

U.S.C.G. Merchant Marine Exam

Chief Engineer-UFIV

Q694 Motor Plants

(Sample Examination)

Choose the best answer to the following Multiple Choice Questions.

1. What type of engine lubrication oil filter system sends filtered oil directly to the high-pressure supply gallery?

- (A) shunt system
- (B) batch system
- (C) centrifugal purifier system
- (D) bypass system

If choice A is selected set score to 1.

2. On a diesel-propelled vessel operating with constant slip, what is the effect on fuel consumption with an increase in shaft RPM?

- (A) fuel consumption varies as the square of the shaft RPM
- (B) fuel consumption varies directly proportional to the shaft RPM
- (C) fuel consumption varies as the cube of the shaft RPM
- (D) fuel consumption varies inversely with the shaft RPM

If choice C is selected set score to 1.

3. Trunk type diesel engine pistons are effectively cooled when heat is _____.

- (A) radiated through the engine block
- (B) transferred to water cooled cylinder walls
- (C) conducted through the piston crown
- (D) transferred to escaping exhaust gases

If choice B is selected set score to 1.

4. Misalignment of the drive shaft and propeller shaft flanges can be detected by using a dial indicator or _____.

- (A) inside micrometer
- (B) sighting device
- (C) feeler gage
- (D) adjustable trammel

If choice C is selected set score to 1.

5. Following the failure of one turbocharger on a propulsion diesel engine, fitted with multiple turbochargers, which of the following actions should be taken prior to further operation of the engine?
- (A) Lock the rotor of the damaged turbocharger.
 - (B) Secure cooling and lubrication to the damaged turbocharger.
 - (C) Blank off the exhaust gas inlet to the damaged turbocharger.
 - (D) All of the above.

If choice D is selected set score to 1.

6. Worn main bearings will cause the compression ratio of a diesel engine to _____.
- (A) increase
 - (B) decrease
 - (C) increase on compression; decrease on expansion
 - (D) remain the same

If choice B is selected set score to 1.

7. Which statement about diesel engine combustion is true?
- (A) Maximum combustion pressure is reached before TDC.
 - (B) Combustion does not begin until the piston starts down on the power stroke.
 - (C) Turbulence in the cylinder causes a delay in ignition.
 - (D) Maximum cylinder firing pressure is not developed until the piston passes TDC.

If choice D is selected set score to 1.

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

If choice A is selected set score to 1.

9. If a crankcase explosion due to a hot spot were to occur, the size of the explosion is dependent on which of the following?
- (A) The temperature of the hot spot in the crankcase.
 - (B) The amount of debris in the oil in the crankcase.
 - (C) The ratio of oil mist to air in the crankcase.
 - (D) The amount of water in the oil in the crankcase.

If choice C is selected set score to 1.

10. What is a major initial ramification of receiving bunkers with a water content of 0.75% by volume?

- (A) Vessel will have to use additional efforts to reduce the water content, the oily-water separators can deal with the discharge waste water.
- (B) Economic loss of receiving less fuel, by volume, but still within ISO 8217:2010 fuel specifications.
- (C) Loss of specific heating value of fuel's thus effecting fuel consumption and engine efficiency, as well as an economic loss.
- (D) All water may be dealt with by proper use of centrifuges, thus not a significant onboard or economic/engineering problem.

If choice C is selected set score to 1.

11. Exhaust valve timing for the engine, shown in the illustration, is to be set at 106° after top dead center. To what position should the flywheel be rotated to set the exhaust valve timing on the No.11 cylinder? Illustration MO-0039

- (A) 61°
- (B) 209°
- (C) 315°
- (D) 360°

If choice A is selected set score to 1.

12. Regularly taken indicator cards on a diesel engine provides relative engine performance data allowing engineers to compare to previous data and manufacturer's design. What are the two most important parameters obtained from reading the indicator cards?

- (A) Pmax and Pcomp.
- (B) Pmax and injection delay.
- (C) Pmax and scavenging air pressure.
- (D) Pcomp and injection timing.

If choice A is selected set score to 1.

13. Which of the following statements is correct concerning the operating function of the governor shown in the illustration? Illustration MO-0096

- (A) Excess oil under high-pressure is released from the spring loaded accumulators to the sump.
- (B) The speed droop lever spring prevents the engine from racing or hunting by arresting the movement of the power piston after a speed change.
- (C) The dial type adjusting knob (B) is used for setting speed droop and damping out hunting.
- (D) The compensating mechanism provides positive control to lower engine speed as load is increased.

If choice A is selected set score to 1.

14. High-speed, multi-cylinder, diesel engines commonly use counterweights placed opposite to the crankpins to _____.

- (A) prevent bearing loads
- (B) provide dynamic balance by equalizing centrifugal force
- (C) counteract inertia forces
- (D) provide a balance of rocking couples around the crankshaft

If choice B is selected set score to 1.

15. Which of the following statements would apply when checking the valve clearance of the unit shown in the illustration? Illustration MO-0074

- (A) The valve is mechanically adjusted at point "D".
- (B) The valve is mechanically adjusted at point "E".
- (C) Tappet clearance is measured between points "A" and "B".
- (D) Cold valve clearance is measured between components "C" and "D".

If choice D is selected set score to 1.

16. High firing pressures and a low exhaust temperature in a diesel engine may result from _____.

- (A) increased exhaust system back pressure
- (B) early fuel injection timing
- (C) early exhaust valve opening
- (D) low scavenge air temperature

If choice B is selected set score to 1.

17. During the valve overlap period, the exhaust pressure of a turbocharged, four-stroke cycle diesel engine must be less than the intake manifold pressure to ensure _____.

- (A) effective constant pressure for turbocharger operation
- (B) effective cylinder scavenging and cooling
- (C) constant pressure from the turbochargers
- (D) cooler operation of the exhaust system

If choice B is selected set score to 1.

18. Poor combustion in a diesel engine can be caused by _____.

- (A) high scavenge air pressure
- (B) low exhaust pressure
- (C) low compression temperature
- (D) high compression pressure

If choice C is selected set score to 1.

19. What is the maximum allowable clearance permitted between the bearing, shown in the illustration and the shaft along its vertical axis? Illustration MO-0121

- (A) 0.30 mm
- (B) 0.46 mm
- (C) 0.80 mm
- (D) 1.00 mm

If choice C is selected set score to 1.

20. The device labeled "D", as shown in the illustration, is the bowl _____. Illustration MO-0112

- (A) top
- (B) hood
- (C) hub
- (D) cover

If choice A is selected set score to 1.

21. The service life of a worn aluminum piston for an auxiliary diesel, for which no spares are readily available, can be extended by _____.

- (A) knurling the piston skirt surface
- (B) increasing the dimensions of the ring land grooves
- (C) building up the piston skirt with a liquid epoxy material and then re-machining
- (D) turning down the piston skirt to concentric values

If choice A is selected set score to 1.

22. What will cause valve stem blow-by to the valve section shown in the illustration? Illustration MO-0030

- (A) A cracked lower spring plate.
- (B) Worn, broken or stuck compression rings.
- (C) Damaged rubber rings on the valve seat insert.
- (D) Defective rubber seal rings in the valve guides.

If choice D is selected set score to 1.

23. Oil accumulating in the exhaust piping or manifold of a diesel engine can be caused by _____.

- (A) collapsed hydraulic valve lifters
- (B) worn valve guides
- (C) excessive crankcase vacuum
- (D) excessive lube oil pressure

If choice B is selected set score to 1.

24. Uneven bolt tightening during the installation of a fuel injection pump can result in _____.

- (A) high torsional shock to fuel lines
- (B) ignition delay
- (C) binding of pump moving parts
- (D) improper pump-to-engine timing

If choice C is selected set score to 1.

25. The purpose of an oil mist detector in a main propulsion diesel engine is to warn of _____.

- (A) a possible overheated bearing
- (B) low cylinder oil pressure
- (C) excessively high crankcase vacuum
- (D) excessive carbon buildup in the lube oil

If choice A is selected set score to 1.

26. A large change in ambient temperature, or using an oil of a viscosity different than the one recommended by the manufacturer in a mechanical hydraulic governor, will result in the need to adjust the _____.

- (A) accumulator spring tension
- (B) compensating needle valve
- (C) pilot valve opening
- (D) compensating spring tension

If choice B is selected set score to 1.

27. Which of the following devices will increase the power output of a diesel engine without increasing its frictional load?

- (A) Gear-driven centrifugal blower
- (B) Turbine-driven centrifugal blower
- (C) Roots-type rotary blower
- (D) Positive displacement blower

If choice B is selected set score to 1.

28. 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.

29. The intake and exhaust valves used in a diesel engine are returned to their seats by _____.

- (A) combustion pressure
- (B) push rod pressure
- (C) exhaust pressure
- (D) spring force

If choice D is selected set score to 1.

30. Which construction detail is apparent in the connecting rod and piston assembly shown in the illustration? Illustration MO-0011

- (A) The piston is designed with a heat dam.
- (B) It is a fork assembly.
- (C) The piston is water cooled.
- (D) The wrist pin is free floating.

If choice A is selected set score to 1.

31. Which of the following conditions is indicated by the presence of water in the scavenging air receiver?

- (A) Excessively high scavenge air temperature
- (B) Leaking after cooler
- (C) Leaking cylinder head gaskets
- (D) Auxiliary blower failure

If choice B is selected set score to 1.

32. Which of the following effects will excessively cold lube oil have on the operation of a diesel engine?

- (A) The engine will crank slowly and may fail to start.
- (B) The cooling system will overheat causing the engine to stall.
- (C) The engine will over speed when started.
- (D) The fuel oil supply will become diluted resulting in rough running.

If choice A is selected set score to 1.

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

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

If choice C is selected set score to 1.

34. In a two cycle diesel engine, a Roots-type blower is usually _____.

- (A) gear driven by the engine
- (B) driven by separate motor
- (C) actuated by the intake valves
- (D) driven by an exhaust gas turbine

If choice A is selected set score to 1.

35. When an additional load is applied to a diesel engine which is using an air bladder clutch unit that is inadequately inflated, you can expect _____.

- (A) chipped reduction gear teeth
- (B) overheating because of slipping shoes
- (C) pneumatic seizure
- (D) excessive wear on the thrust bearings

If choice B is selected set score to 1.

36. The principal hazard to personnel when using a diesel engine fuel nozzle tester is _____.

- (A) electrical shock
- (B) toxic fumes
- (C) explosion
- (D) blood poisoning

If choice D is selected set score to 1.

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

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

If choice C is selected set score to 1.

38. The purpose of the compensating adjustment used in a diesel engine hydraulic governor is to _____.

- (A) compensate for low oil level
- (B) increase governor promptness
- (C) limit engine load
- (D) prevent governor hunting

If choice D is selected set score to 1.

39. The illustration shown describes a _____. Illustration MO-0069

- (A) four-cycle opposed cylinder diesel engine
- (B) four-cycle opposed-piston diesel engine
- (C) two-cycle opposed cylinder diesel engine
- (D) two-cycle opposed-piston diesel engine

If choice D is selected set score to 1.

40. Governor hunting is caused by _____.

- (A) governor over-control
- (B) excessive speed droop
- (C) insufficient speed droop
- (D) governor under-control

If choice A is selected set score to 1.

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

If choice B is selected set score to 1.

42. Which of the following statements represents the function of the plunger flange labeled "A" shown in the illustration? Illustration MO-0061

- (A) It prevents the plunger from rotating in the barrel.
- (B) It limits the actual stroke of the plunger.
- (C) It takes the plunger off stroke when injection is completed.
- (D) It transmits the control rack setting to the plunger.

If choice D is selected set score to 1.

43. Which of the couplings listed is normally not repairable, and is usually replaced if completely damaged?

- (A) Flexible disk-ring coupling
- (B) Gear-type coupling
- (C) Block and jaw coupling
- (D) Grid spring coupling

If choice B is selected set score to 1.

44. One remedy for a high firing pressure, in addition to a high exhaust temperature in one cylinder of a diesel engine, is to _____.

- (A) adjust the fuel rack
- (B) retard fuel injector timing
- (C) reduce fuel booster pump pressure
- (D) increase scavenge air pressure

If choice A is selected set score to 1.

45. The component labeled "A" on the engine reversing device shown in the illustration performs its function by transmitting _____. Illustration MO-0125

- (A) a hydraulic pressure which shifts an alternate set of camshaft followers to ride on the engine camshaft
- (B) an electric voltage which energizes solenoids to de-clutch the engine
- (C) a fuel oil pressure signal which reverses the engine governor control cylinder
- (D) a pneumatic signal which activates a hydraulic control cylinder allowing the camshaft to shift axially

If choice D is selected set score to 1.

46. When is fuel injected into a cylinder of diesel engines?

- (A) After combustion gases in the cylinder have expanded.
- (B) As air is taken into the cylinder.
- (C) After air in the cylinder is compressed.
- (D) Before air in the cylinder is compressed.

If choice C is selected set score to 1.

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

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

If choice A is selected set score to 1.

48. A diesel-generator governor is hunting. After changing the oil, the governor is flushed and the compensation needle valve is adjusted, but the hunting persists. You should NOW _____.

- (A) set the speed droop adjustment to zero
- (B) calibrate the fuel pump rack settings
- (C) carefully check for binding in the governor linkage
- (D) check air intake manifold pressure

If choice C is selected set score to 1.

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

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

If choice D is selected set score to 1.

50. One cause of diesel engine surging can be a result of _____.

- (A) low compression
- (B) injection pump fuel rack binding or sticking
- (C) solenoid stuck open
- (D) fuel booster pump pressure too high

If choice B is selected set score to 1.

51. When two cams of the same diameter, one with tangential flanks and the other with convex flanks are compared, the cam with tangential flanks will cause _____.

- (A) less valve seat wear
- (B) greater valve lift
- (C) more abrupt valve action
- (D) less valve gear wear

If choice D is selected set score to 1.

52. Auxiliary diesel engine electric starting motors use _____.

- (A) low amperage, high voltage AC power
- (B) alternating current transformers
- (C) 400 cycle per second motor-generator power
- (D) battery power direct current

If choice D is selected set score to 1.

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

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

If choice C is selected set score to 1.

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

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

If choice A is selected set score to 1.

55. A sudden power loss from a turbocharged and after cooled diesel engine is an indication of a/an _____.

- (A) crankcase exhauster overload
- (B) obstruction in the engine cylinders
- (C) turbocharger malfunction or failure
- (D) overload on the intercooler

If choice C is selected set score to 1.

56. In a four-stroke cycle diesel engine, badly worn intake valve guides can cause excessive _____.

- (A) cooling water temperatures
- (B) lube oil consumption
- (C) exhaust pressure
- (D) exhaust temperatures

If choice B is selected set score to 1.

57. Which of the following statements is true concerning the air starting valve, labeled "III", as shown in the illustration? Illustration MO-0046

- (A) When starting, the air starting valve is held open by air pressure.
- (B) When starting air is secured, the air starting valve is closed.
- (C) During normal engine running, the air starting valve opens and closes constantly due to cam action.
- (D) The air starting valve is opened by cam action.

If choice D is selected set score to 1.

58. The over speed trip installed on most diesel engines will stop the engine by shutting off the _____.

- (A) exhaust damper
- (B) lube oil supply
- (C) water supply
- (D) fuel and/or air supply

If choice D is selected set score to 1.

59. What is the best way of stopping an over speeding diesel engine?

- (A) Disconnect the battery cables from the starting motor.
- (B) Drain the hydraulic fluid from the governor sump.
- (C) Block the flow of cooling air to the radiator.
- (D) Secure the fuel supply and block the air intake.

If choice D is selected set score to 1.

60. 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) air starting control valve
- (C) individual distribution valves
- (D) high-pressure in the starting air manifold

If choice A is selected set score to 1.

61. Worn diesel engine intake valve guides can result in _____.

- (A) increased engine breathing efficiency
- (B) excessive valve lash
- (C) excessive lube oil consumption
- (D) lower than normal fuel consumption

If choice C is selected set score to 1.

62. The pinion gear shown in the illustration is located _____. Illustration MO-0086

- (A) below #1 and #3
- (B) between #1 and #3
- (C) below #2 and #4
- (D) between #2 and #4

If choice B is selected set score to 1.

63. Injection pressure in a common rail fuel system is controlled by _____.

- (A) a bypass valve
- (B) varying the injector needle valve clearance
- (C) engine speed
- (D) varying the fuel pump piston stroke

If choice A is selected set score to 1.

64. Direct reversible main propulsion diesel engines would normally be fitted with a/an _____.

- (A) isochronous hunting governor
- (B) constant speed governor
- (C) nutating disk governor
- (D) variable speed governor

If choice D is selected set score to 1.

65. As shown in the illustration of the fuel injection pump, the section designated as "M" is referred to as the _____. Illustration MO-0061

- (A) plunger helix
- (B) plunger relief shoulder
- (C) plunger control tab
- (D) plunger sleeve

If choice A is selected set score to 1.

66. In an auxiliary diesel engine, one reason for knurling the piston skirt is to _____.

- (A) improve skirt lubrication
- (B) transmit forces evenly
- (C) allow for heat expansion
- (D) improve the piston seal

If choice A is selected set score to 1.

67. Which of the listed items should be secured before performing any maintenance on a solenoid operated air start valve?

- (A) Electric power and starting air
- (B) Lube oil standby pump and control air
- (C) Hydraulic switch and engage jacking gear
- (D) Motor drain and pneumatic control system power

If choice A is selected set score to 1.

68. Problems with the diesel engine fuel injection pump are usually caused by _____.

- (A) kinked fuel lines
- (B) excessive engine vibration
- (C) improper adjustment
- (D) contaminated fuel

If choice D is selected set score to 1.

69. According to the illustration, which of the following is true? Illustration MO-0067

- (A) The shaker method is used for piston cooling.
- (B) The piston has four compression rings.
- (C) The piston has two oil scraper rings.
- (D) All of the above.

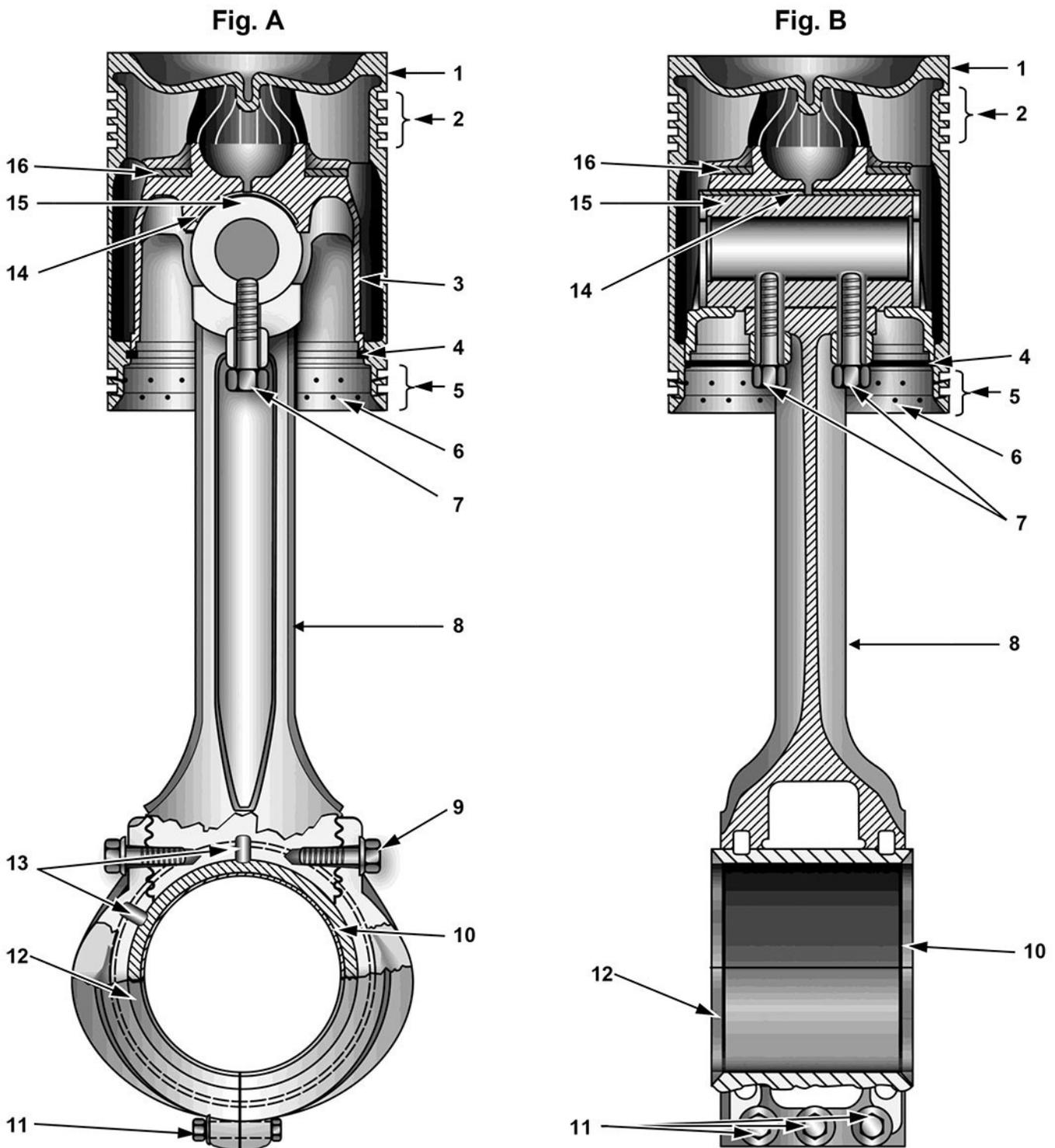
If choice D is selected set score to 1.

70. Which type of diesel engine fuel nozzle is shown in the illustration? Illustration MO-0059

- (A) Open
- (B) Pintle
- (C) Self-cleaning
- (D) Multi-hole

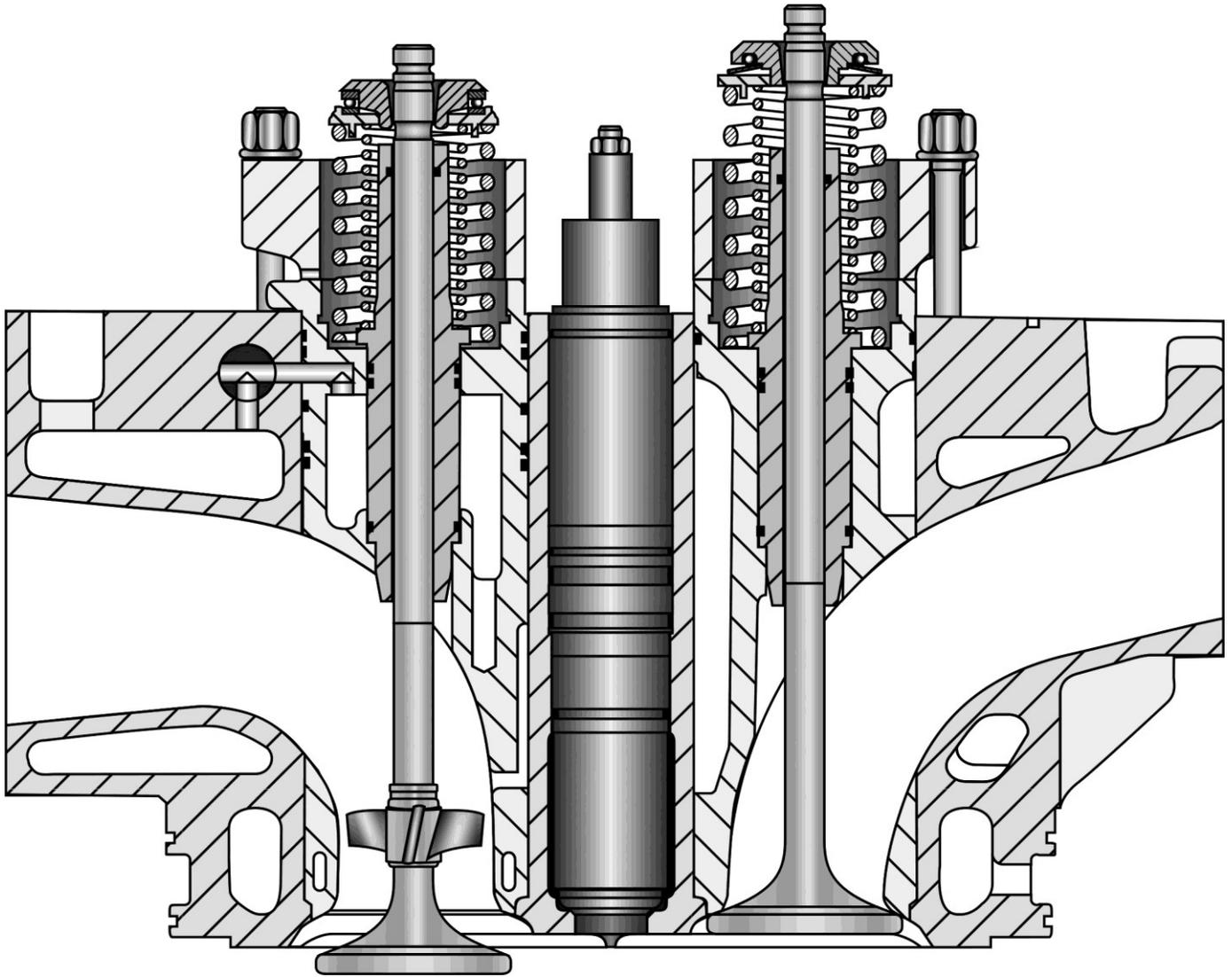
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MO-0011



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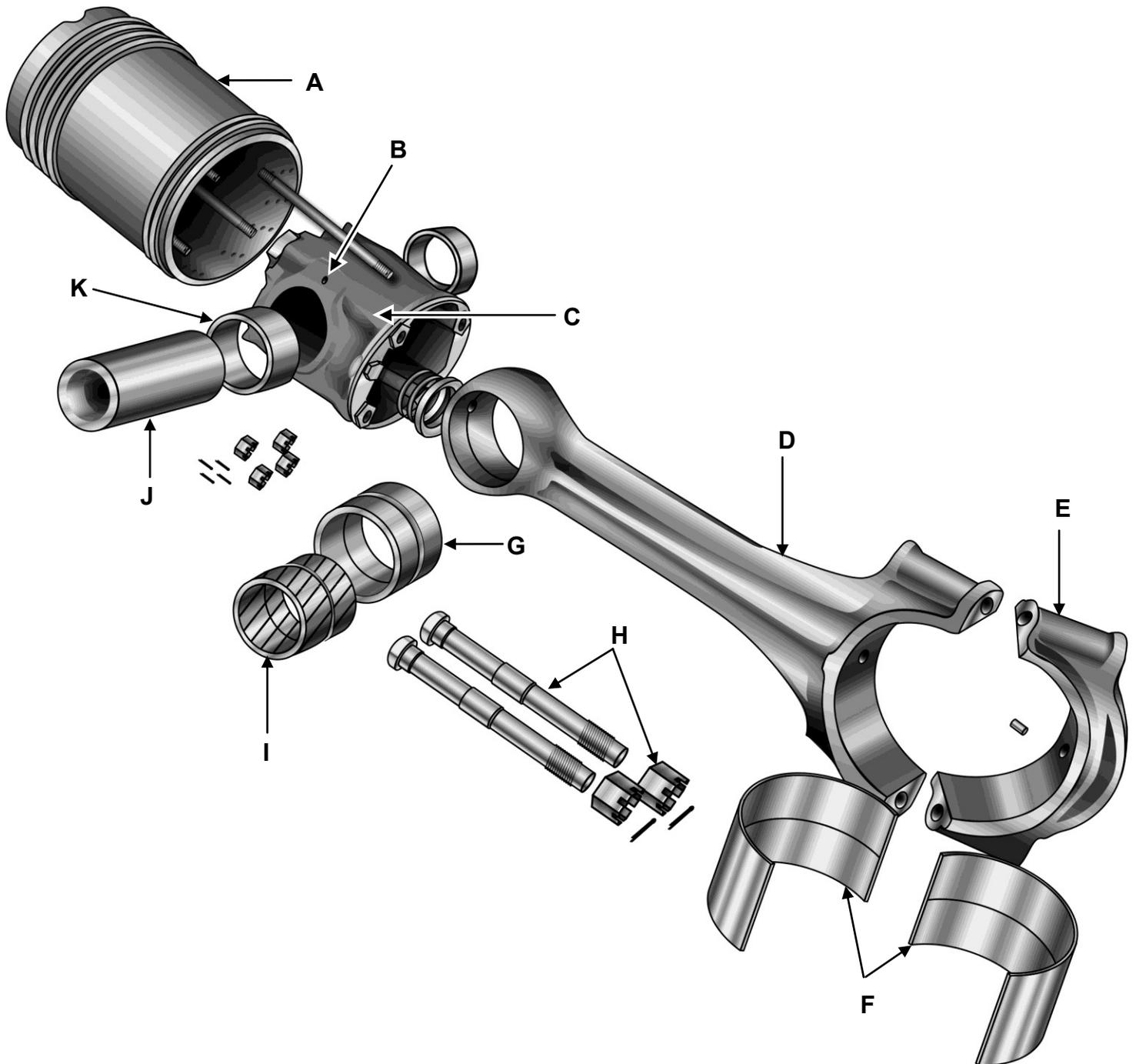
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MO-0039

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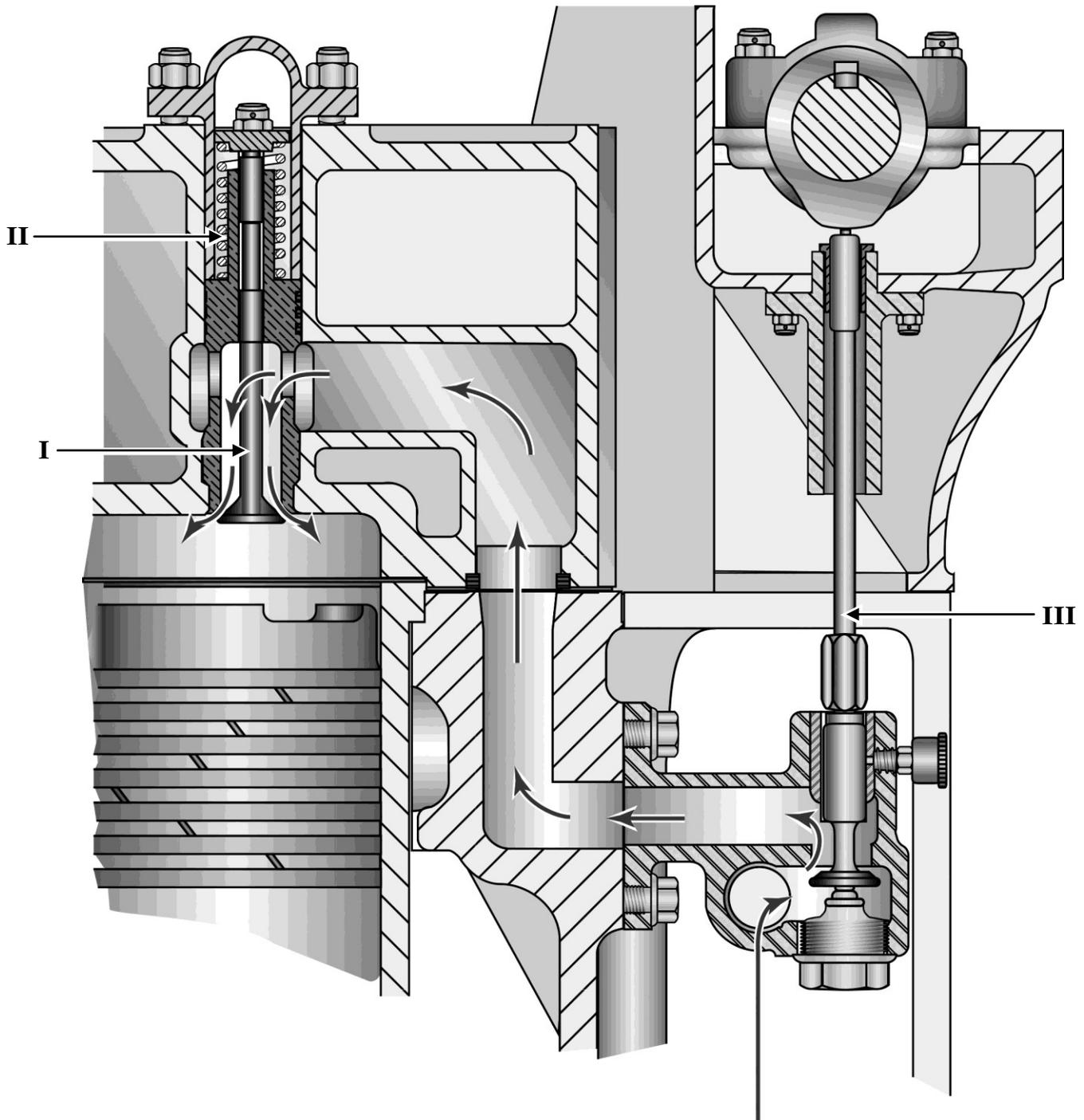
20-Cylinder	
Firing Order	Top Dead Center
1	0 DEGREES
14	27 “
9	36 “
16	63 ”
4	72 “
13	99 “
6	108 “
20	135 “
3	144 “
12	171 “
10	180 “
17	207 “
2	216 “
15	243 “
7	252 “
18	279 “
5	288 “
11	315 “
8	324 “
19	351 “

MO-0040



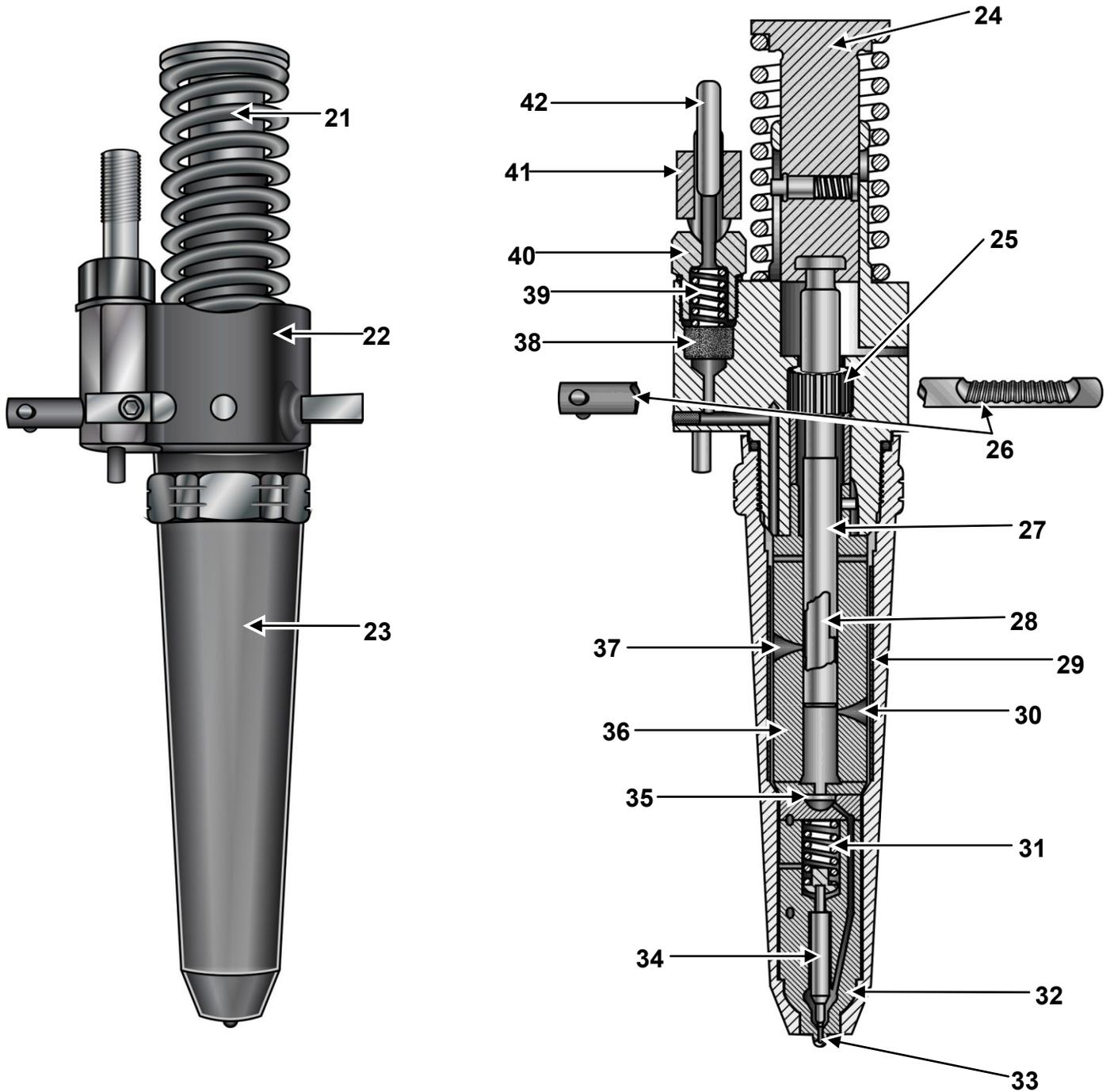
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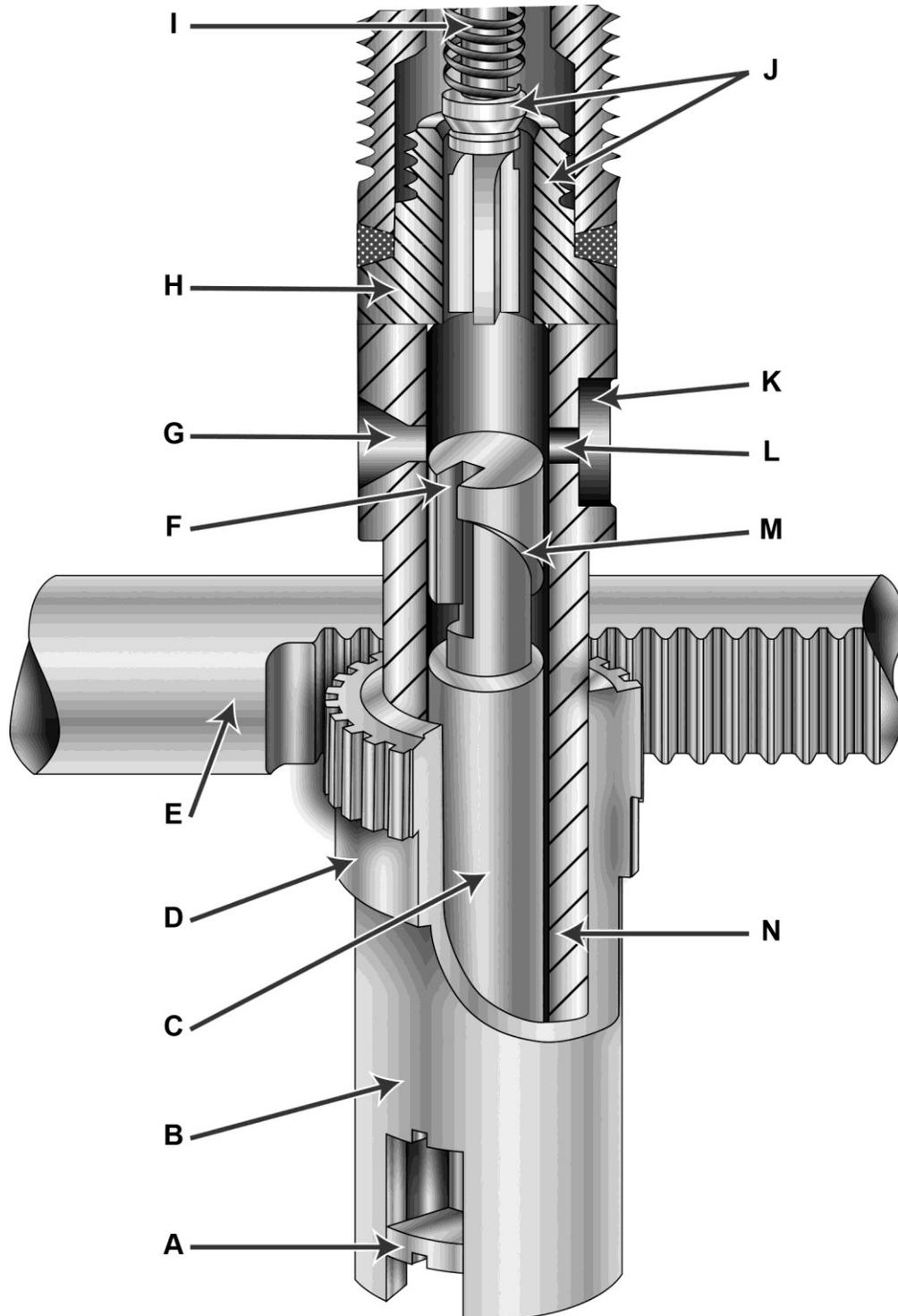
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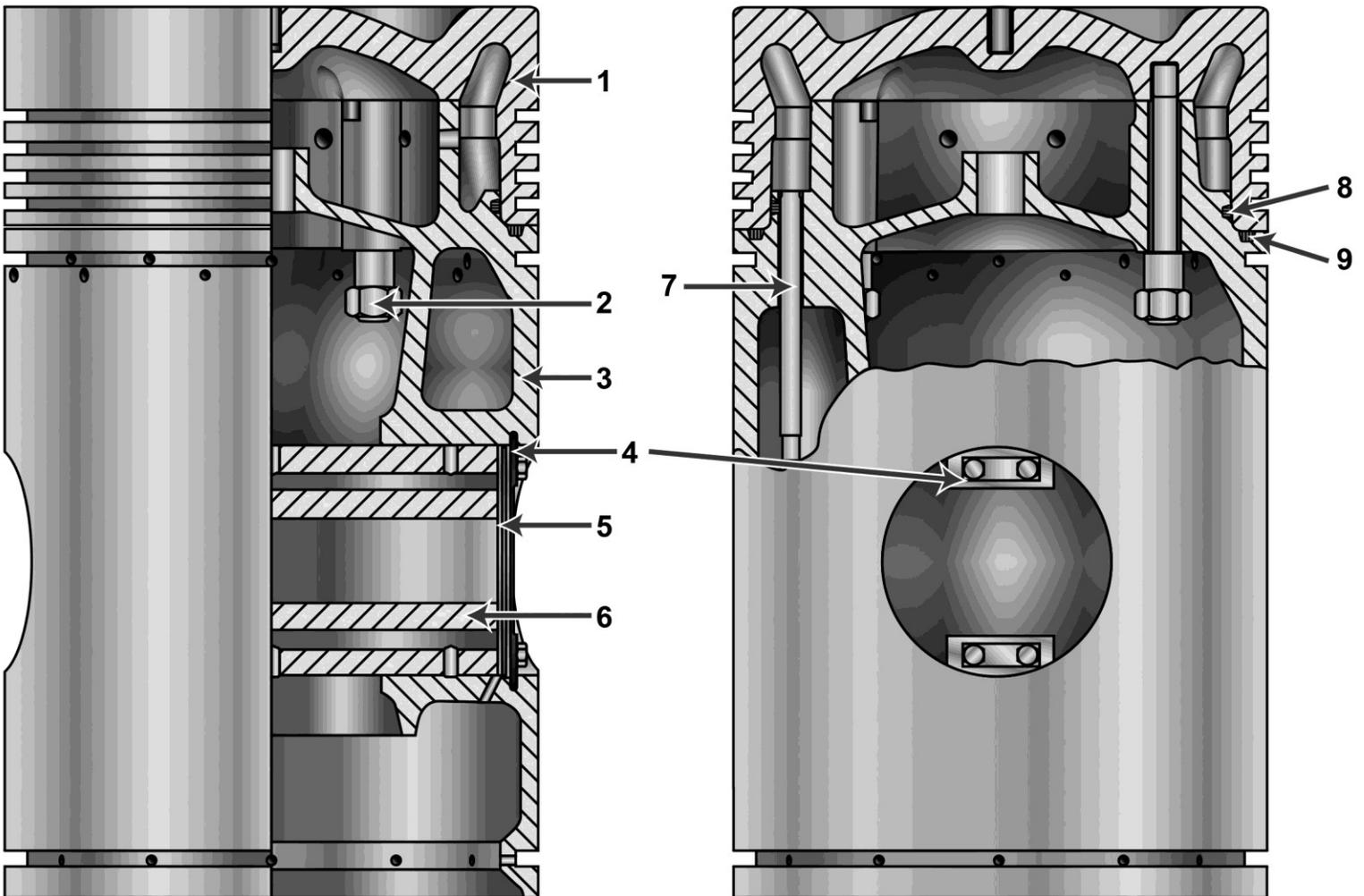
MO-0061



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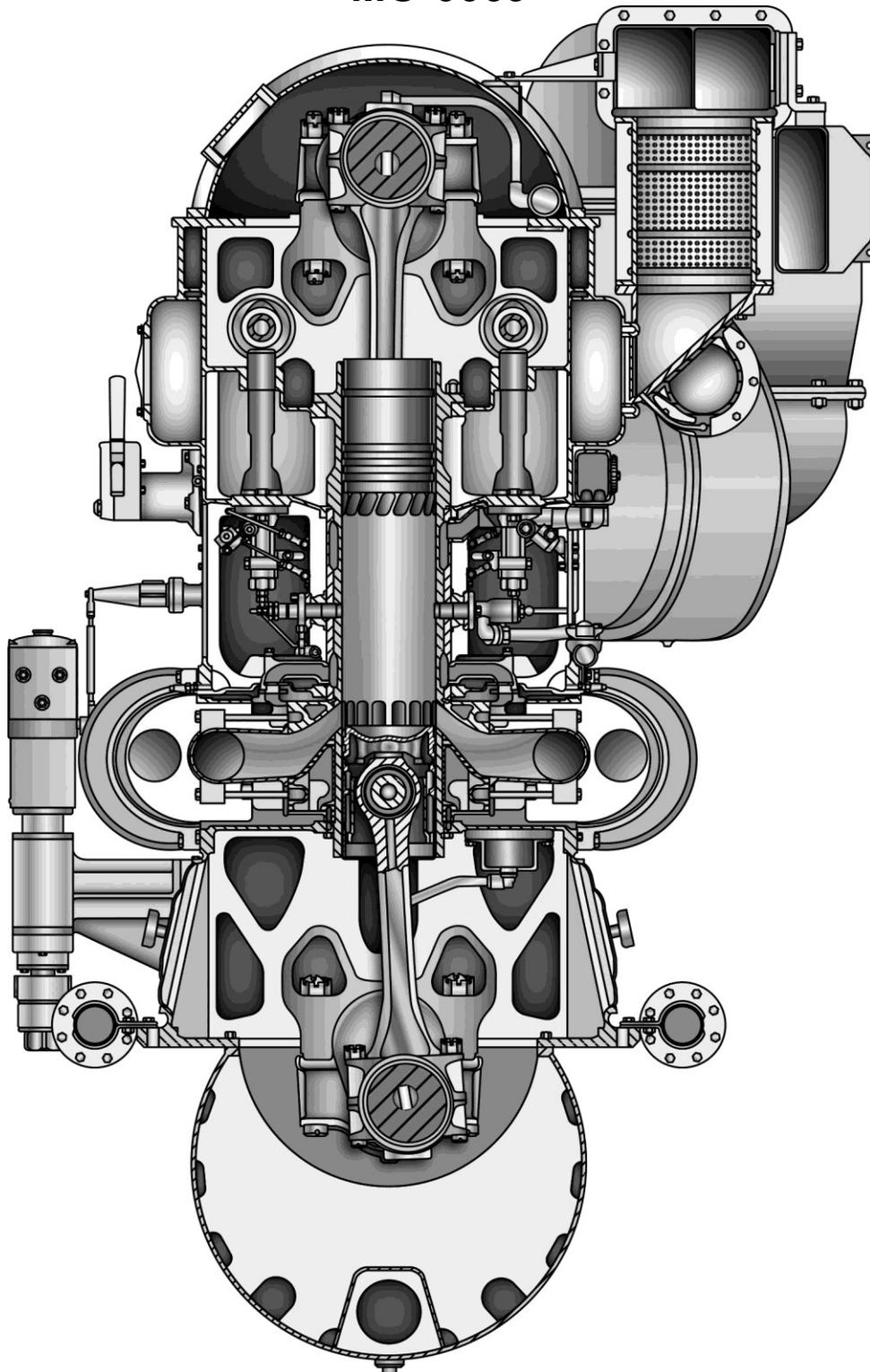
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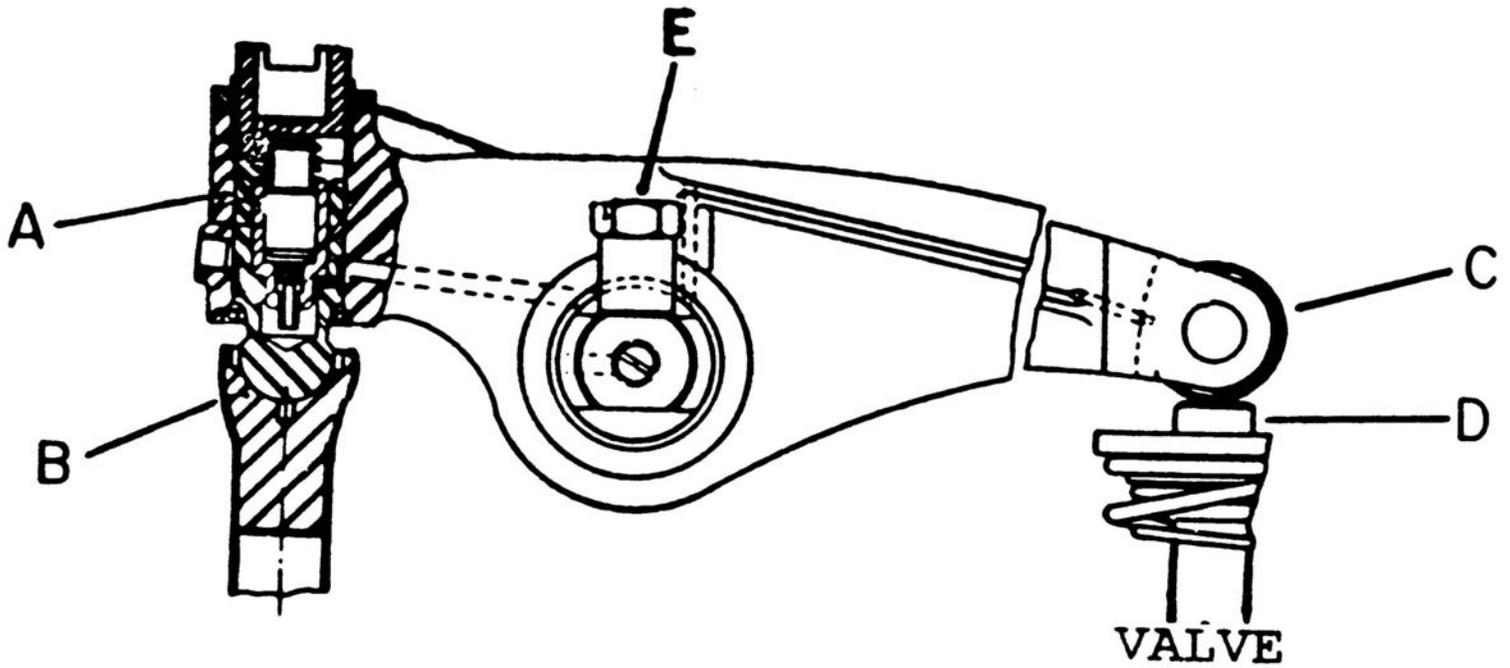


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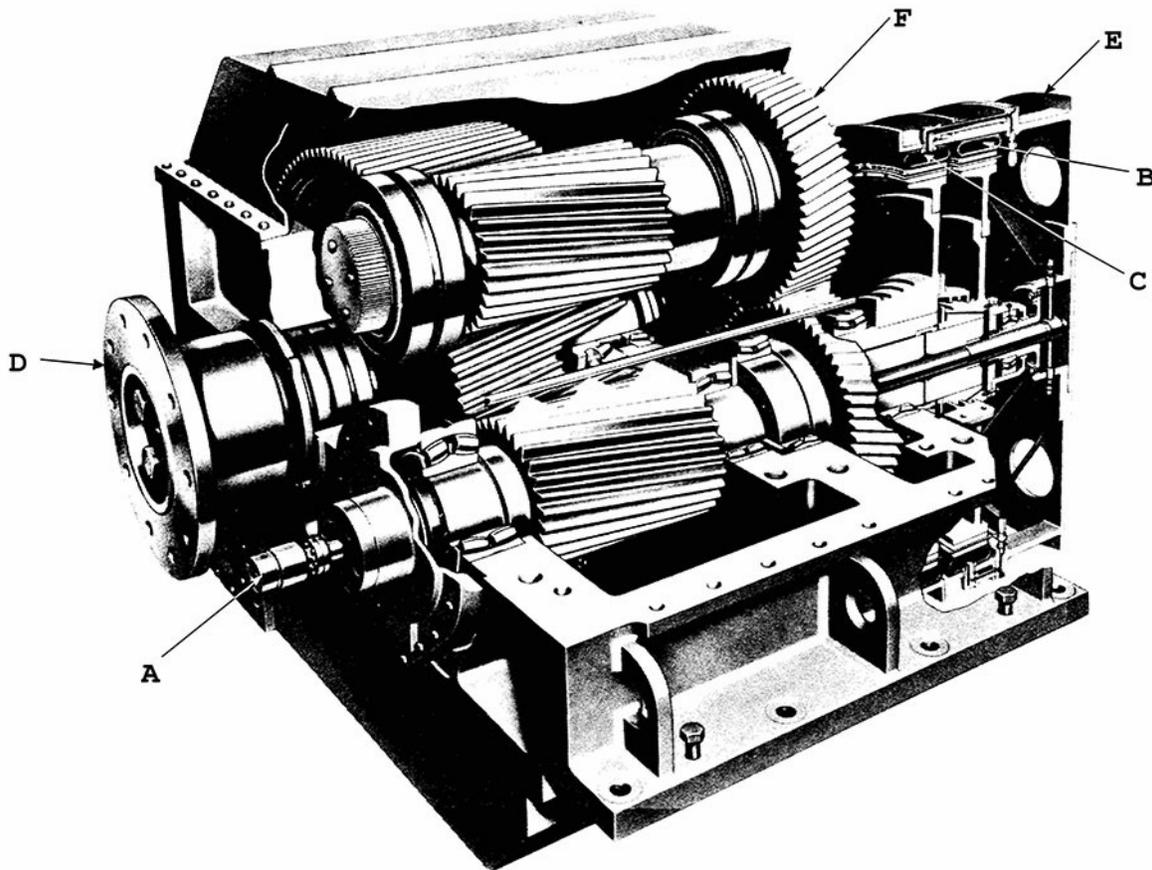
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MO-0074



MO-0085

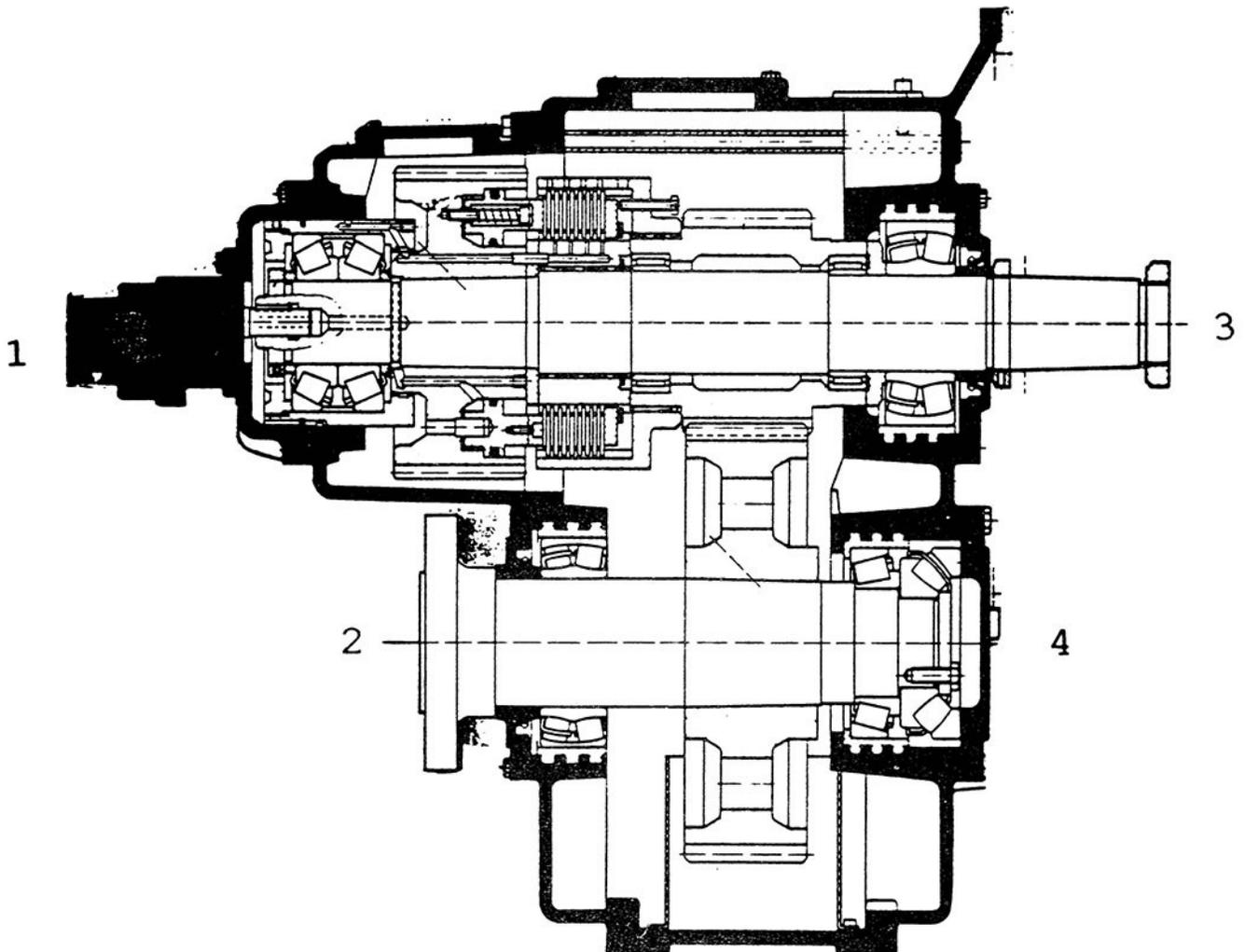


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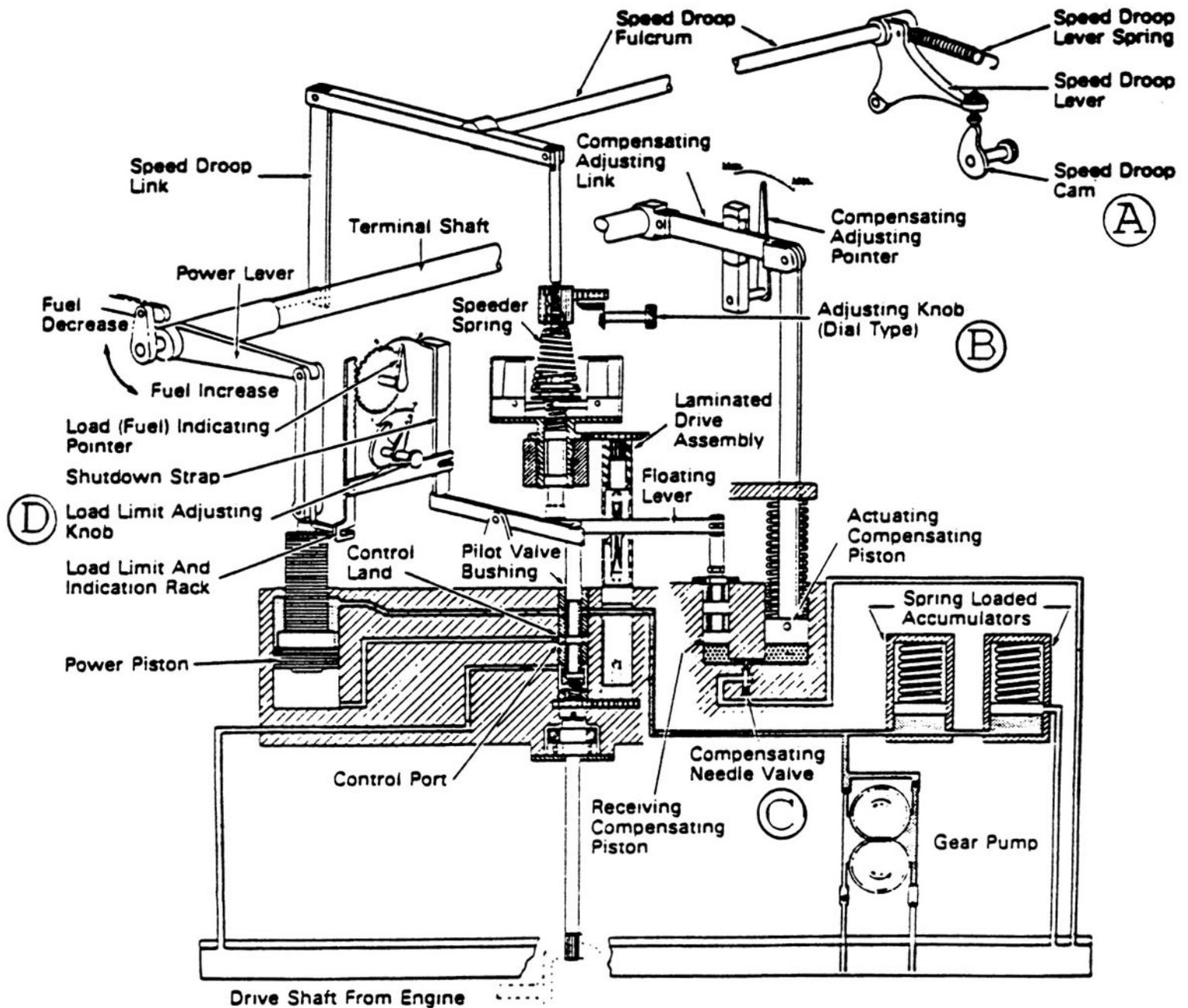
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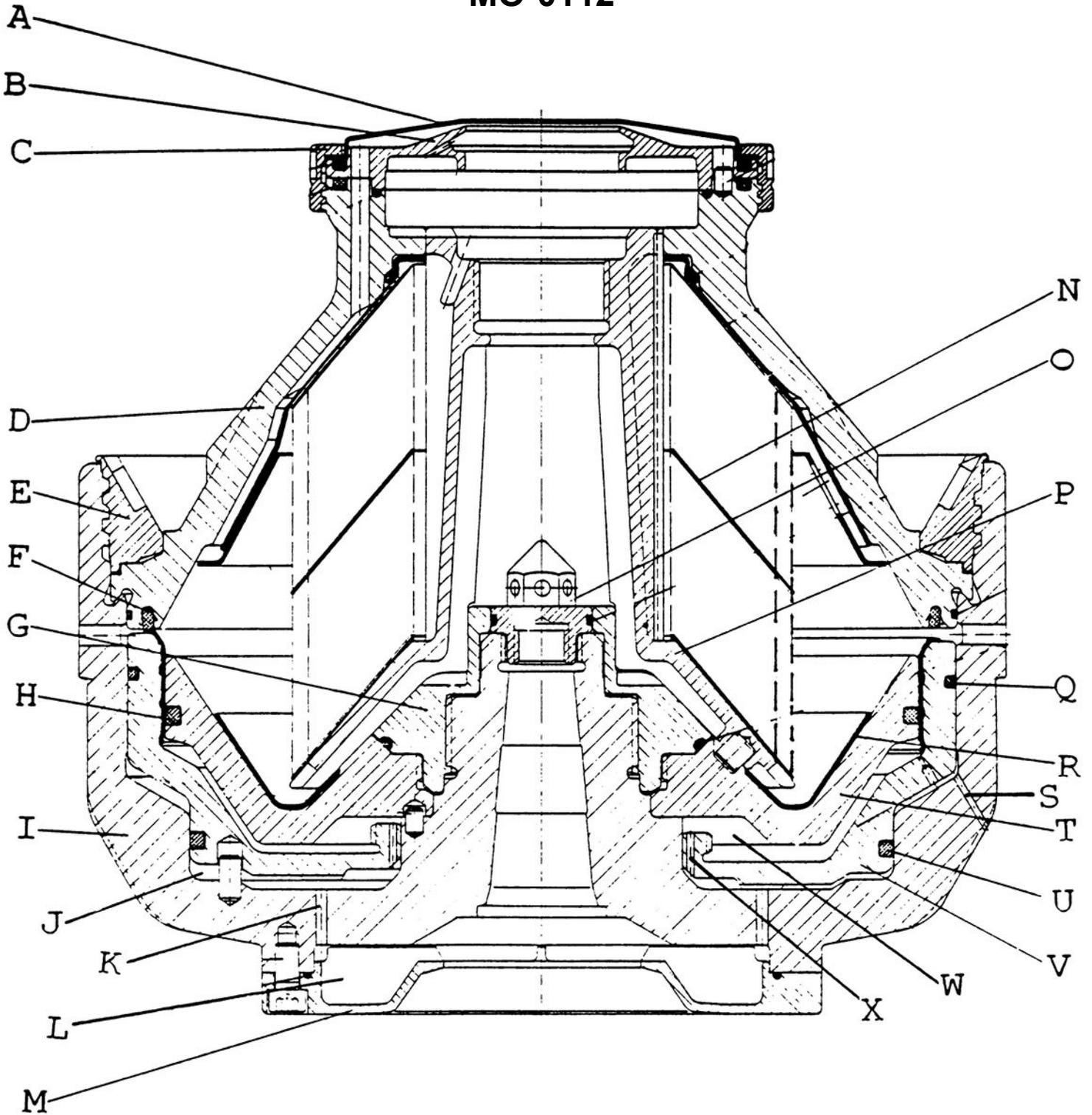
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MO-0112

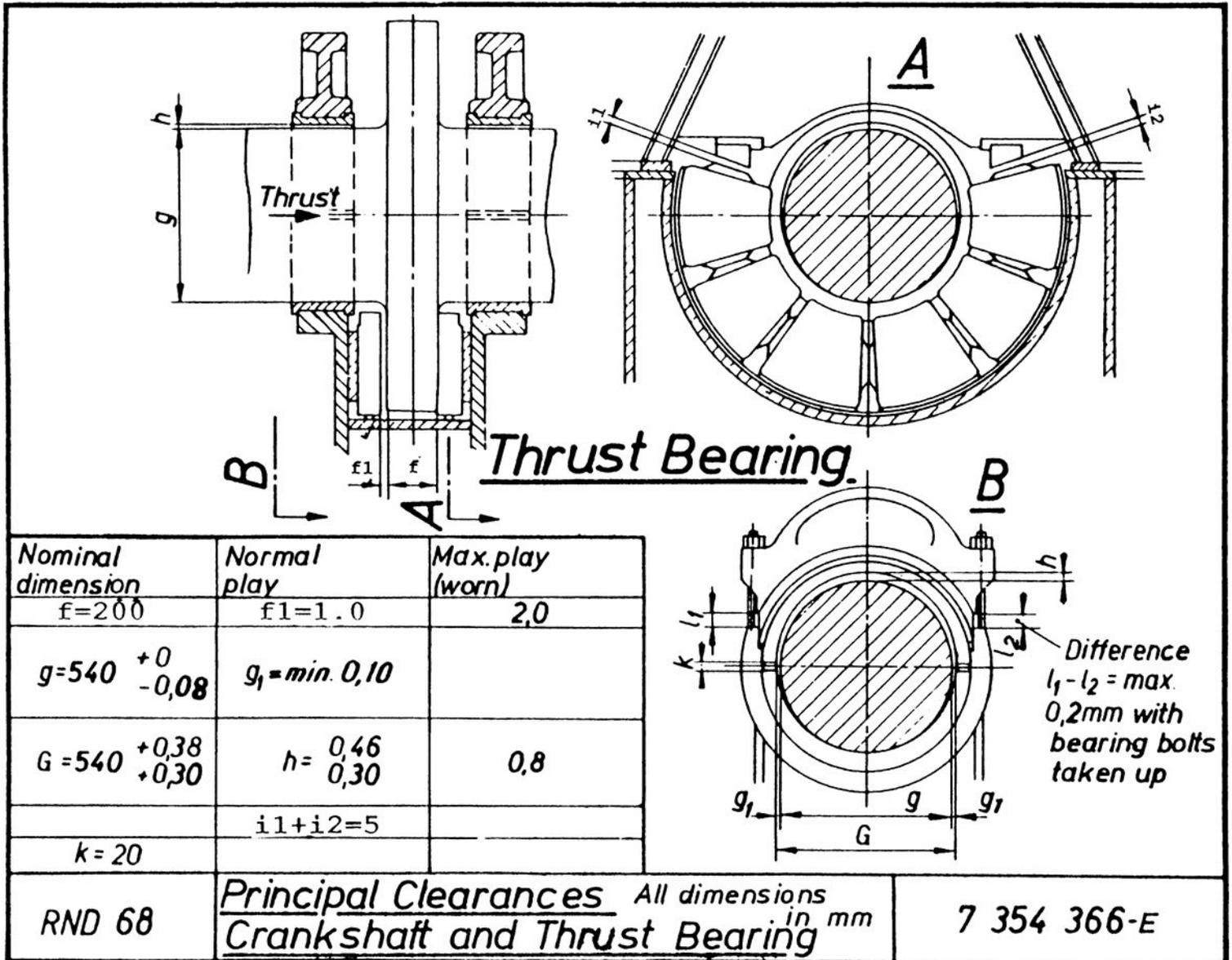


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MO-0125

