AUTOMOTIVE Youth Educational Systems YES!
The Passport to a Rewarding Automotive Career

ASE CERTIFIED

Modern Automotive Technology Chapter 13

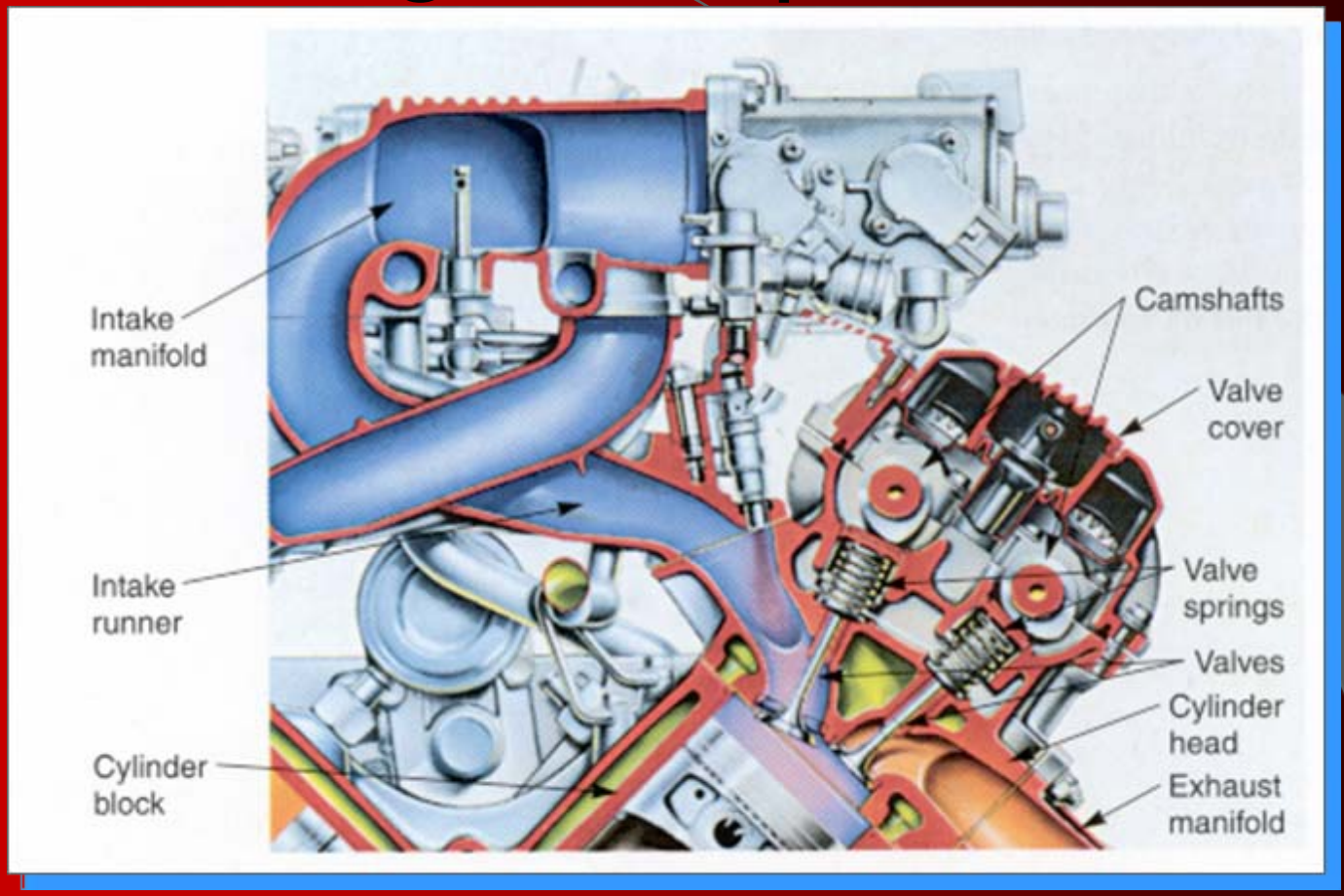
Engine Top End Construction

North Montco Technical Career Center

Learning Objectives

- Describe the construction of an engine cylinder head
- Explain umbrella and O-ring seals
- Explain the purpose of vales springs, shims, stems caps, and spring shields
- Explain hydraulic and mechanical lifters
- Describe different types of rocker arm assemblies
- Describe safety practices when working on engine top end components

Engine Top End

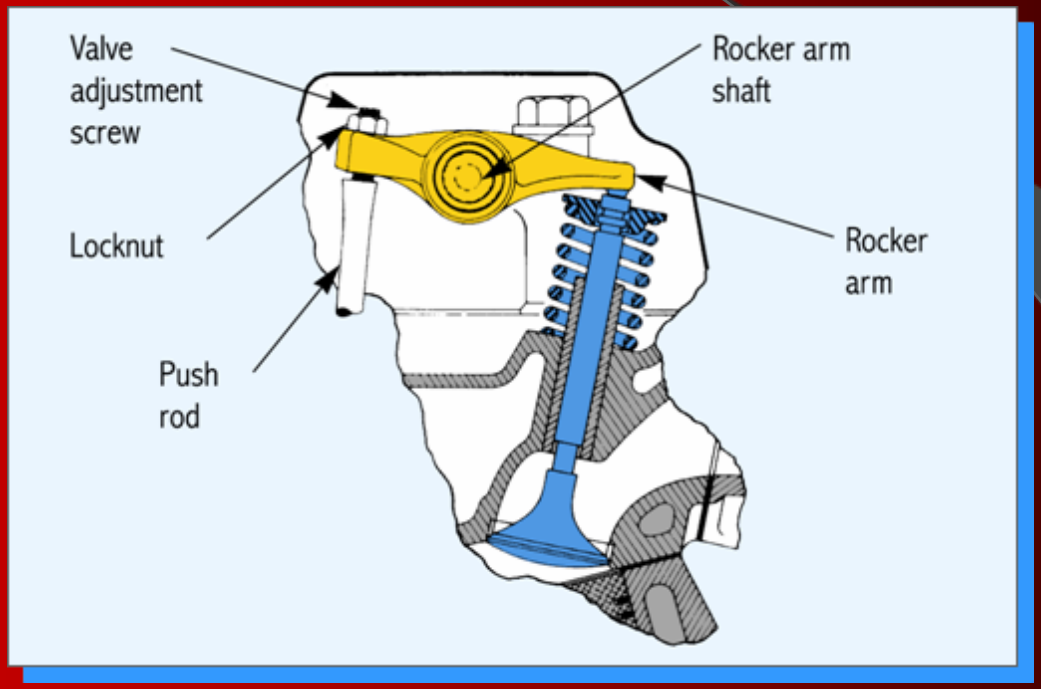


Includes the cylinder head, valve train, valve cover, and intake and exhaust manifolds

Engine Top End Construction

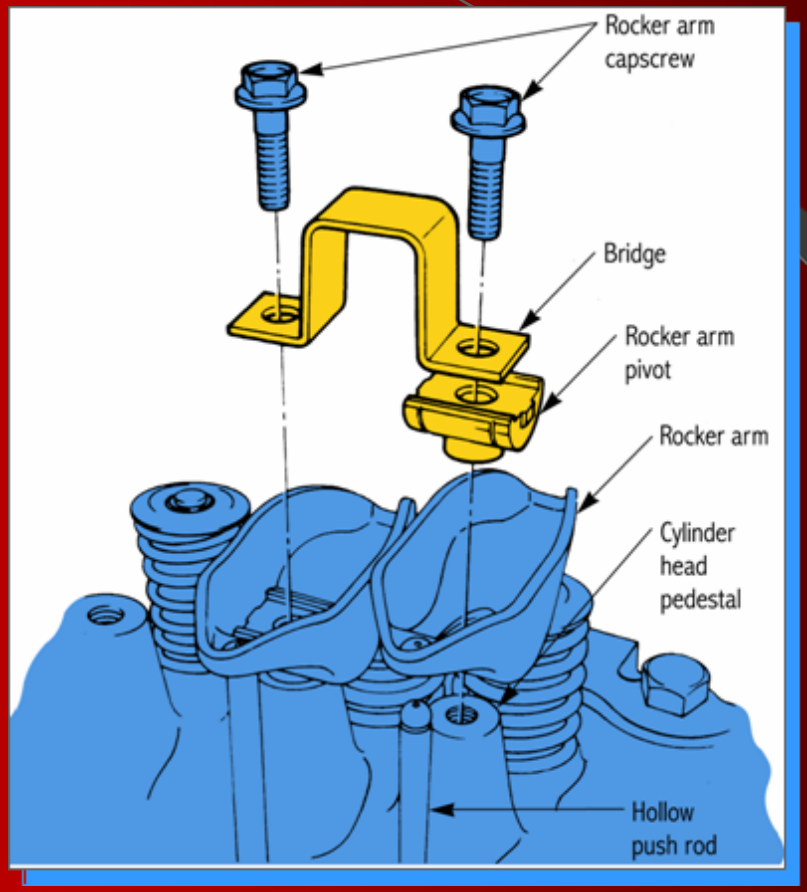
1. Rockers Arms transfer valve train motion to valve stem tips.
2. Runners carry air-fuel mixture to cylinder head ports.
3. Headers are lightweight, free-flowing steel tubing exhaust manifolds.

Rocker Arms



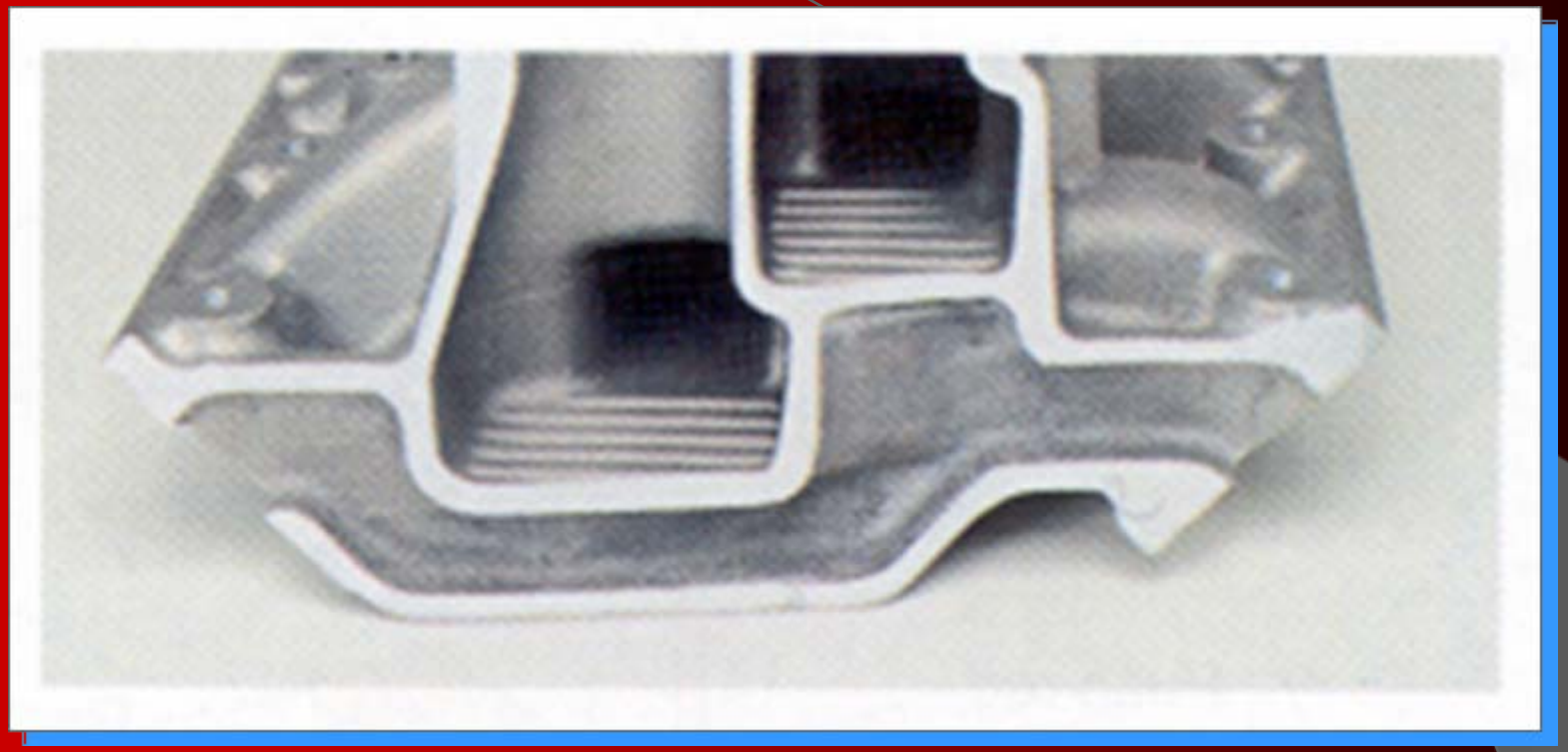
Transfer valve train motion to the valve stem tips

Pivot Balls (Stands)



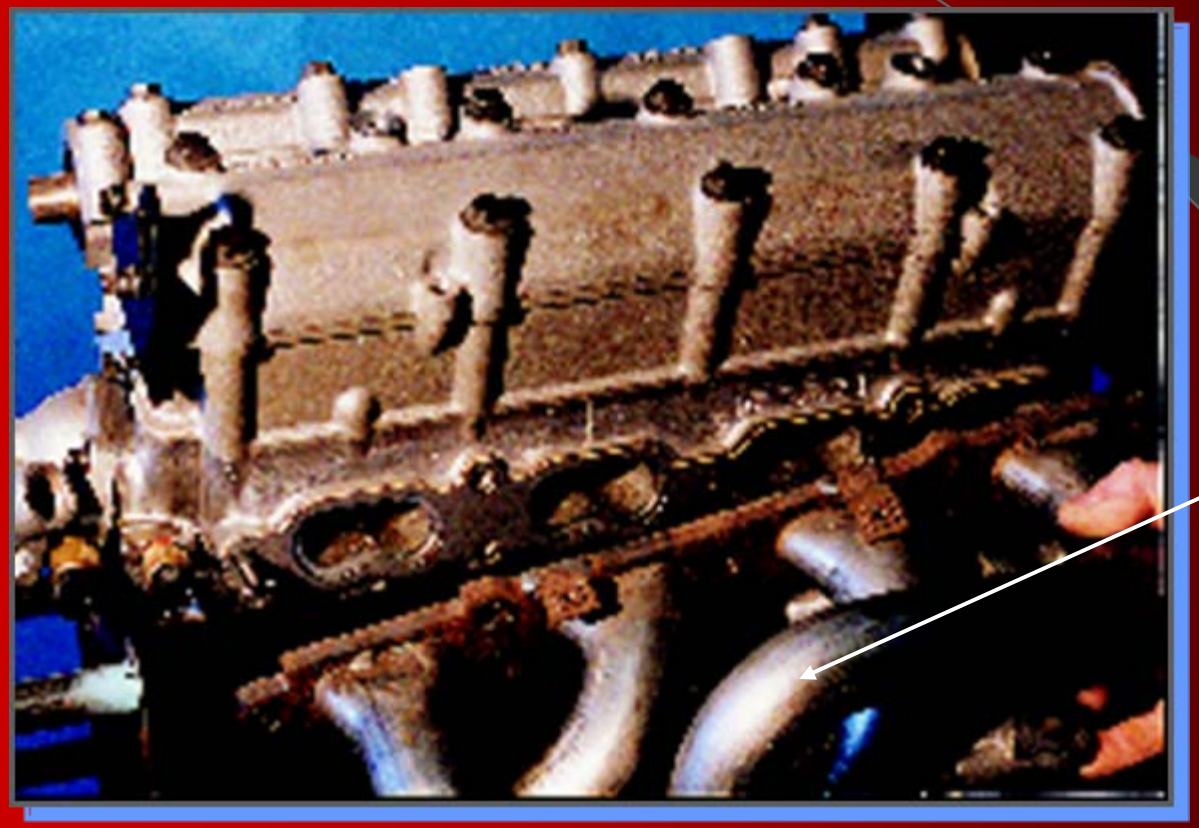
Used to hold the rocker arm in place over the valve

Manifold Runners



Carry either the air-fuel mixture or air to the cylinder head ports

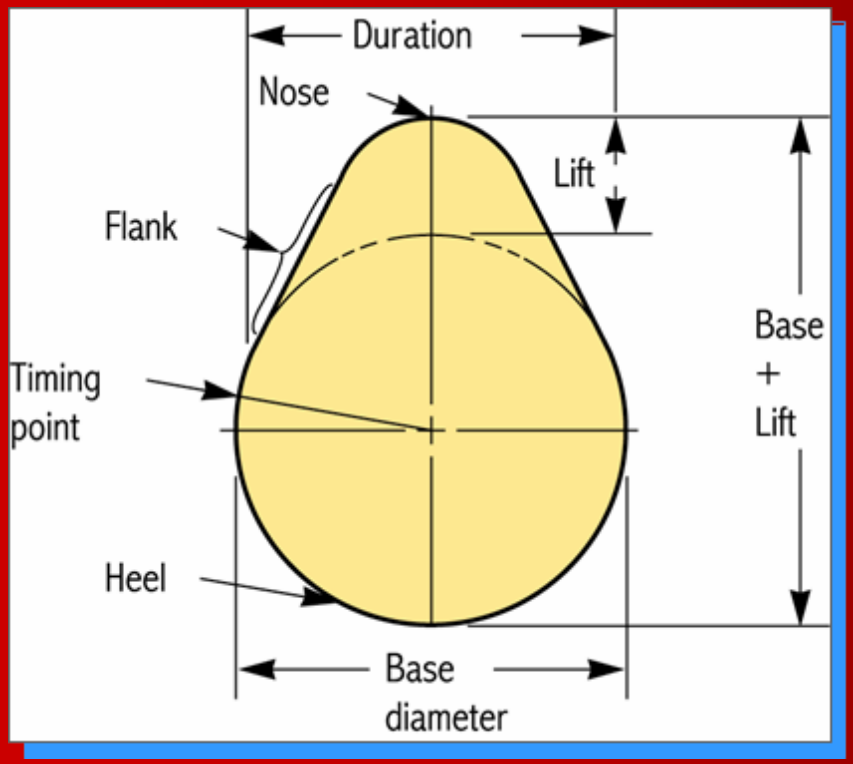
Exhaust Manifold



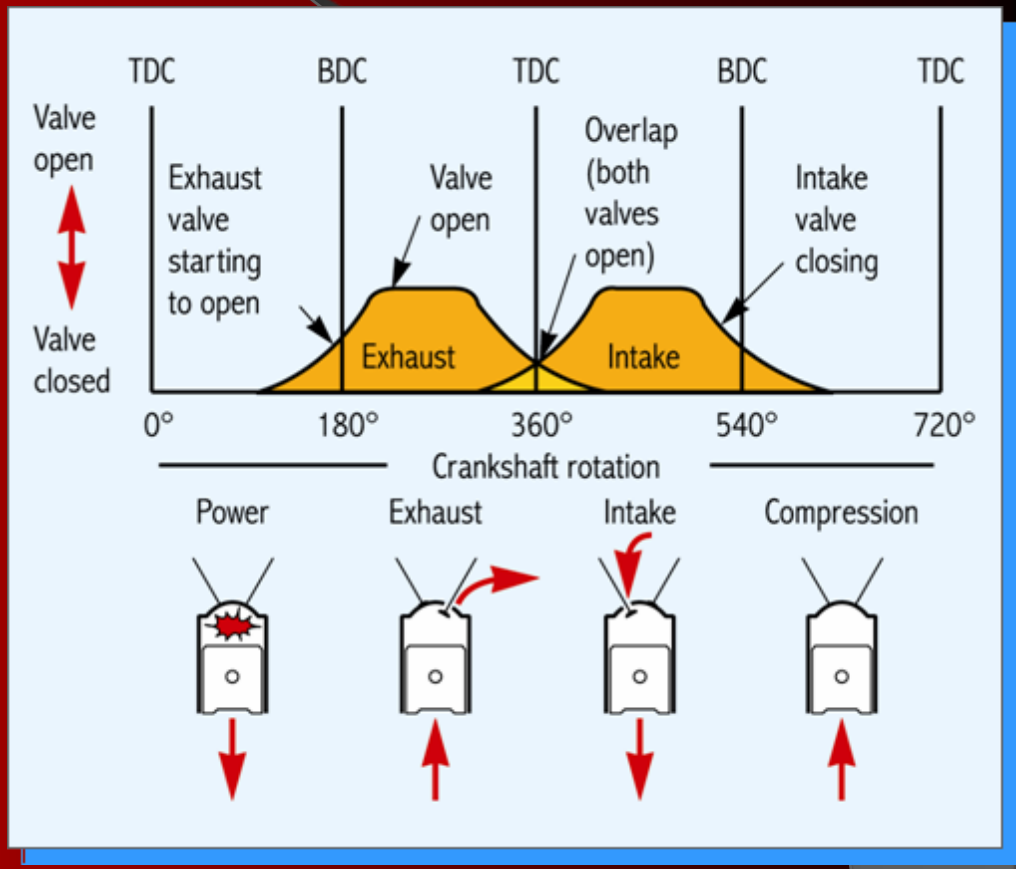
Engine Top End Construction

4. Camshaft Duration is regulated by the shape of the cam lobe nose and flank.
5. An Integral Valve Guide is part of the cylinder head casting.
6. Camshaft Lift is the distance each valve opens.

Camshaft Lift and Timing

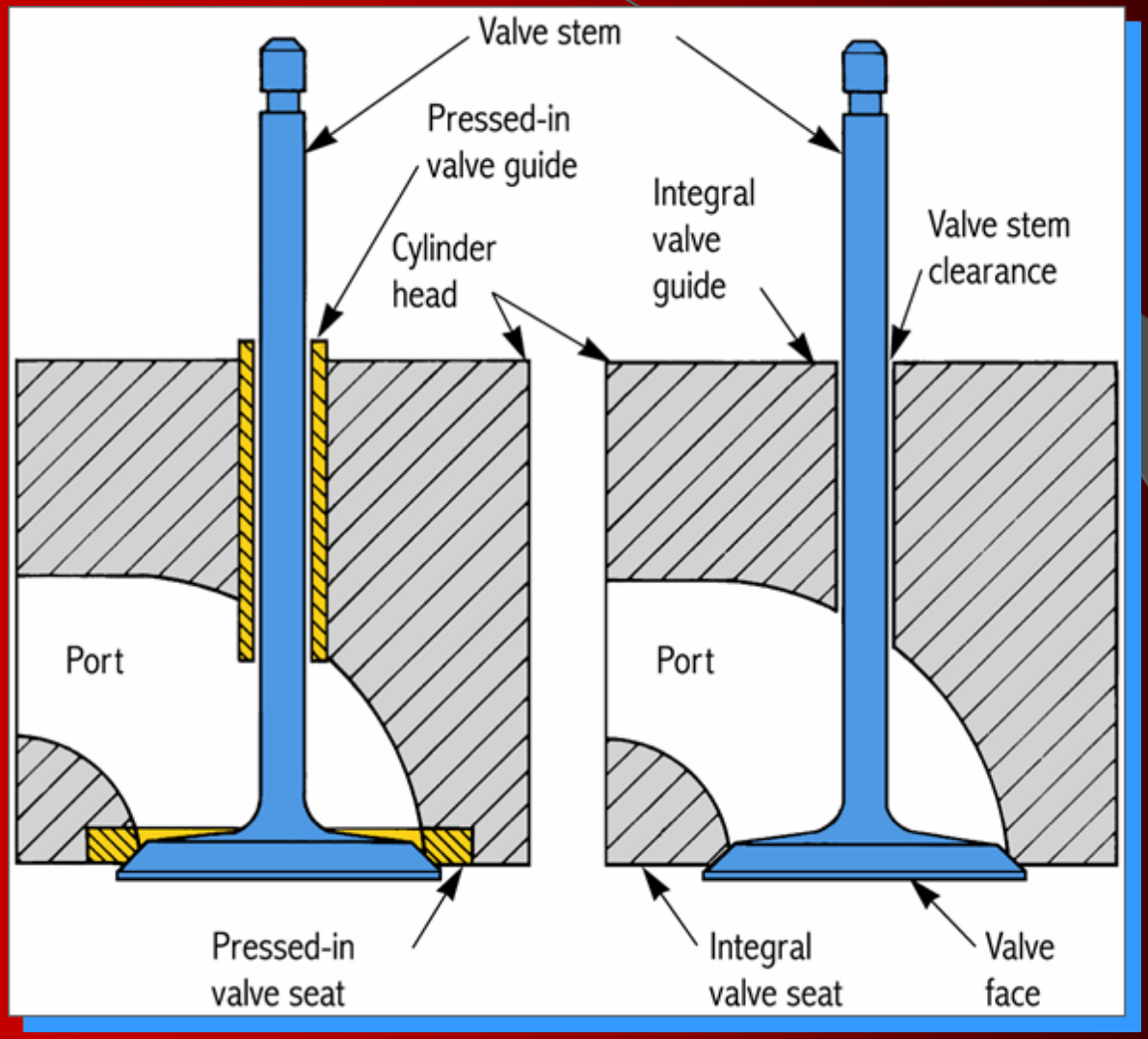


Lift



Timing

Valve Seats and Guides

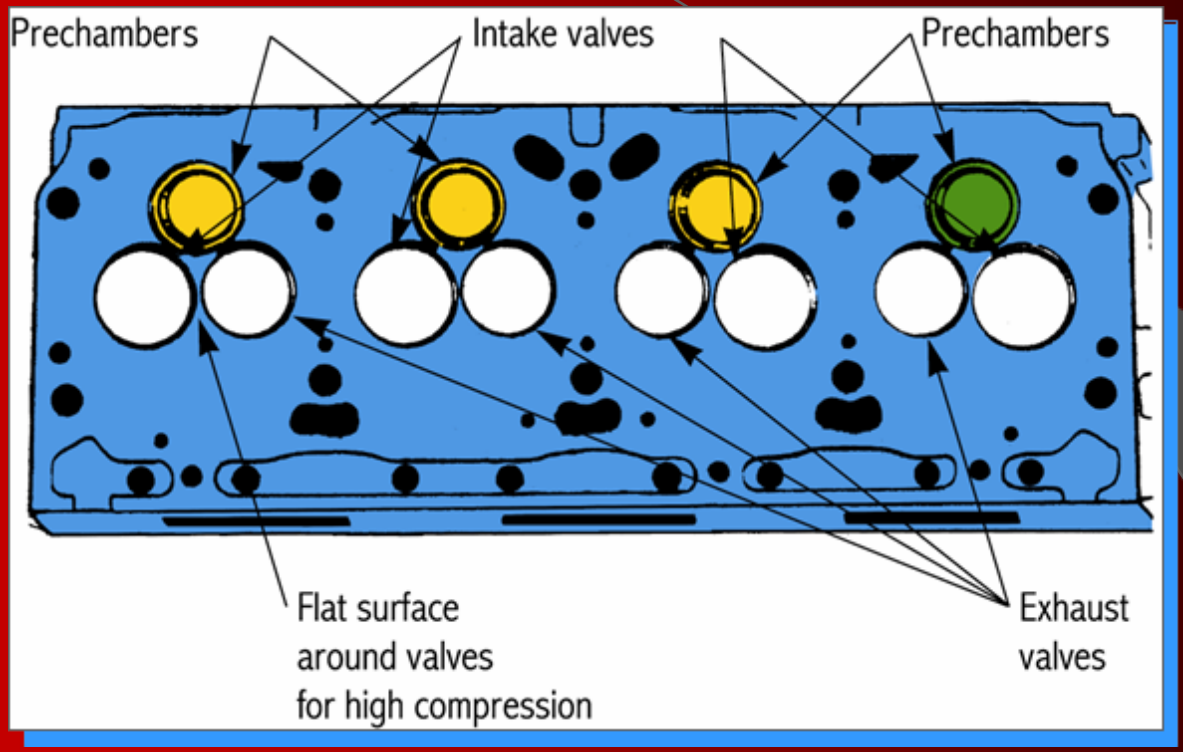


Engine Top End Construction

7. A Prechamber Cup is pressed into the cylinder head of some diesel engines.

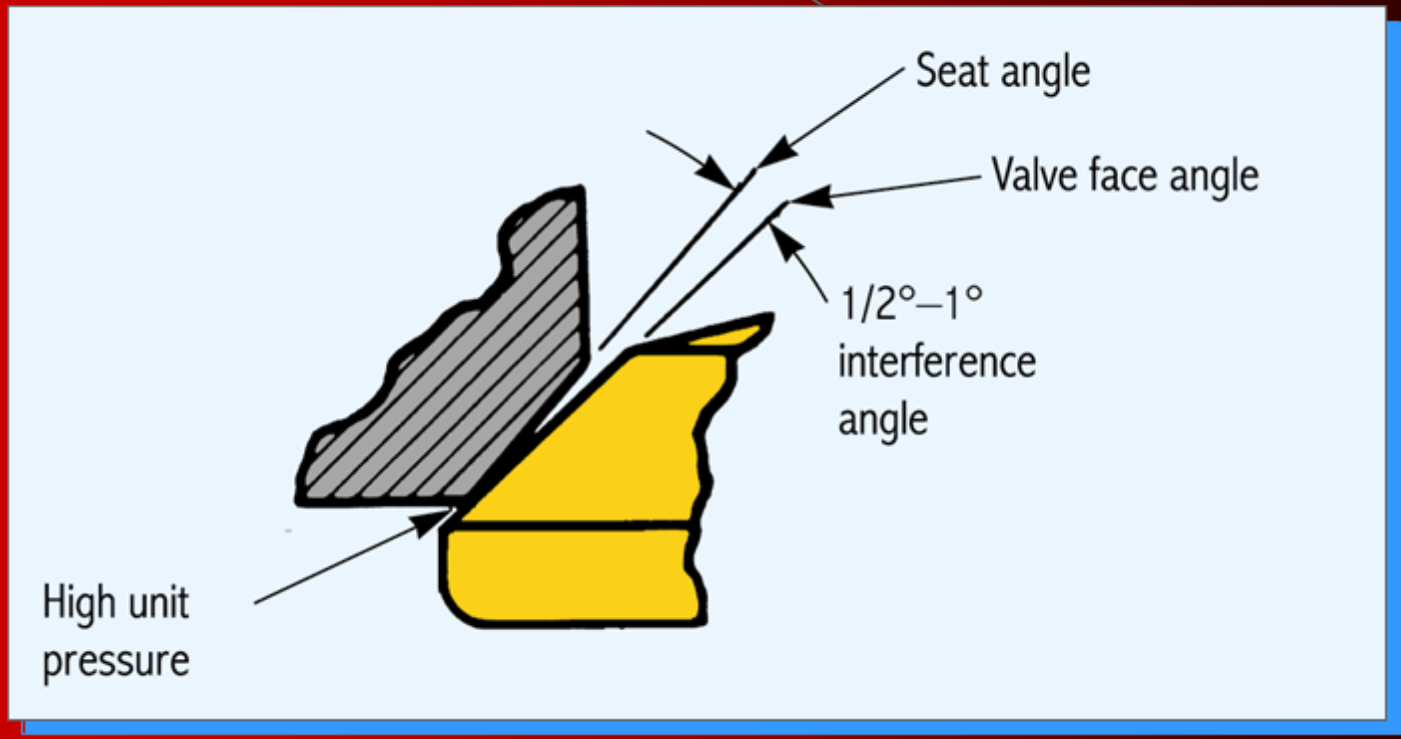
8. Interference Angle reduces the contact area between seat and valve.

Diesel Prechamber Cup



Area is heated by the glow plug for better cold starting

Valve Seat Angle



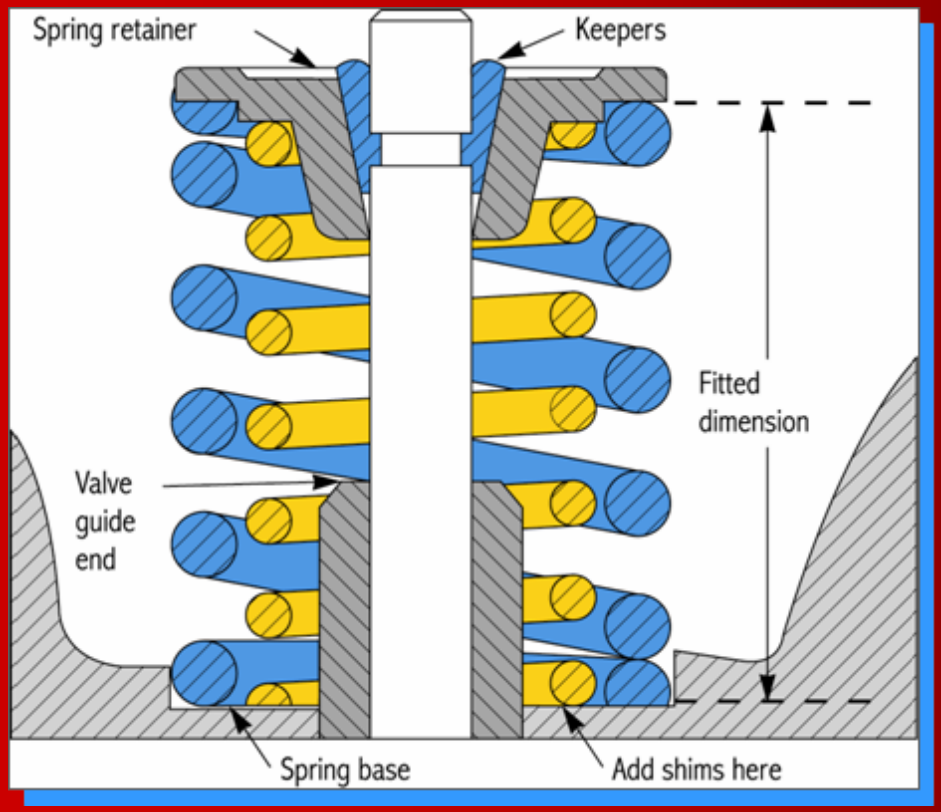
Interference angle increases sealing pressure and speeds seating

Engine Top End Construction

9. A Valve Spring Shim is a very thin, accurately machined washer used to increase spring tension.

10. A Stratified Charge Chamber is found in gasoline engines designed to use a rich fuel mixture in the auxiliary chamber to ignite a lean mixture in the main combustion chamber.

Valve Spring Shim

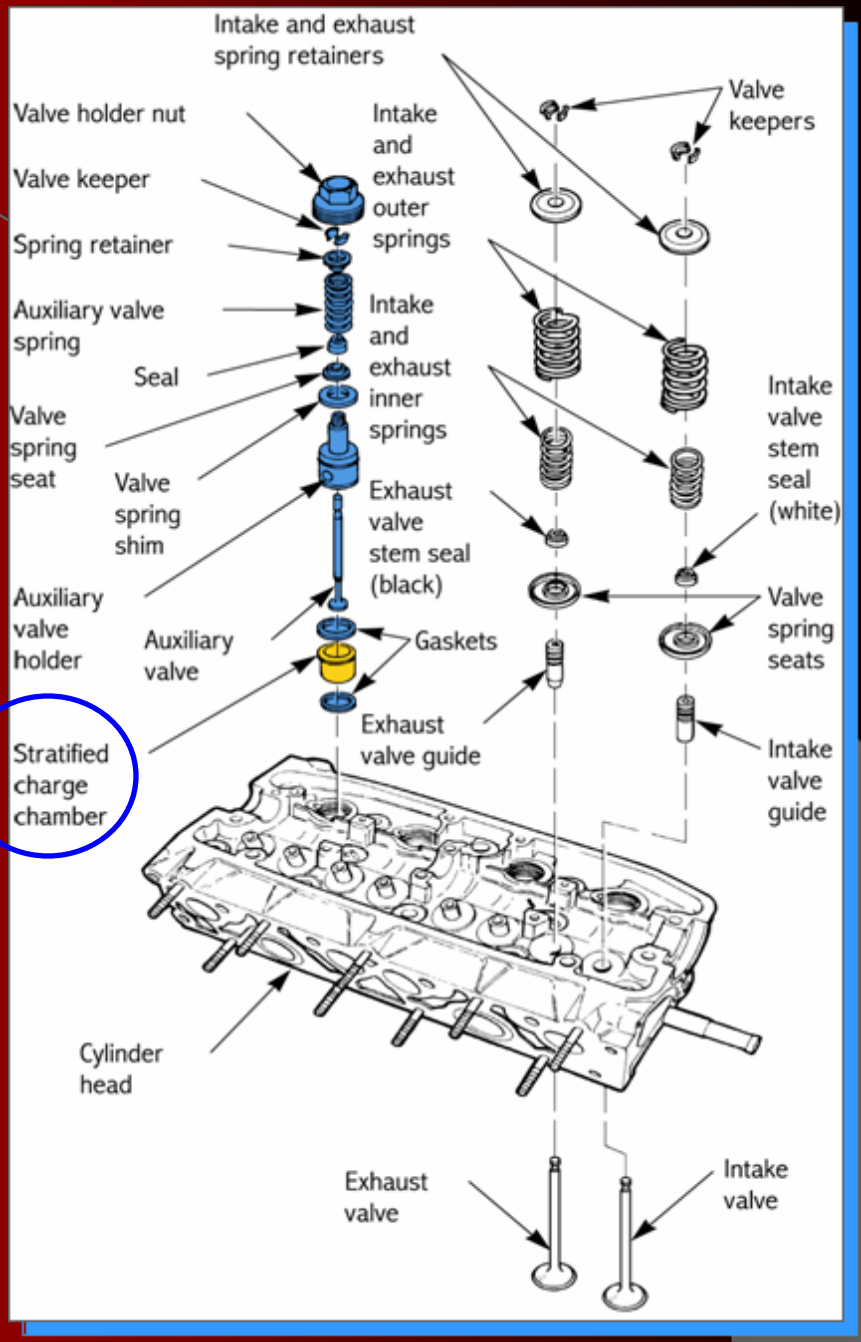


Very thin, accurately machined washer used to increase spring tension

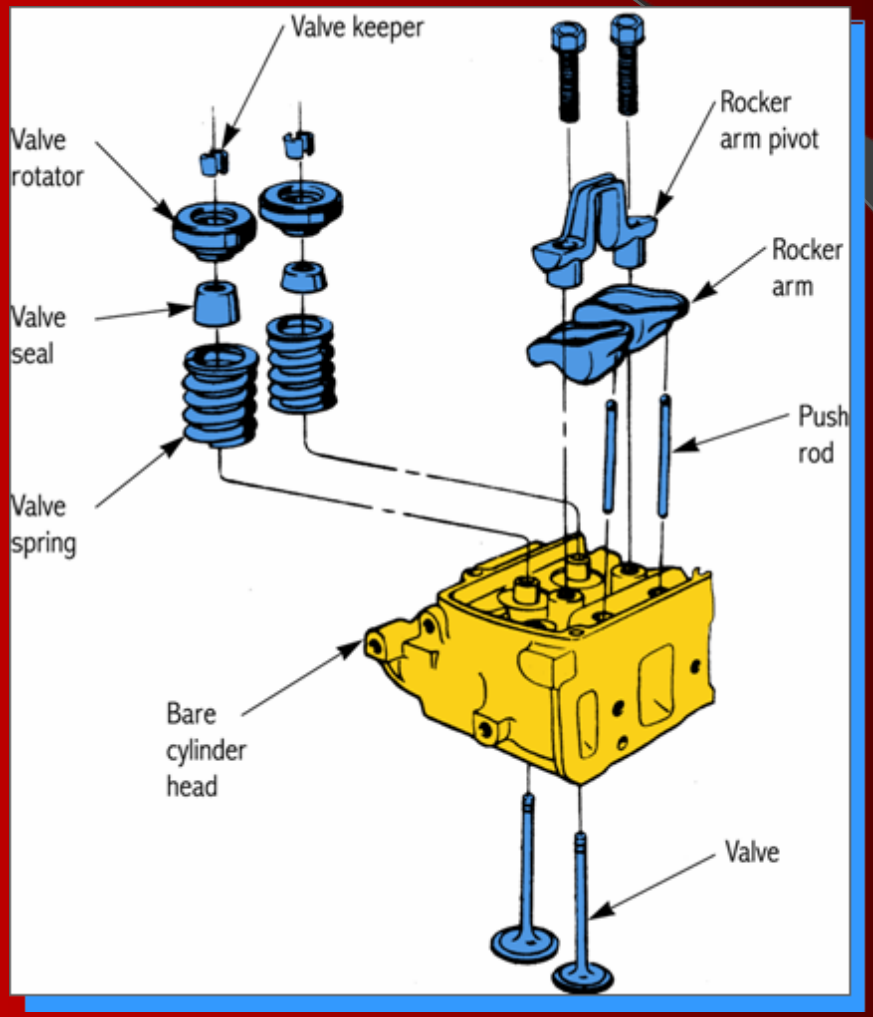
When a shim is placed under a spring, the open and closed lengths of the spring are reduced

Stratified Charge Chamber

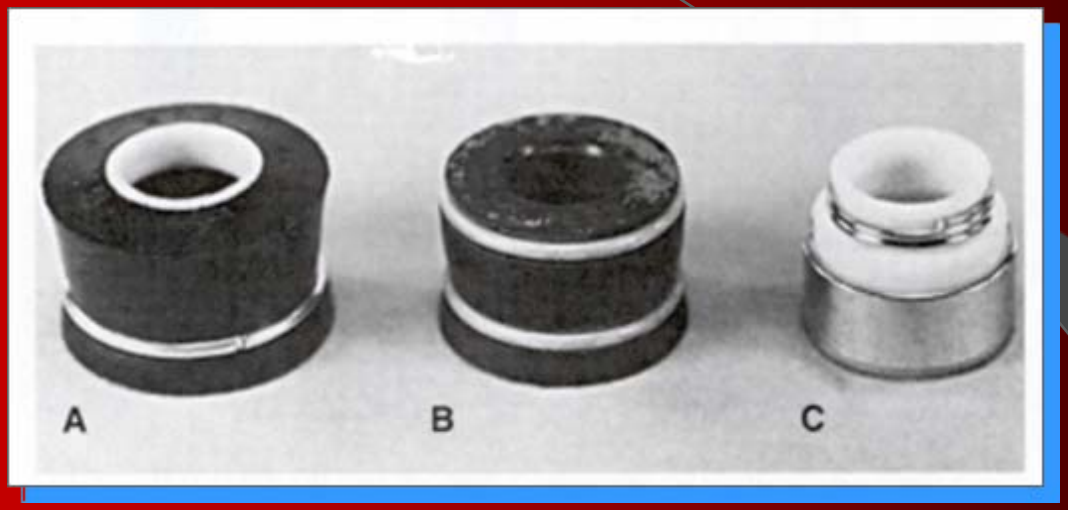
- Fits into the cylinder head casting to form an auxiliary chamber
- Uses a rich fuel mixture in the auxiliary chamber to ignite a lean mixture in the main combustion chamber



Cylinder Head and Parts



Umbrella Valve Seal

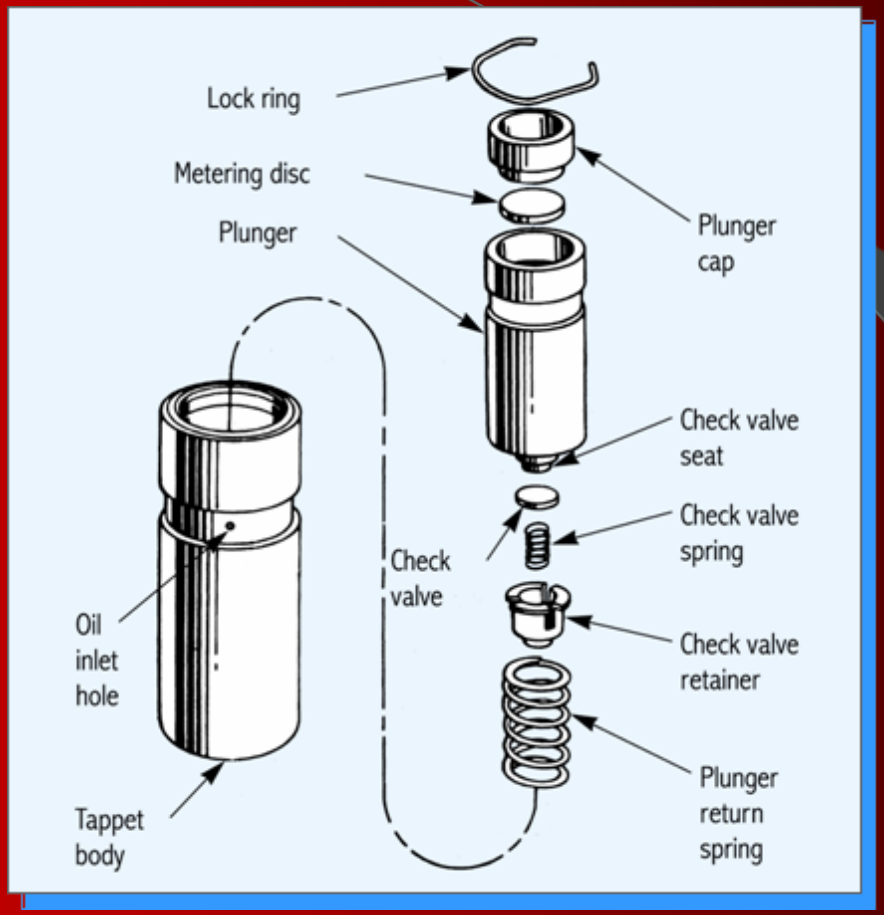


A. Synthetic rubber seal with plastic shedder insert

B. All synthetic rubber seal

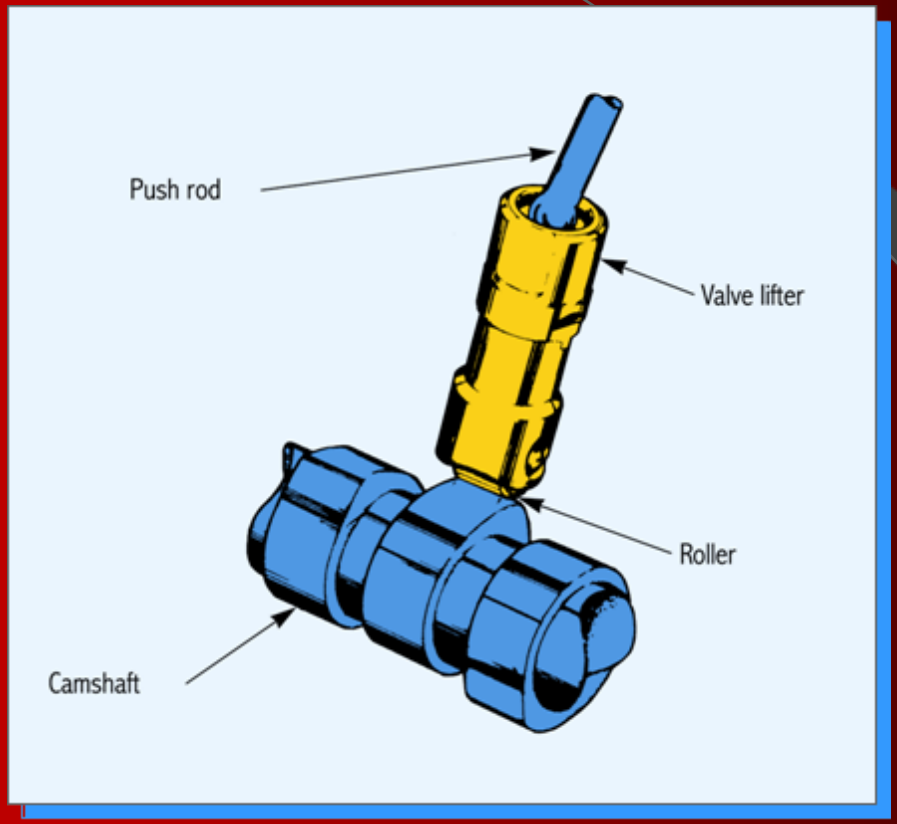
C. Plastic valve seal

Hydraulic Lifters



Lifter adjusts automatically with temperature changes and part wear

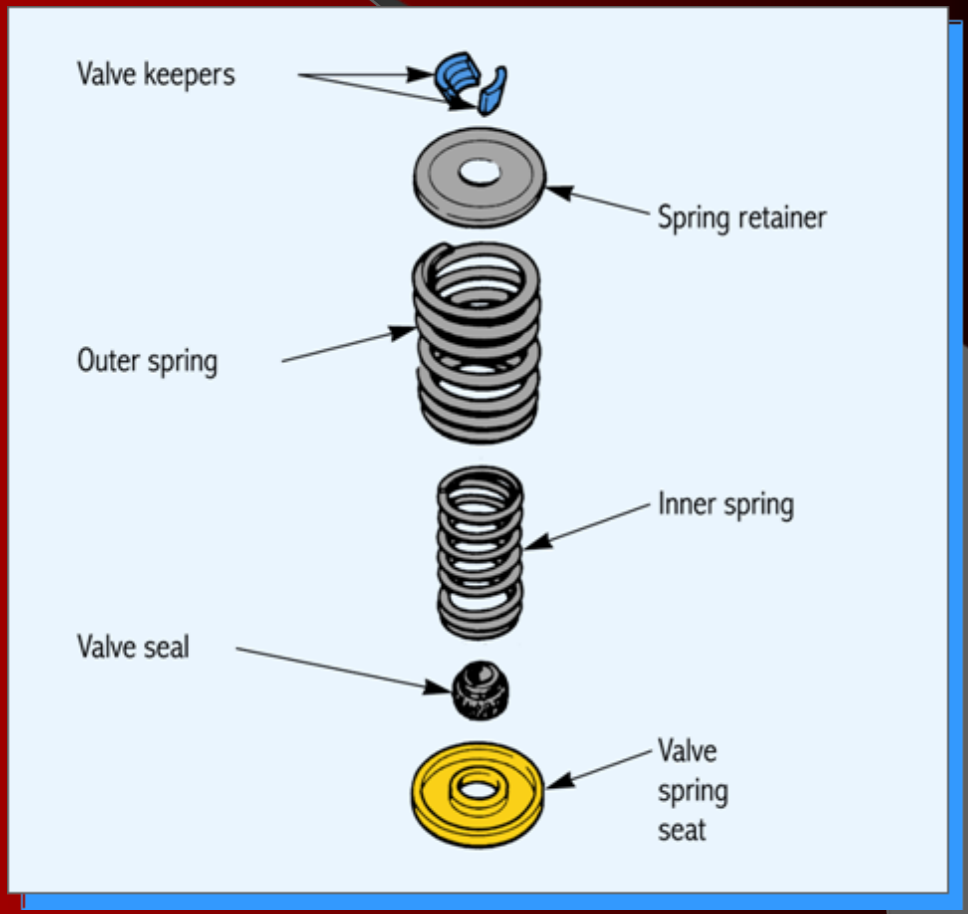
Roller Lifters



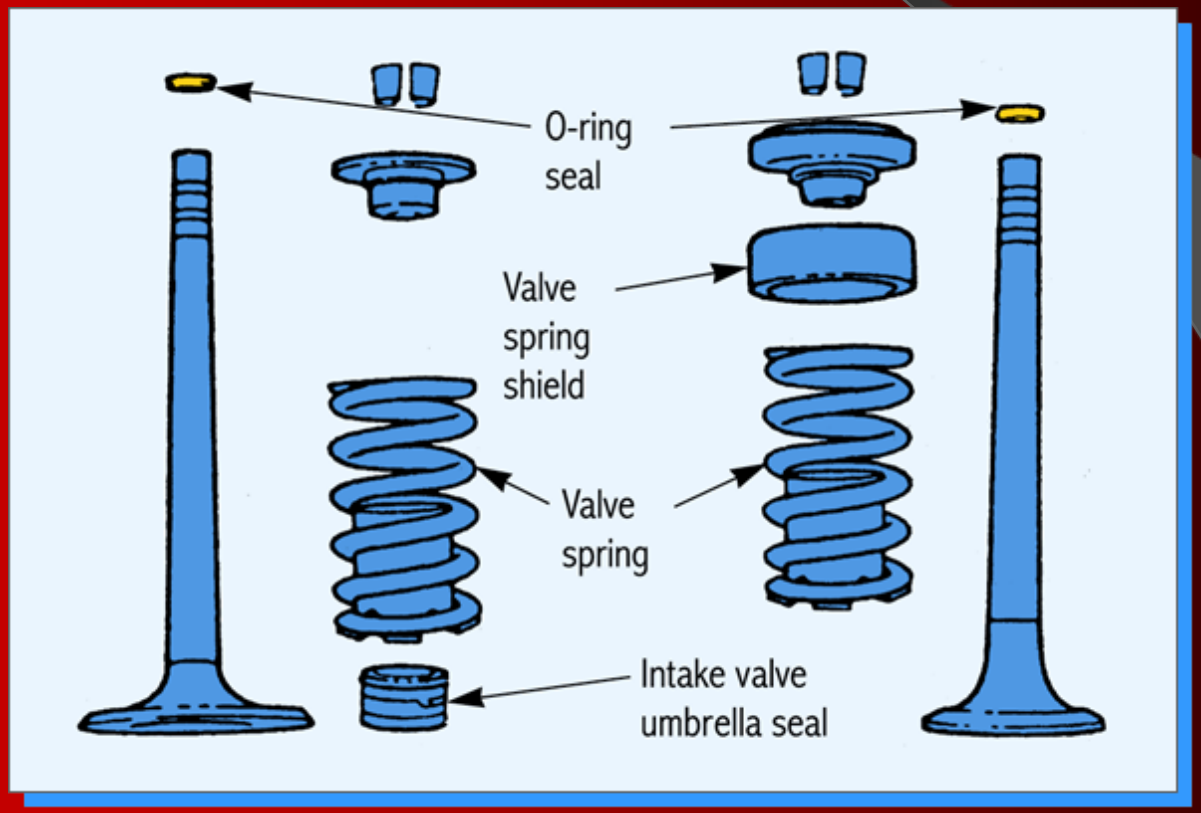
Small roller rides on the camshaft lobe to reduce friction

Valve Retainers and Keepers

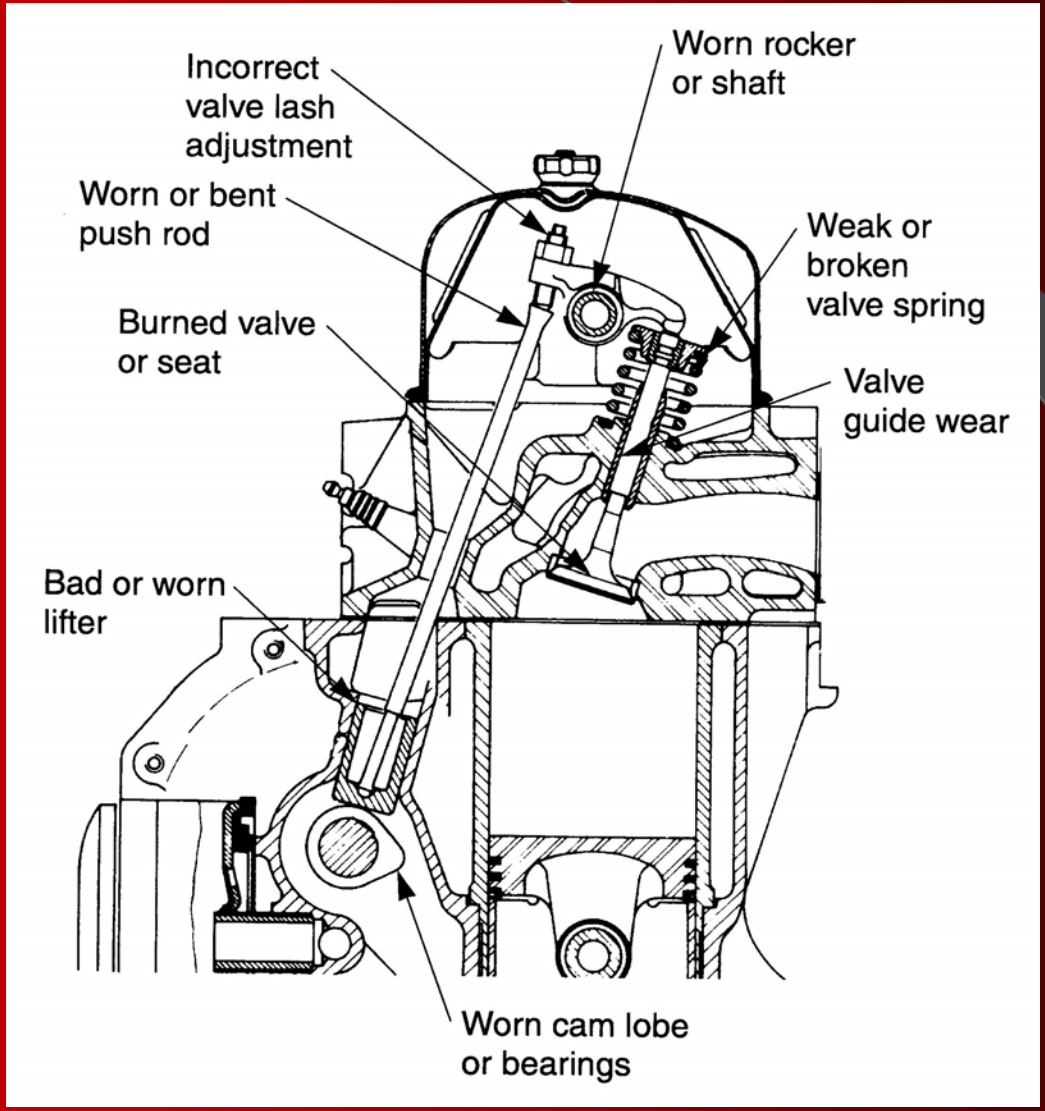
Used to lock the valve spring onto the valve



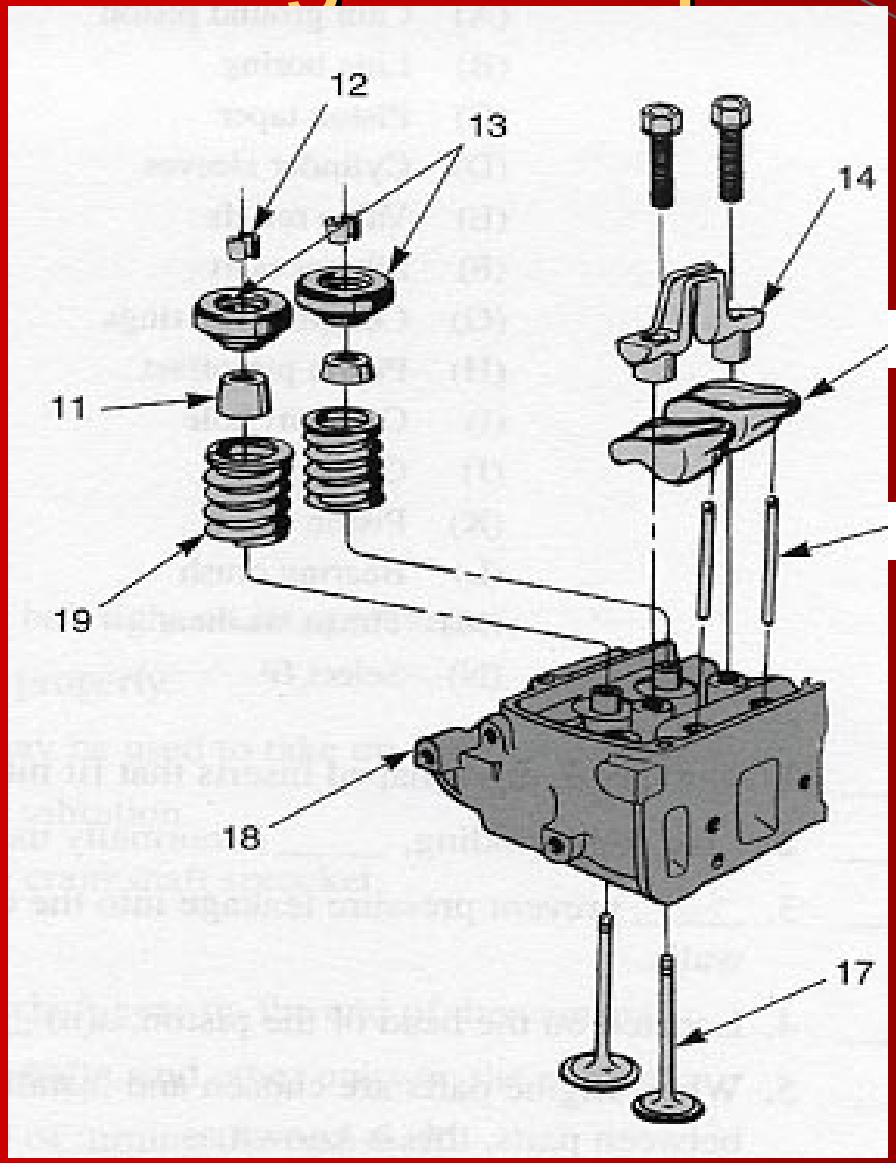
O-ring Valve Seal



Valve Train Problems



Engine Top End Construction



11. Valve seal
12. Valve keepers
13. Valve retainers
14. Rocker arm pivot
15. Rocker arms
16. Push rods
17. Exhaust valve
18. Bare cylinder head
19. Valve spring

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