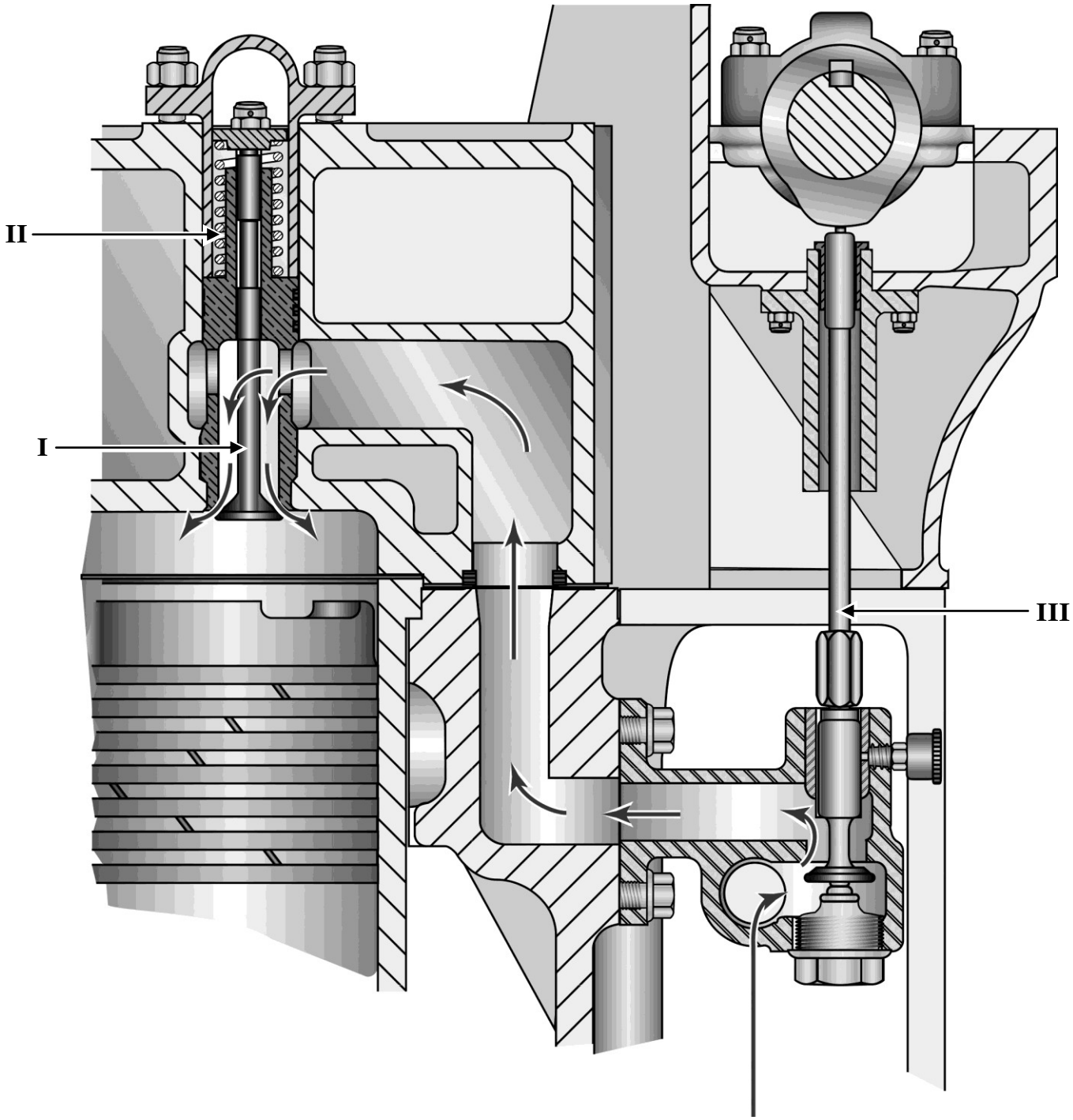

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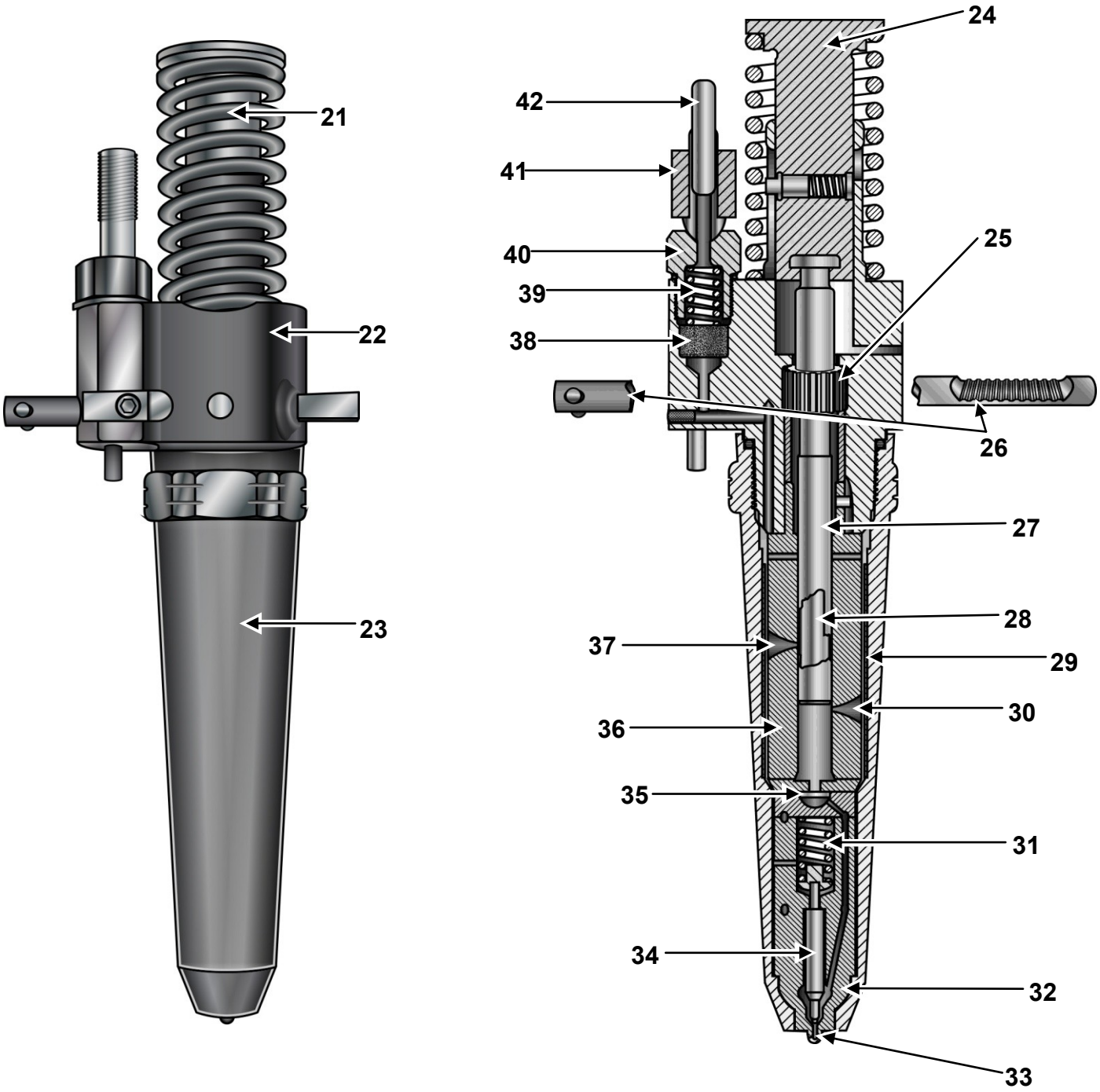

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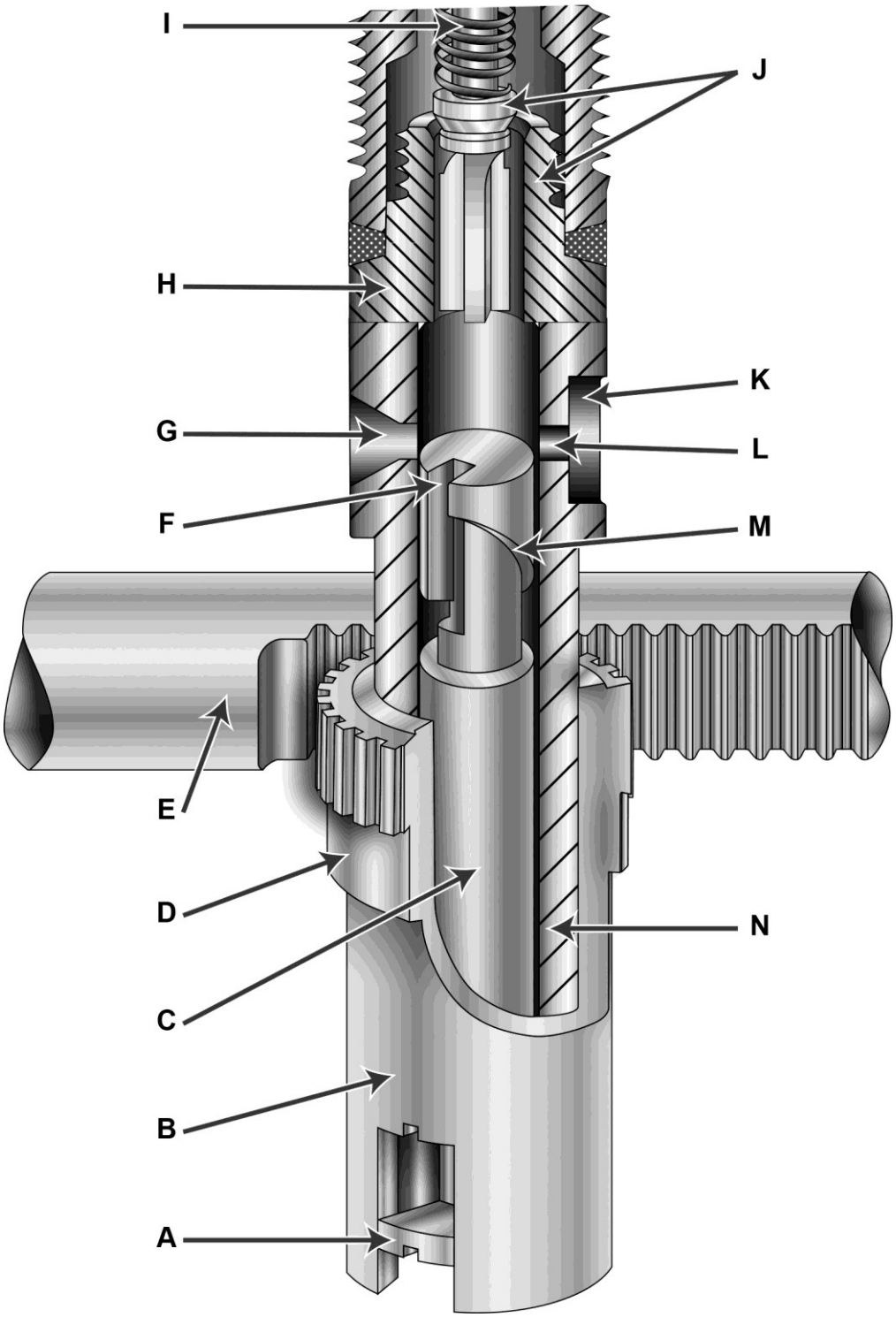

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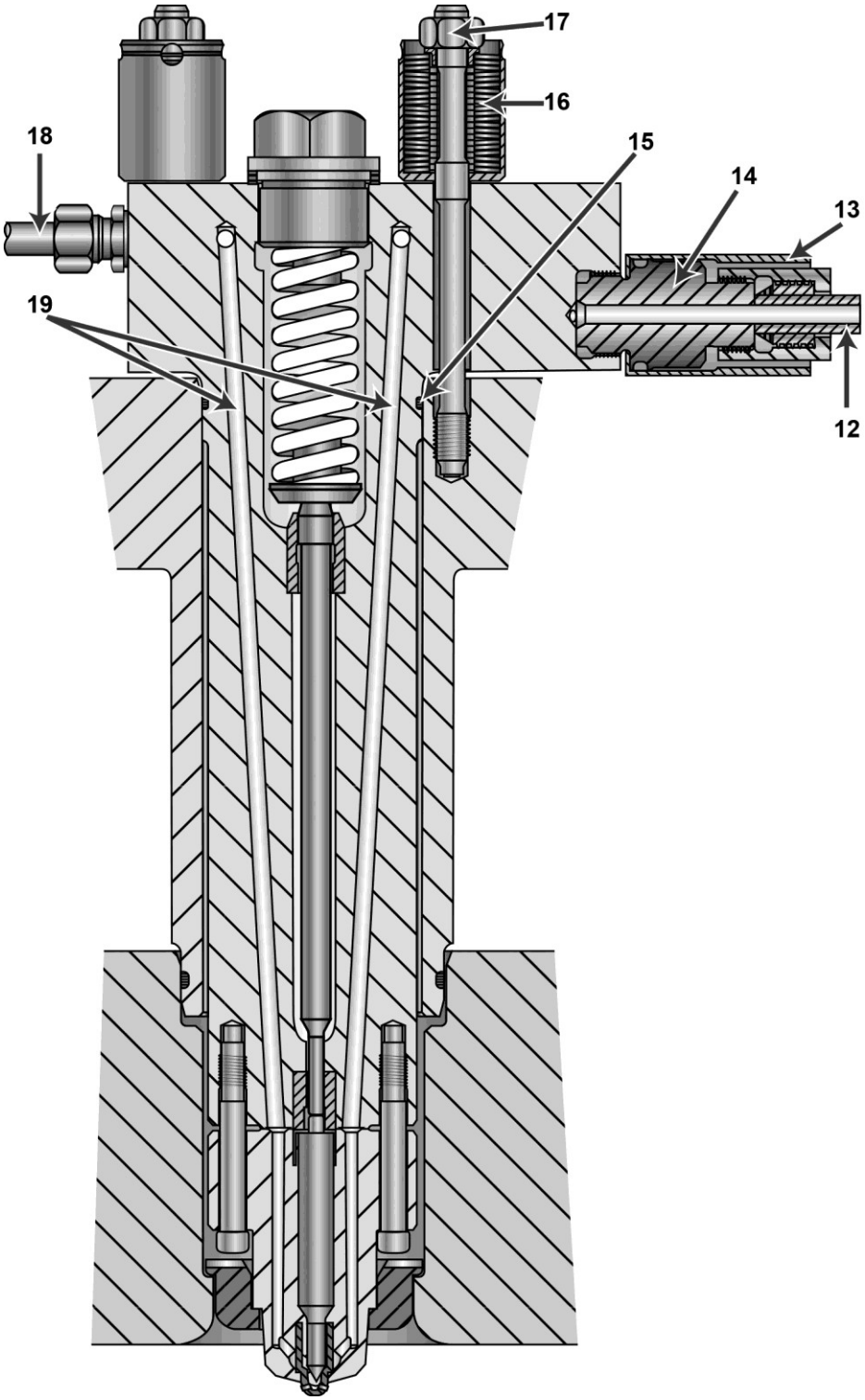
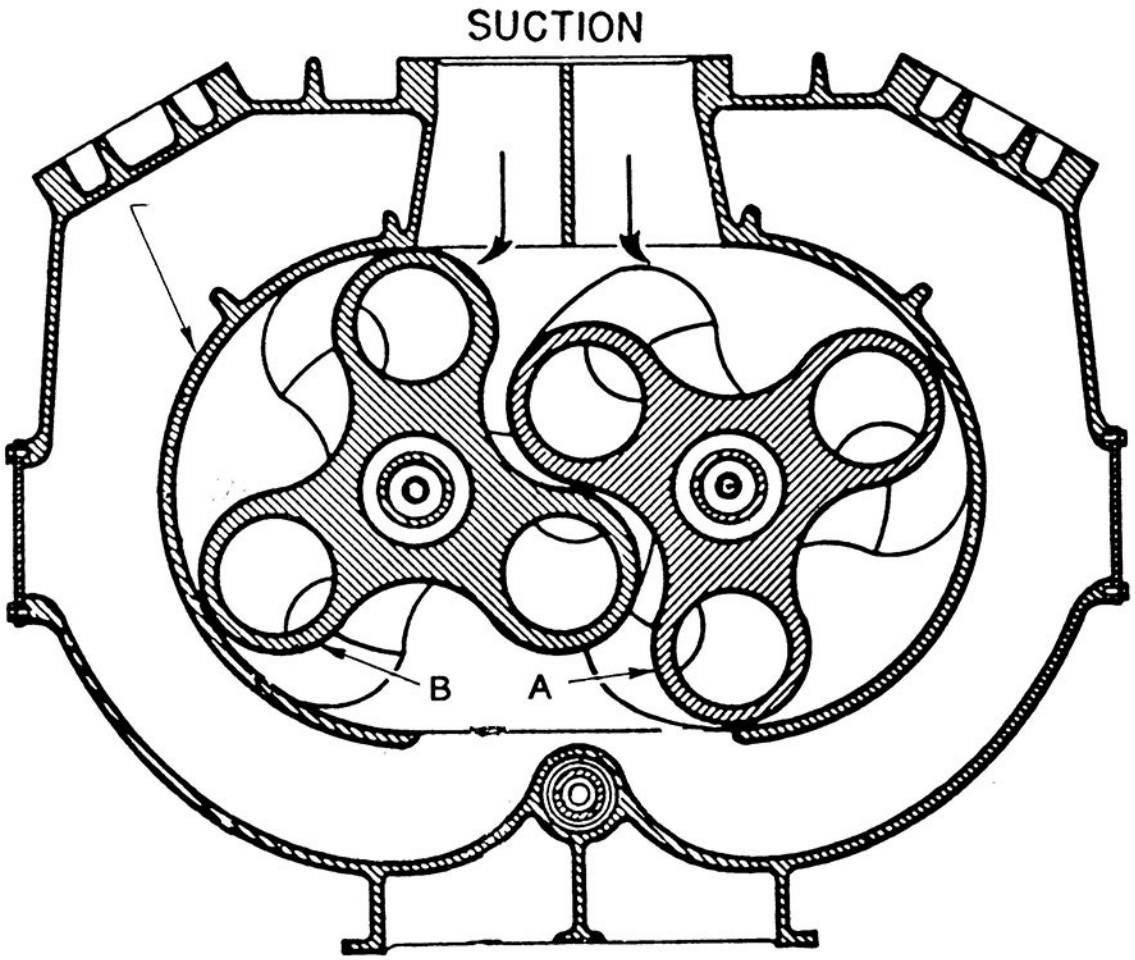


MO-0082



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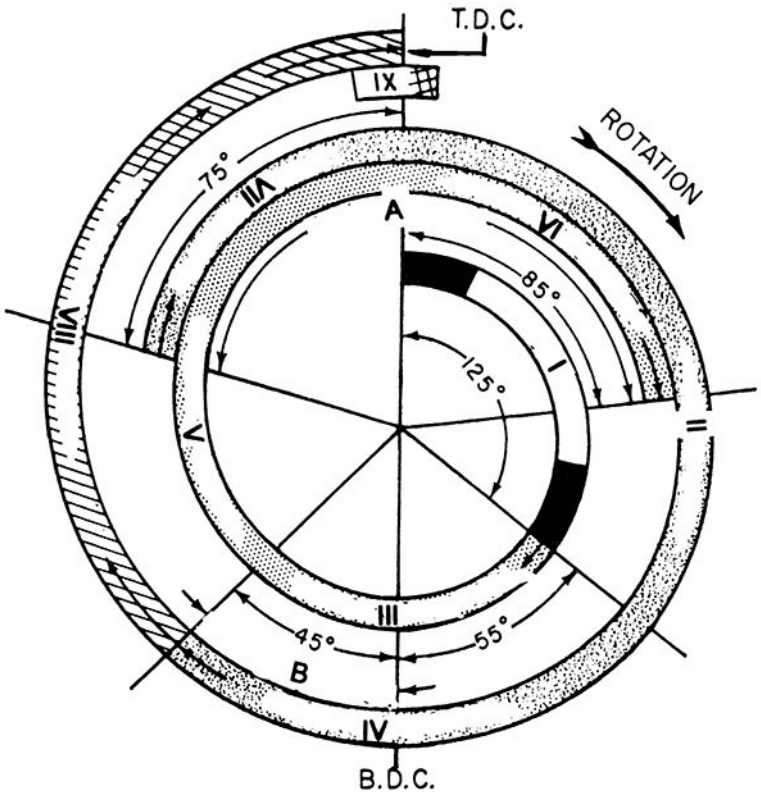

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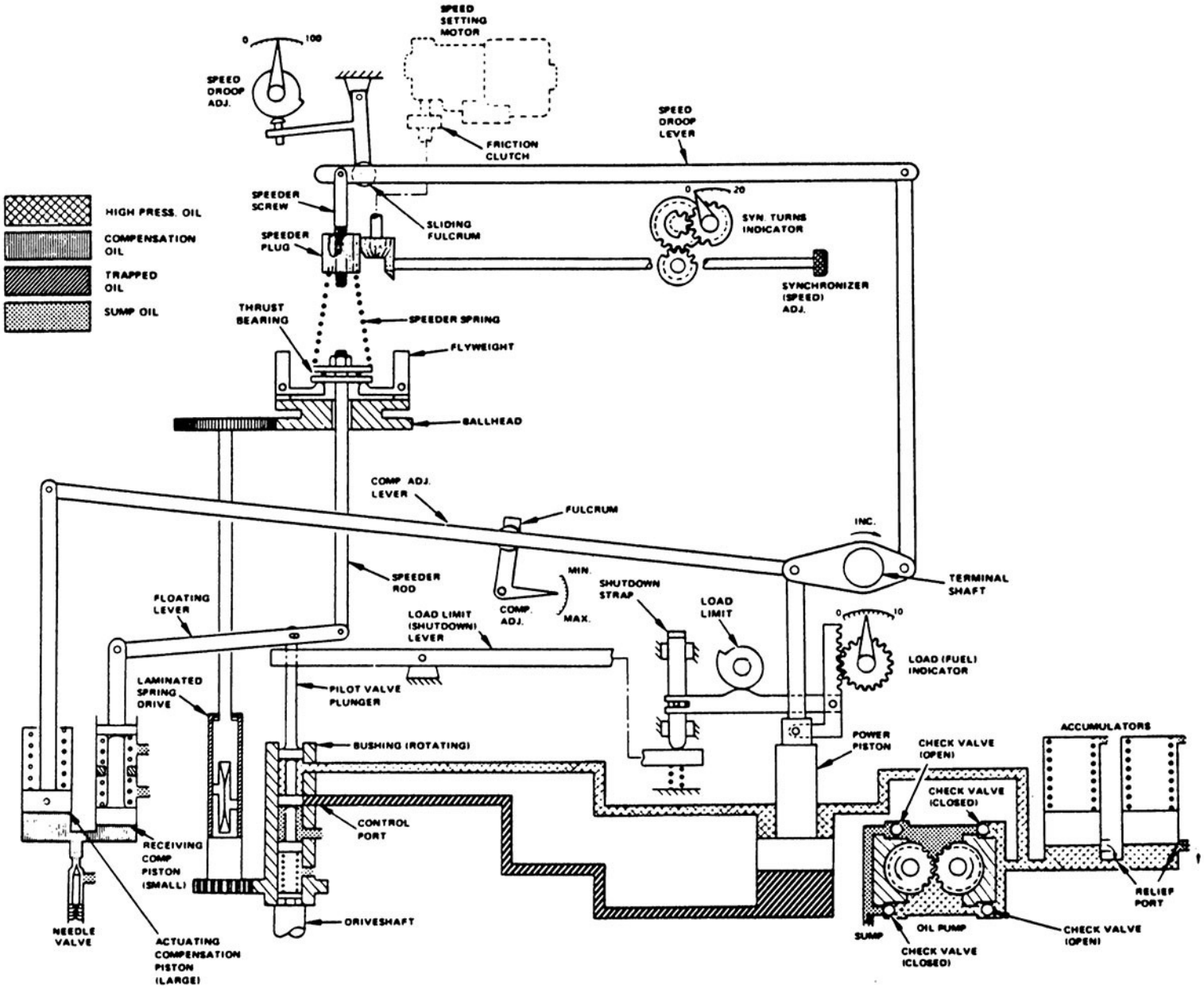
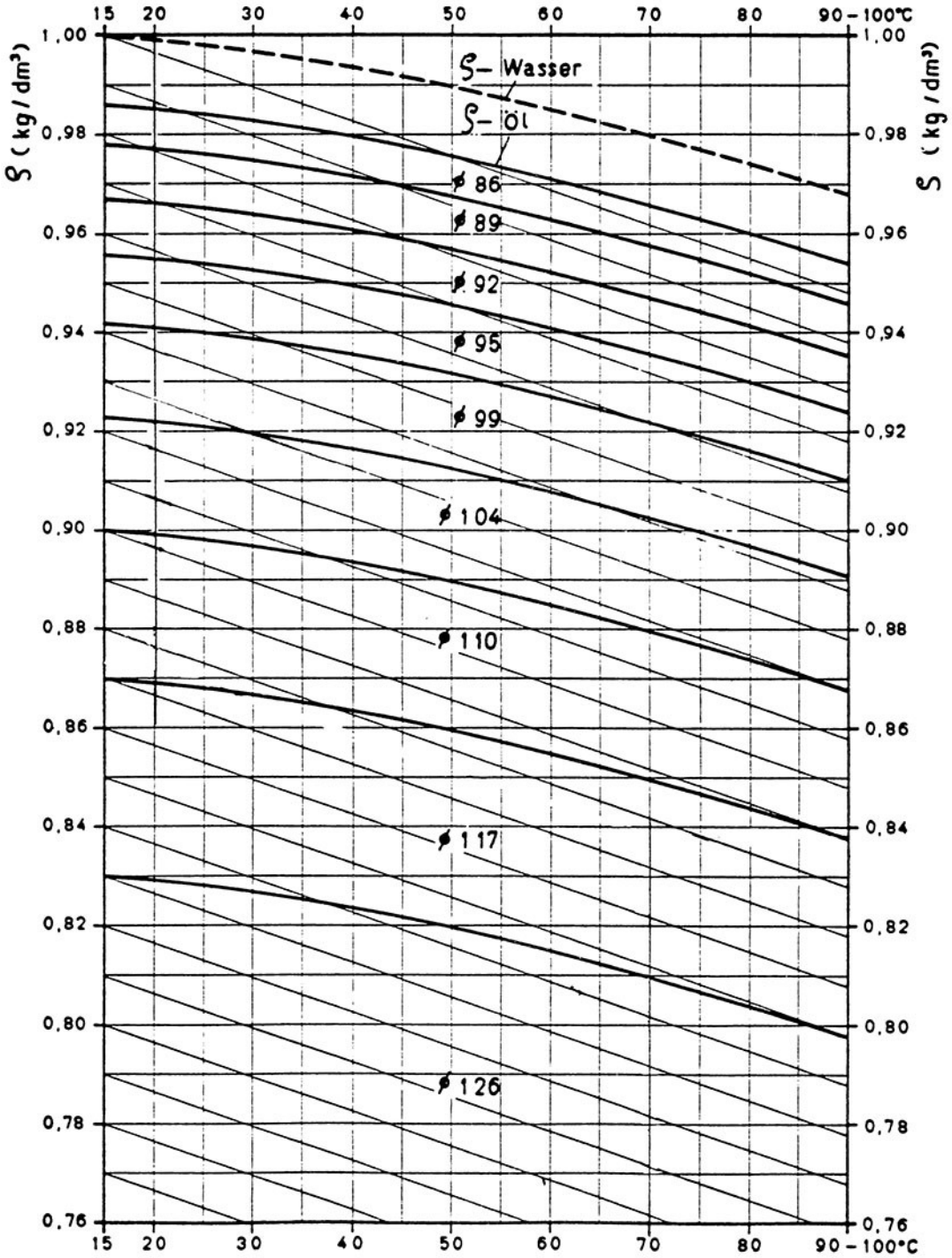


MO-0113



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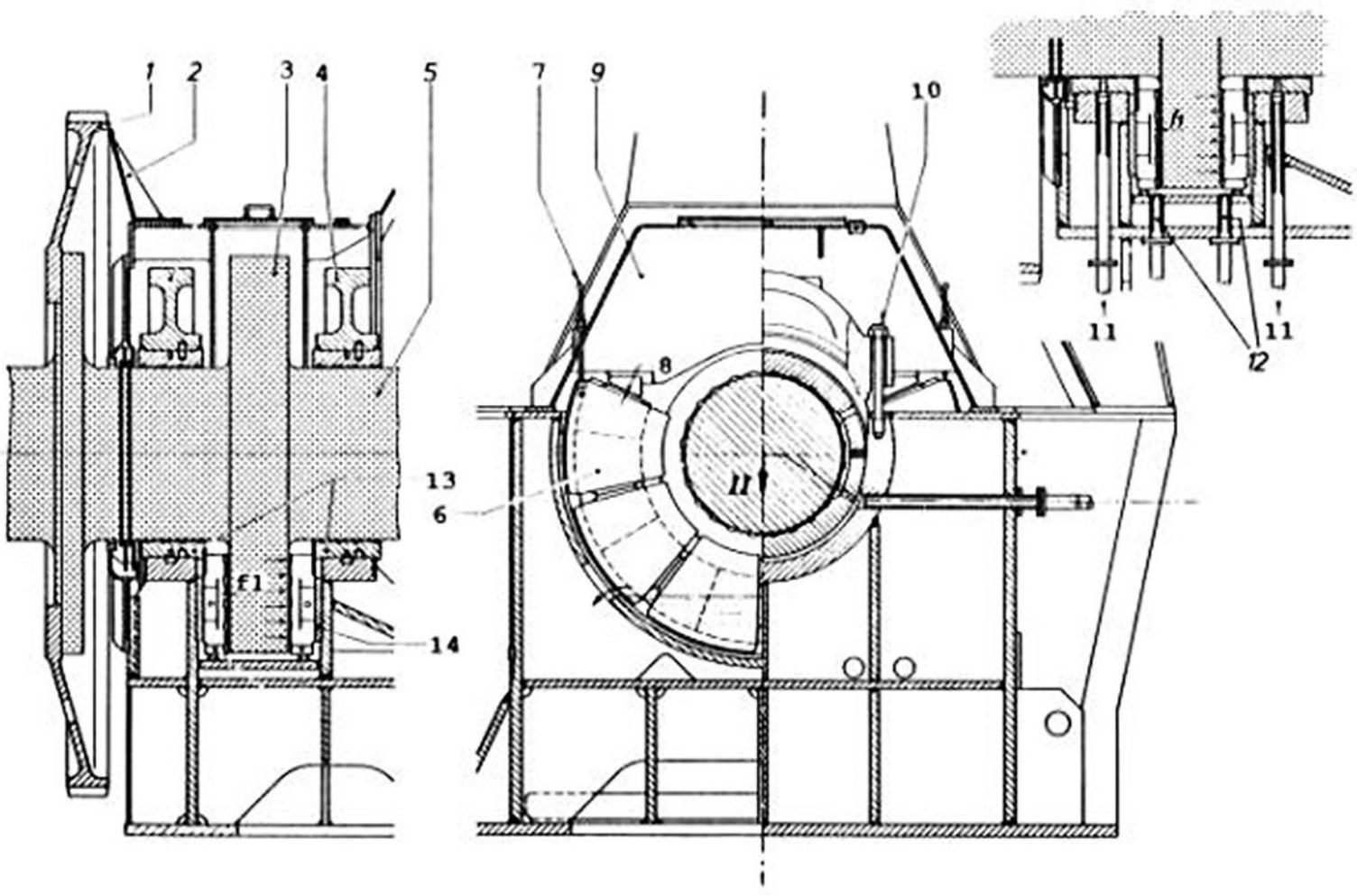

MO-0122