Top End

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Purpose of an IC engine: Convert chemical energy stored in fuel to mechanical energy that can be used to do work (i.e. move the motorcycle)

Purpose of top end: Provide a place where this energy conversion happens in a controlled and predictable way
Top End: Operation, Mechanisms, Theory

- 4 - Stroke Cycle
- Spark Ignition
  - Compression Ratio
  - Knocking / Dieseling
- Ideal Gas Law (PV = nRT)
- Cooling
Top End: Operation, Mechanisms, Theory

**Timing**: how do the valves open at the right time?

Our engine: pushrod, OHV

Other designs?
Top End Hardware: Barrel, Piston
Top End Hardware: **Barrel, Piston**

**Piston**: rides inside cylinder

**Barrel**: constant volume housing for piston

Must be smooth to cut down on friction and wear - honing

**Boring**: make room for an oversize piston (0.030”)
Top End Hardware: Camshaft, Tappets, Pushrods
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**Camshaft:** Timing locked to crankshaft (2:1 ratio)

lobes are roughly at a right angle to each other

**Tappets:** Lobes on camshaft push these up and push the pushrods

**Pushrods:** push on the rocker arms to actuate the valves

Inspect to make sure they’re not bent
Camshaft(s)

Pushrods
Top End Hardware: **Rockers**

- Connect motion of push rod to the valve
- Push rod goes up in contact with rocker, opposing end goes down and depresses the valve
Top End Hardware: Valves
Top End Hardware: **Valves**

- Cut and lap valves and valve seats (need a good seal)
- Leave 0.005”-0.010” gap between rocker arm and valve stem (why?)
- Opposing helicity of springs
- Larger intake valve
- Geometry of collars retains the valves
Top End Hardware: **Head**
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- Function: cap for the barrel; house the valves and rockers
- Sand blasted
- Valve seats lapped
- Copper head gasket (why?)
- This is where the spark plug is screwed in
- Hemispherical
Top End Hardware: Valve Covers
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Prevents dirt from getting in and oil from getting out

Lapping the sealing surfaces changed them slightly

3D scan existing cover and try to make a model in CREO

Did not work

Took measurements of valve cover and made another model in CREO to make on CNC

Rough and imperfect but should work (precision not as critical as with
Lubrication

Extremely important to keep the engine running for more than a few seconds

Oil is for more than lubrication (e.g. cooling, corrosion prevention)

Many places that the oil needs to reach
Image Sources

https://4.bp.blogspot.com/-GlyAdnUo2iw/U441uhQz2hI/AAAAAAAAAUE/hh4ddkMkH_co3KPHoFwxg5DKuOt-W5DdQCPcB/s1600/Difference%2BBetween%2B4%2BStroke%2Band%2B2%2BStroke%2BEngines.gif

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