

## U.S.C.G. Merchant Marine Exam

### Assistant Engineer-MODU

#### Q715 Motor Plants

#### (Sample Examination)

**Choose the best answer to the following Multiple Choice Questions.**

1. (2.3.1.1-10) The bore of a diesel engine cylinder describes the \_\_\_\_\_.

- (A) swept volume of the cylinder
- (B) inside diameter of the cylinder
- (C) piston displacement in the cylinder
- (D) length of the piston stroke

*If choice B is selected set score to 1.*

2. If a particular liquid has a specific gravity of 0.96 kg/dm<sup>3</sup> 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<sup>3</sup>
- (B) 0.915 kg/dm<sup>3</sup>
- (C) 0.920 kg/dm<sup>3</sup>
- (D) 0.925 kg/dm<sup>3</sup>

*If choice D is selected set score to 1.*

3. Barrel face, taper face, grooved, and chrome plated are all types of diesel engine \_\_\_\_\_.

- (A) pistons
- (B) piston rings
- (C) piston skirts
- (D) cylinder liners

*If choice B is selected set score to 1.*

4. 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.*

5. 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.*

6. A mixture of 45% cetane and 55% alpha-methyl-naphthalene is found to have the same ignition delay as a sample of diesel oil. The sample can be described as having a/an \_\_\_\_\_.
- (A) cetane number of 55
  - (B) cetane number of 45
  - (C) octane number of 55
  - (D) octane number of 45

*If choice B is selected set score to 1.*

7. Auxiliary diesel engine electric starting motors use \_\_\_\_\_.
- (A) 400 cycle per second motor-generator power
  - (B) battery power direct current
  - (C) low amperage, high voltage AC power
  - (D) alternating current transformers

*If choice B is selected set score to 1.*

8. What type of temperature transmitter would be most suitable for measuring diesel engine exhaust and boiler stack temperatures and generates its own electromotive force?
- (A) Resistance temperature detector
  - (B) Thermocouple pyrometer
  - (C) Radiation pyrometer
  - (D) Thermistor probe

*If choice B is selected set score to 1.*

9. 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.*

10. Camshafts are usually driven by timing gears or \_\_\_\_\_.
- (A) push rods
  - (B) chain drives
  - (C) rocker arms
  - (D) flywheels

*If choice B is selected set score to 1.*

**11.** On most modern diesel engines, the main and connecting rod bearings receive their lubricating oil by \_\_\_\_\_.

- (A) banjo feed
- (B) splash feed
- (C) gravity feed
- (D) pressure feed

*If choice D is selected set score to 1.*

**12.** The formation of carbon monoxide in diesel exhaust gases is reduced by \_\_\_\_\_.

- (A) spraying water into the exhaust pipe
- (B) keeping the exhaust system free of carbon deposits
- (C) maintaining proper combustion and scavenging
- (D) avoiding light load operation

*If choice C is selected set score to 1.*

**13.** 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 relief shoulder
- (B) plunger helix
- (C) plunger control tab
- (D) plunger sleeve

*If choice B is selected set score to 1.*

**14.** In a bypass type lubrication system for a diesel engine, the dirty oil line to the centrifuge should be taken from the \_\_\_\_\_.

- (A) lube oil pump suction line
- (B) lube oil pump discharge line
- (C) bottom of the lube oil sump
- (D) outlet from the lube oil header

*If choice C is selected set score to 1.*

**15.** Most 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.*

**16.** Which of the designs listed will keep the lobes from making contact in a Roots-type blower?

- (A) Drive chain
- (B) Blower timing gears
- (C) Air trapped between blower lobes
- (D) Oil filter between blower lobes

*If choice B is selected set score to 1.*

**17.** Diesel engines driving alternators operating in parallel must maintain a set frequency regardless of load changes. The governor characteristic used to accomplish this is known as \_\_\_\_\_.

- (A) actuation
- (B) sensitivity
- (C) compensation
- (D) promptness

*If choice C is selected set score to 1.*

**18.** A decrease in the flash point of diesel engine lube oil indicates the lube oil has become \_\_\_\_\_.

- (A) contaminated with sludge
- (B) contaminated with carbon
- (C) diluted with fuel oil
- (D) diluted with water

*If choice C is selected set score to 1.*

**19.** 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.*

**20.** As engine RPM is increased from idle speed to full load speed, which of the conditions listed will decrease?

- (A) Compression ratio
- (B) Air/Fuel ratio
- (C) Compression pressure
- (D) Lube oil pressure

*If choice B is selected set score to 1.*

**21.** In a diesel engine starting motor equipped with a Bendix drive, the pinion moves and meshes with the flywheel ring gear due to \_\_\_\_\_.

- (A) the shaft sleeve spiral helix and relative rotation between pinion and starter shaft
- (B) shifting levers of solid mechanical linkage
- (C) centrifugal force developed from rotation
- (D) electromotive force developed at the flywheel

*If choice A is selected set score to 1.*

**22.** In the diesel engine shown in the illustration, which of the following statements is true? Illustration MO-0005

- (A) The engine utilizes wet cylinder liners.
- (B) The camshaft turns at half the speed of the crankshaft.
- (C) The intake valves are operated with a valve bridge.
- (D) All of the above.

*If choice D is selected set score to 1.*

**23.** 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.*

**24.** Pre-combustion chambers differ from turbulence chambers in that pre-combustion chambers \_\_\_\_\_.

- (A) allow fuel injection directly into the space above the piston
- (B) do not contain the fuel injector nozzle tip
- (C) contain the major portion of the total clearance volume
- (D) contain a smaller portion of the total clearance volume

*If choice D is selected set score to 1.*

**25.** Which of the combustion chambers shown in the illustration is referred to as an "energy cell" used in some small diesel engines? Illustration MO-0068

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

*If choice A is selected set score to 1.*

**26.** 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.*

**27.** 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.*

**28.** 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.*

**29.** Diesel engines are classified as reciprocating internal combustion engines because they \_\_\_\_\_.

- (A) use energy from fuel burned outside their cylinders
- (B) burn fuel in a combustion chamber that moves back and forth
- (C) use a continuous combustion process to impart rotary motion to the pistons
- (D) burn fuel in a closed chamber which imparts linear motion to pistons

*If choice D is selected set score to 1.*

**30.** Starting systems for large, direct reversing, diesel engines are usually \_\_\_\_\_.

- (A) hydraulic starting motors
- (B) electric starting motors
- (C) direct air admission
- (D) vane type air motors

*If choice C is selected set score to 1.*

**31.** 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.*

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

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

*If choice A is selected set score to 1.*

**33.** 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.*

**34.** 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.*

**35.** The proper location for journal bearing oil grooves is \_\_\_\_\_.

- (A) in the region of the load bearing surface
- (B) as a side relief where the two shells meet
- (C) at the bottom of the bearing
- (D) halfway between bottom and where shells meet

*If choice B is selected set score to 1.*

**36.** The rocker arms of the diesel engine shown in the illustration are indicated by \_\_\_\_\_.  
Illustration MO-0122

- (A) "C" and "Y"
- (B) "B"
- (C) "C"
- (D) "D"

*If choice A is selected set score to 1.*

**37.** Cooling the intake air supplied to a diesel engine will \_\_\_\_\_.

- (A) reduce mean effective pressure
- (B) decrease average compression ratio
- (C) decrease air charge density
- (D) increase peak power output

*If choice D is selected set score to 1.*

**38.** Reduction gear lube oil temperatures for keel cooler installations are generally \_\_\_\_\_.

- (A) lower than raw water-cooled installations
- (B) higher than raw water-cooled installations
- (C) identical to raw water-cooled installations
- (D) lower than raw water-cooled installations, but the pressure will be higher

*If choice B is selected set score to 1.*

**39.** Clearance volume scavenging in a turbocharged, four-stroke cycle diesel engine is accomplished \_\_\_\_\_.

- (A) during the valve overlap period
- (B) with only the exhaust valve open
- (C) at a pressure below atmospheric
- (D) without cooling the cylinders or pistons

*If choice A is selected set score to 1.*

**40.** Injection pressure in a common rail fuel system is controlled by \_\_\_\_\_.

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

*If choice D is selected set score to 1.*

**41.** The fuel injector shown in the illustration is opened by fuel pressure acting upward on \_\_\_\_\_.  
Illustration MO-0059

- (A) part 33
- (B) part 36
- (C) the needle valve
- (D) the plunger

*If choice C is selected set score to 1.*

**42.** 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.*

**43.** Starting aids, such as glow plugs, are usually 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 with electric motor starters

*If choice D is selected set score to 1.*

**44.** Which of the listed design features is found in an exhaust valve and NOT in an intake valve?

- (A) Hard alloy steel construction
- (B) Zinc alloy stems
- (C) Swirling vanes
- (D) Poppet type design

*If choice A is selected set score to 1.*

**45.** Fuel oil penetration into the cylinder of a diesel engine is \_\_\_\_\_.

- (A) dependent on air turbulence
- (B) reduced by finer atomization
- (C) increased by finer atomization
- (D) nonexistent in the pre-combustion chamber system

*If choice B is selected set score to 1.*

**46.** 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.*

**47.** Which segment of the two-stroke cycle engine diagram shown in the illustration represents the exhaust event? Illustration MO-0037

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

*If choice D is selected set score to 1.*

**48.** 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.*

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

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

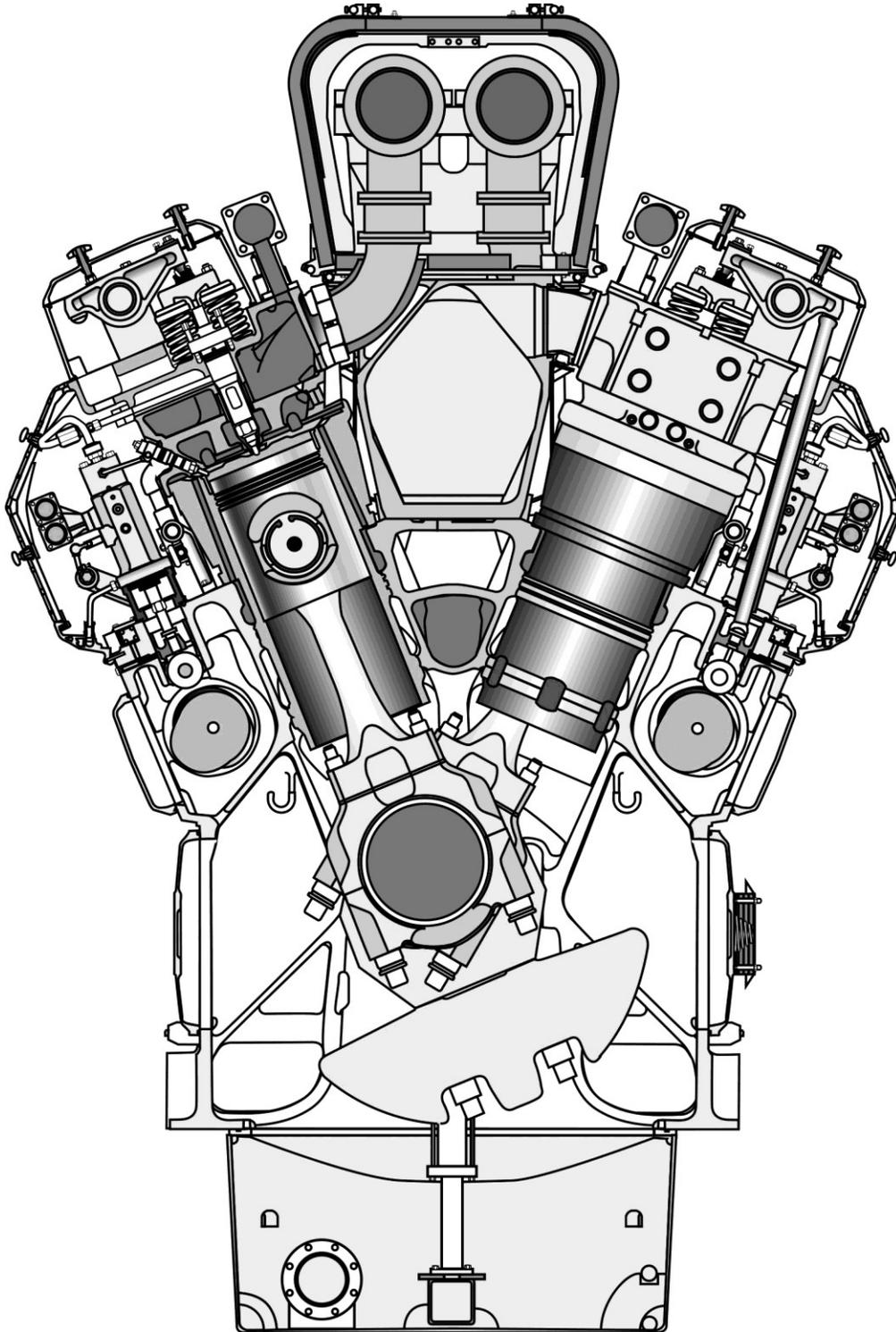
*If choice A is selected set score to 1.*

**50.** 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.*

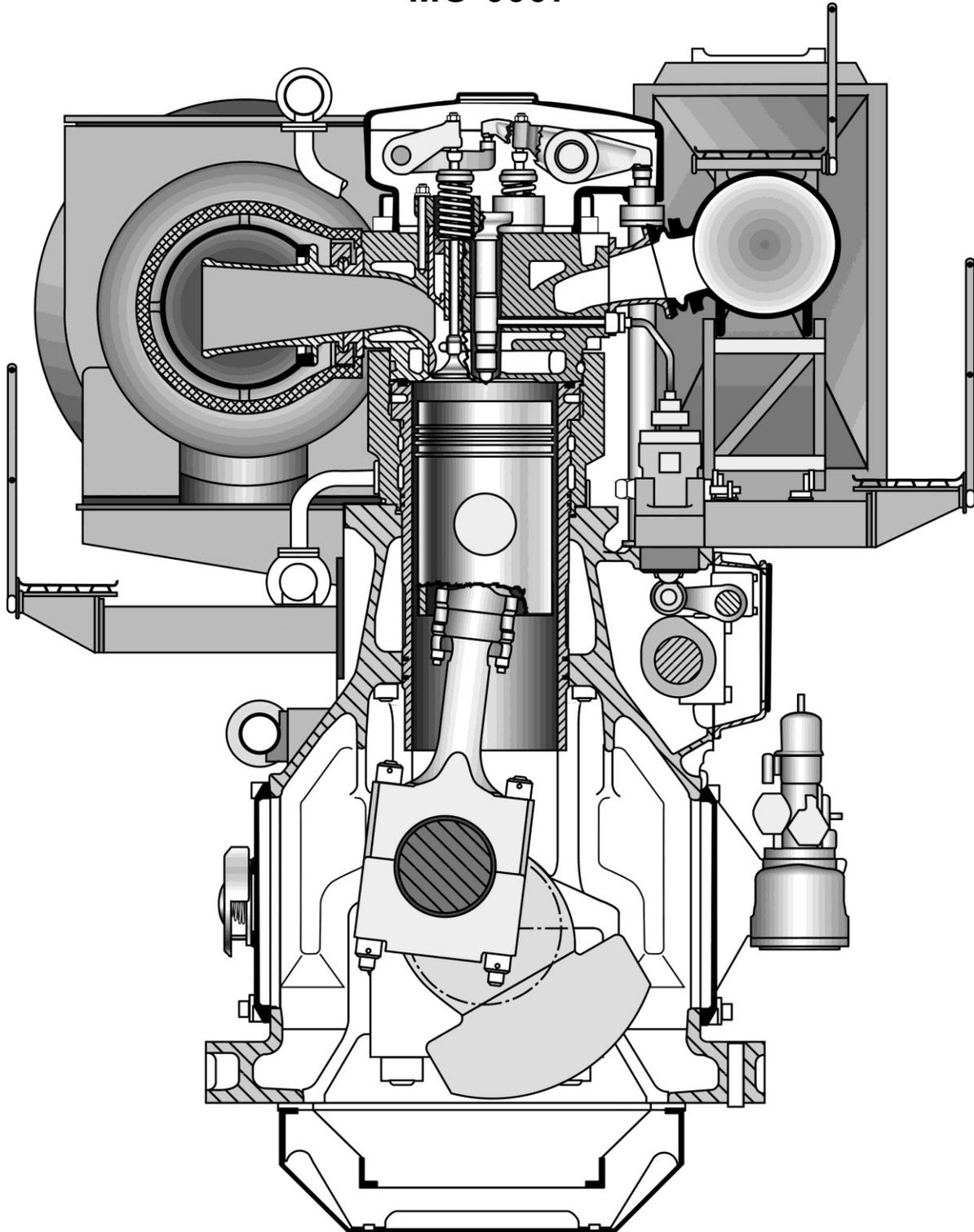
## MO-0005



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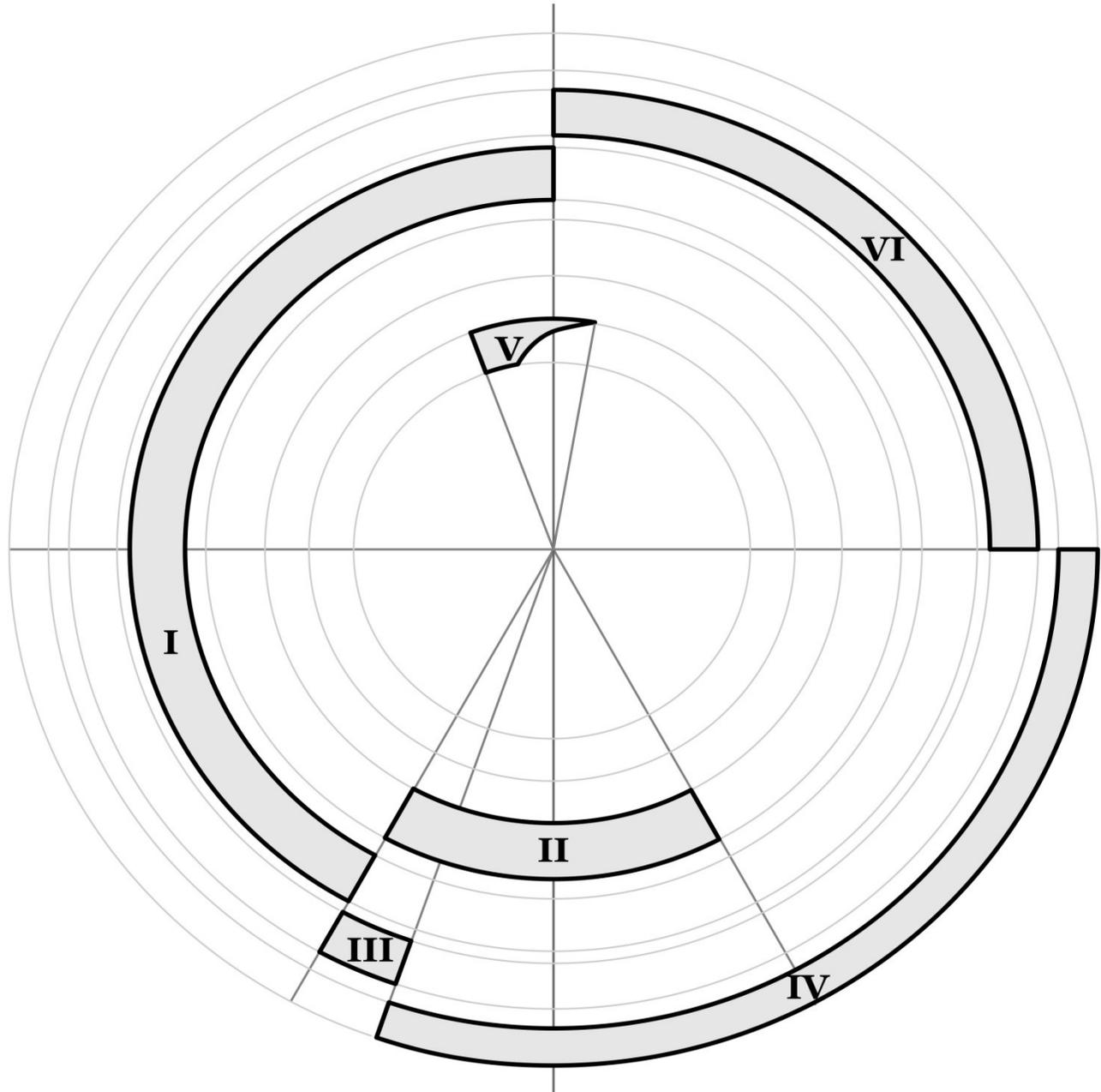
## MO-0007



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## MO-0037

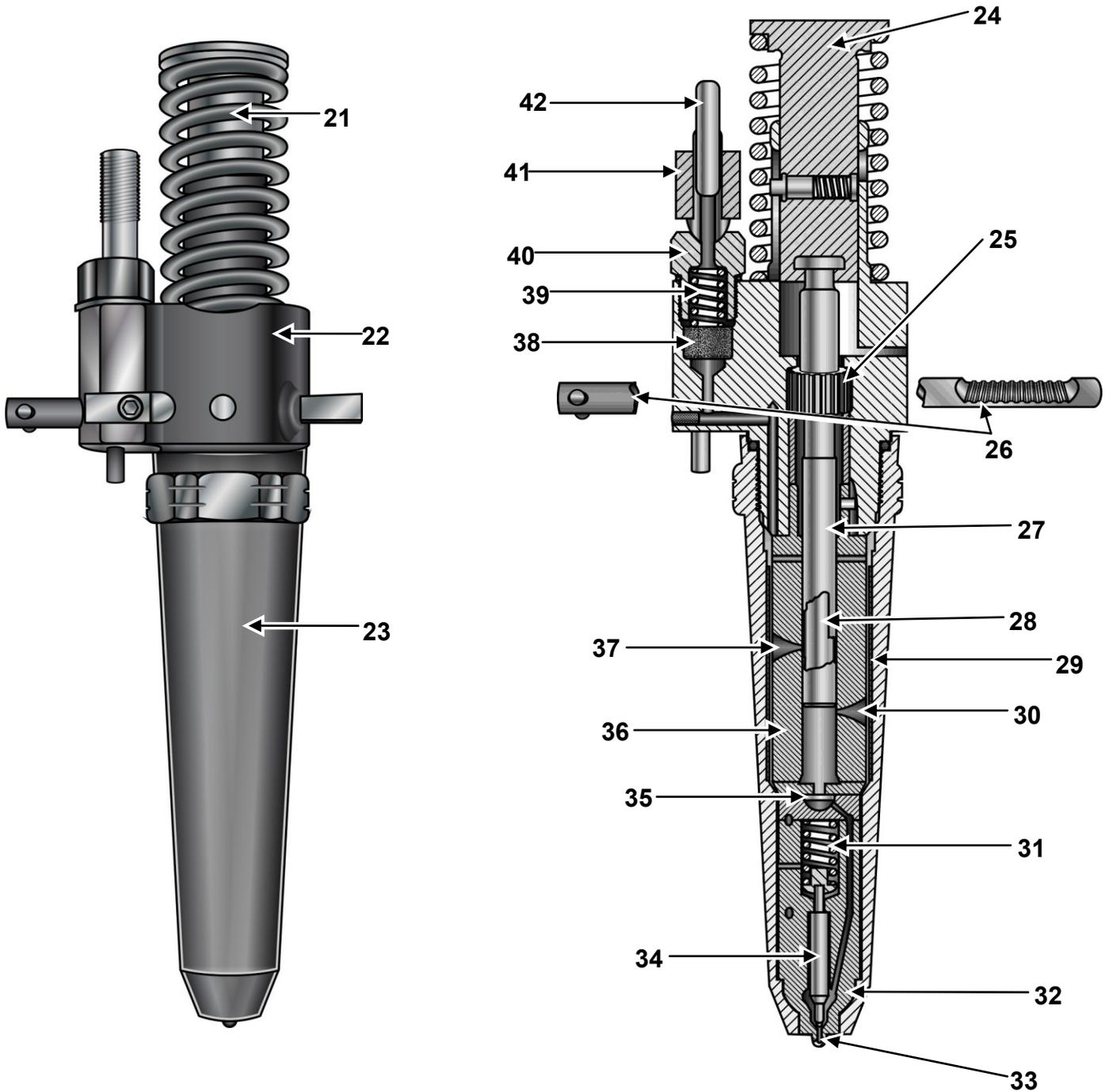


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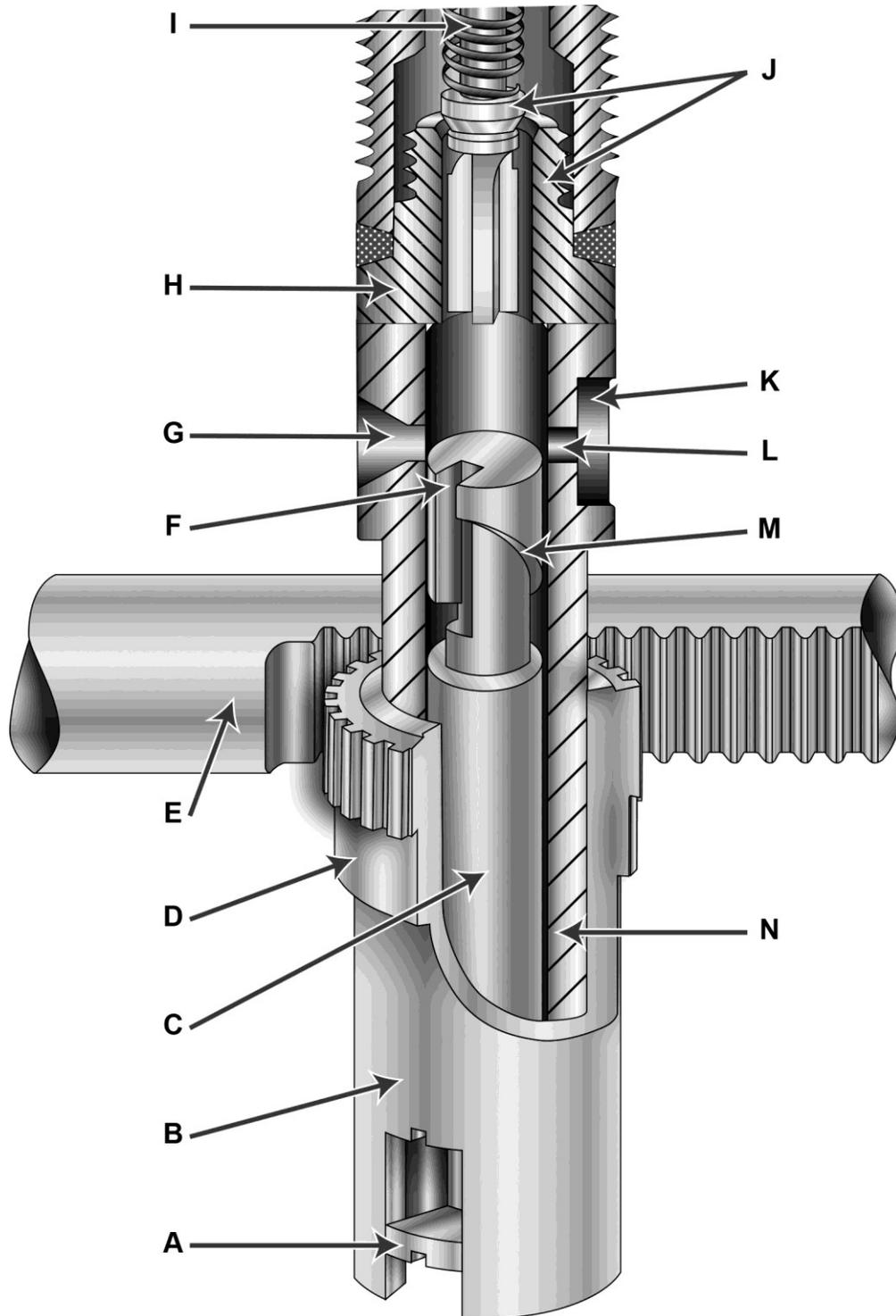
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## MO-0059



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## MO-0061

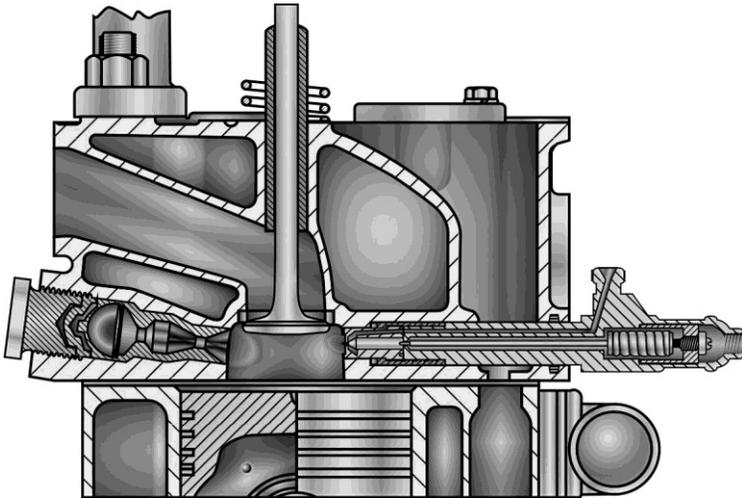


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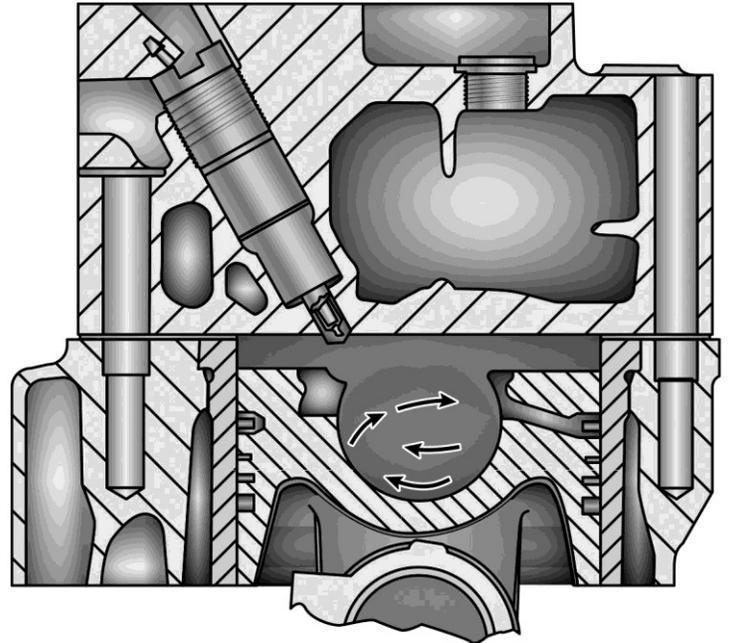
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## MO-0068

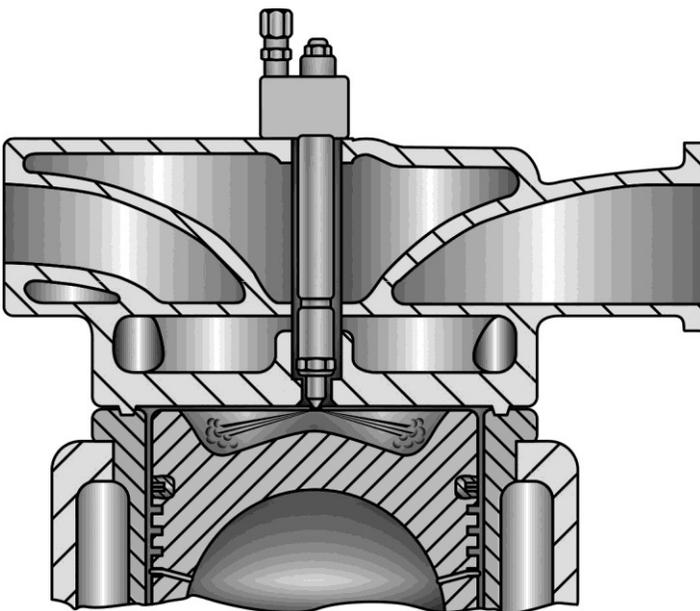
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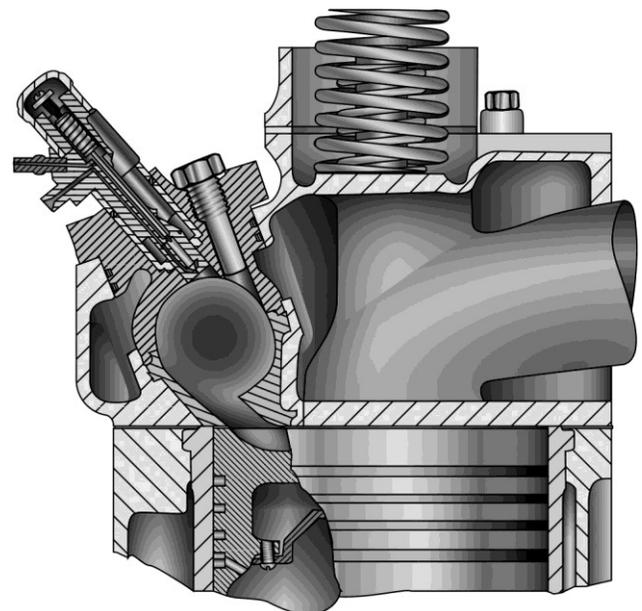
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C



D



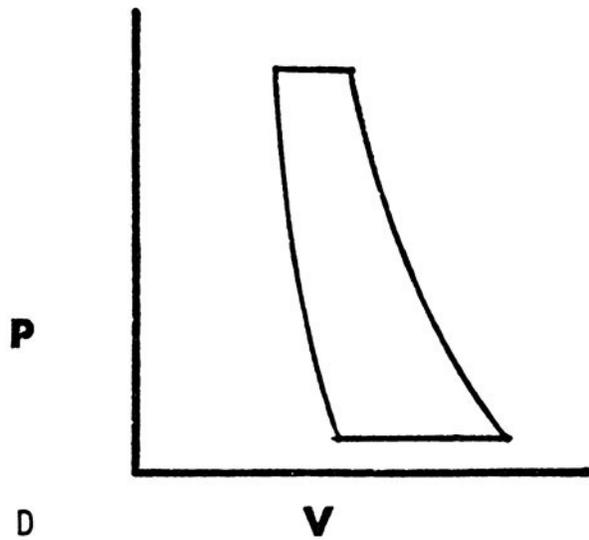
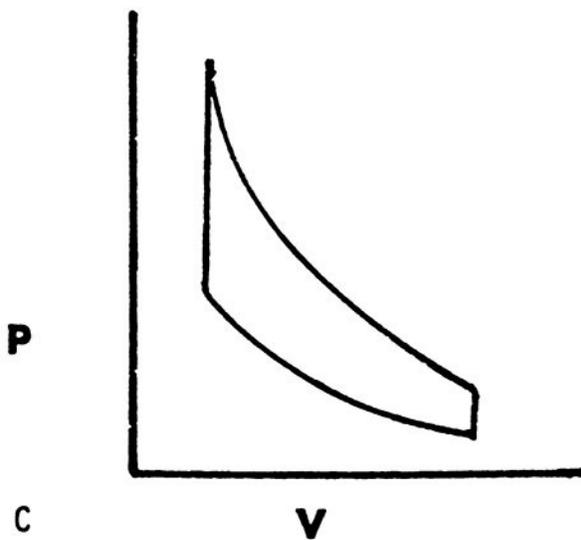
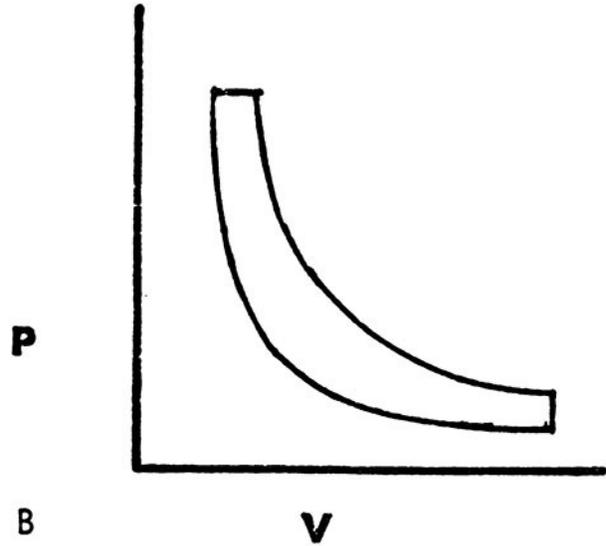
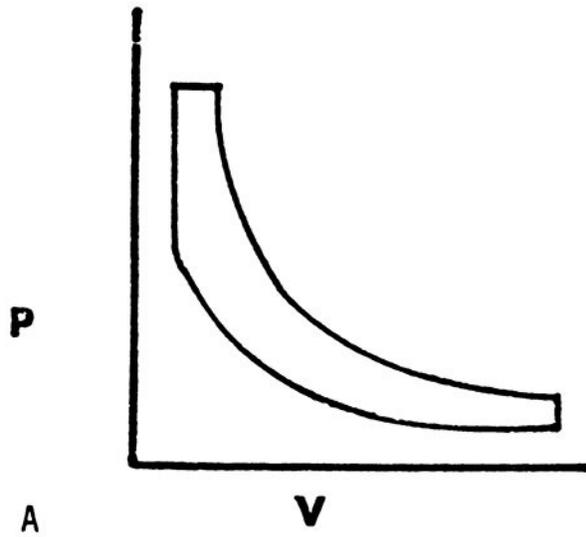
A & D

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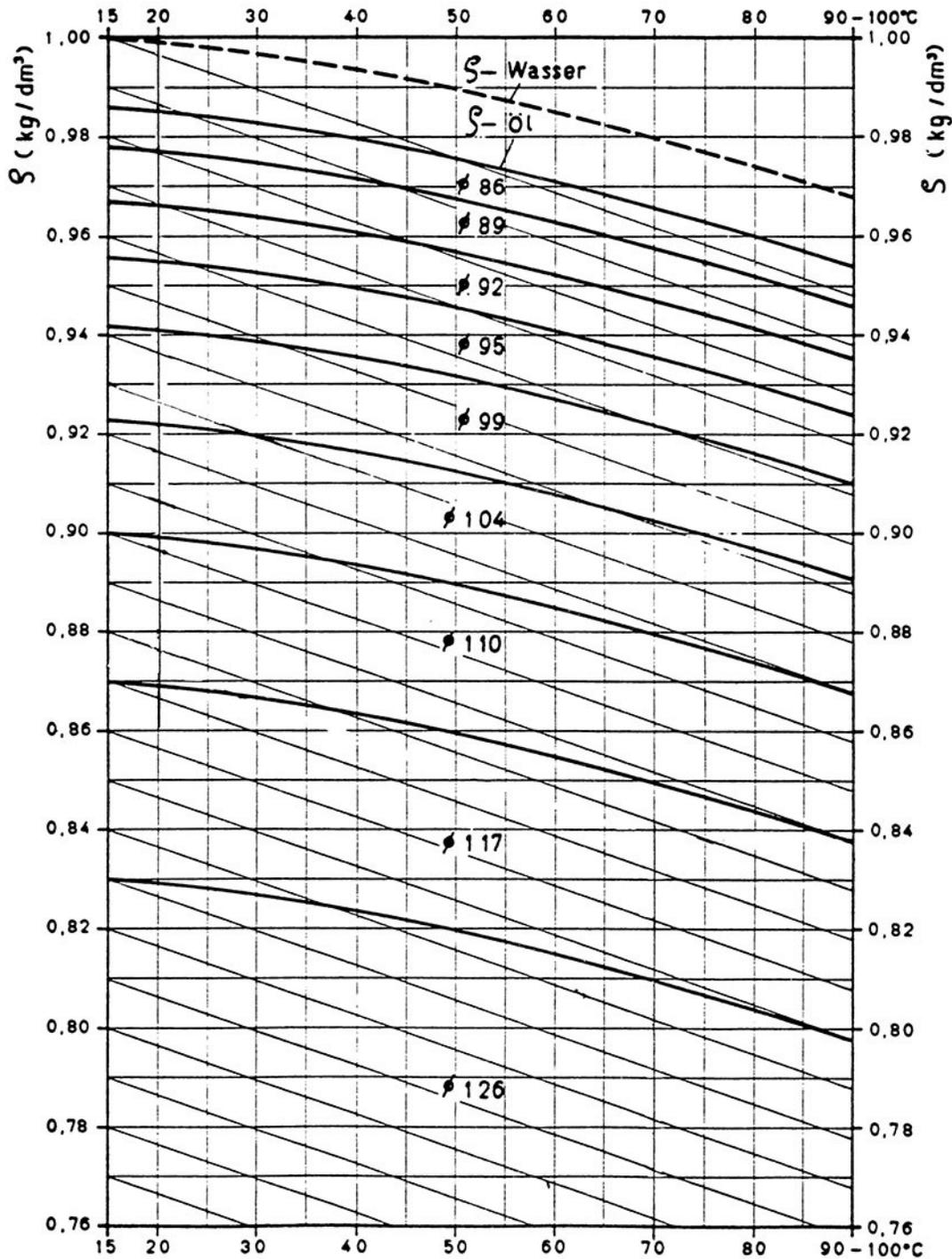
B & C

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Q715 Motor Plants

## MO-0102



## MO-0113



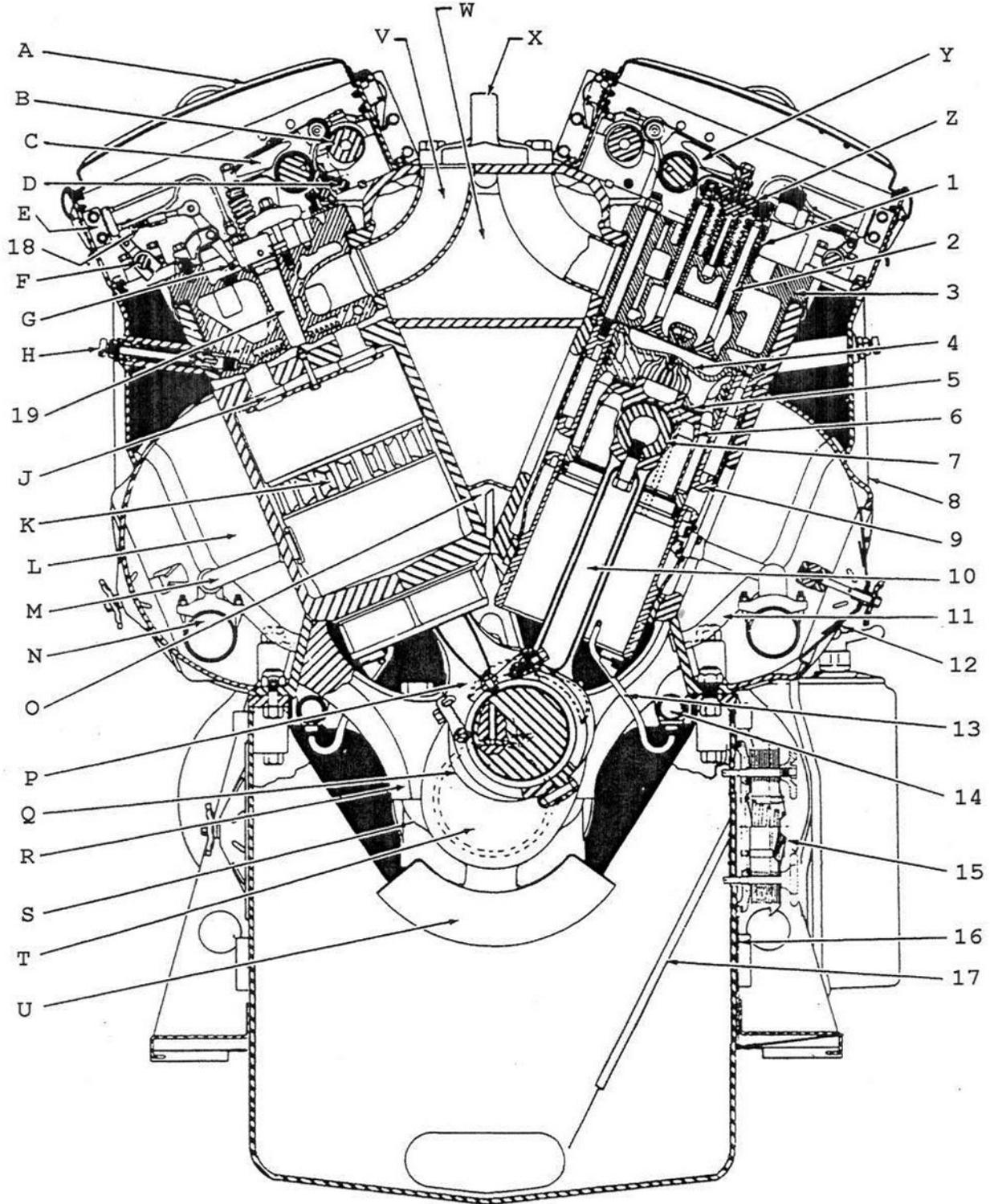
Separating temperature

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