Top End

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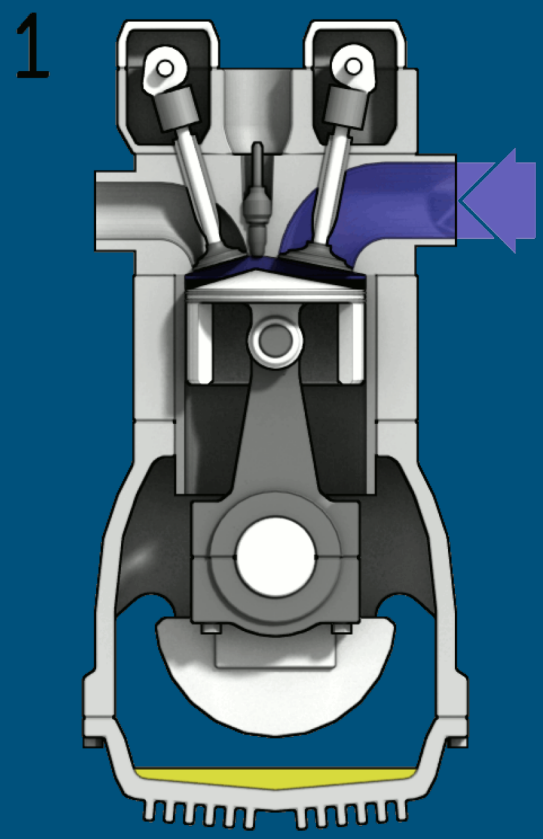
Top End: Purpose/Importance

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

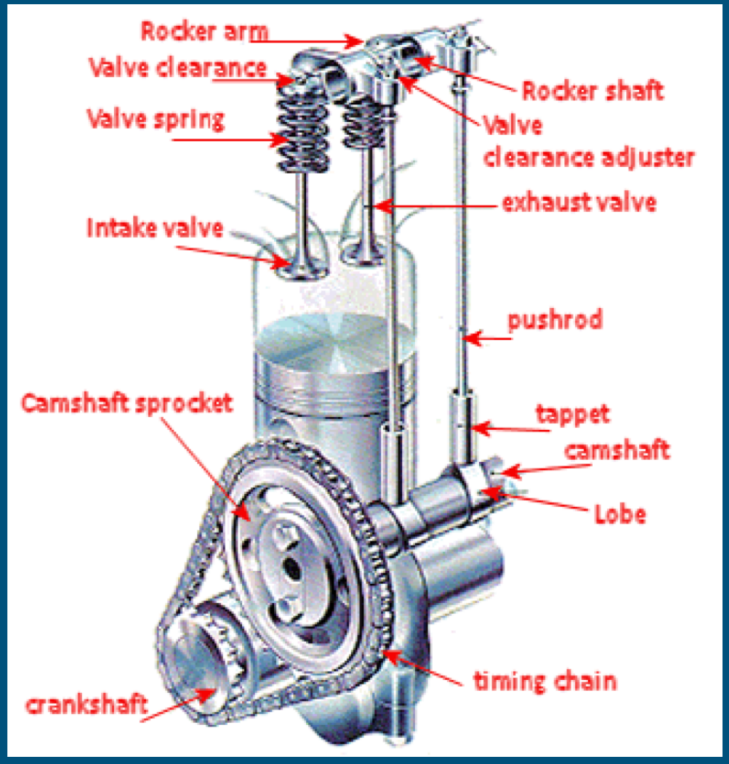


Top End: Operation, Mechanisms, Theory

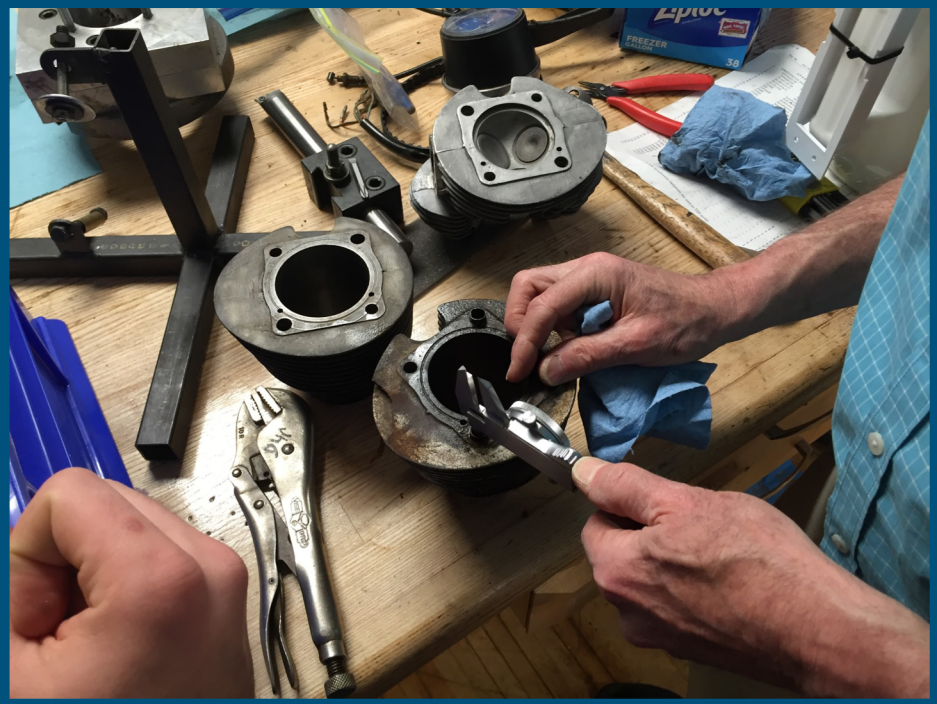
Timing: how do the valves open at the right time?

Our engine: pushrod, OHV

Other designs?



Top End Hardware: **Barrel, Piston**



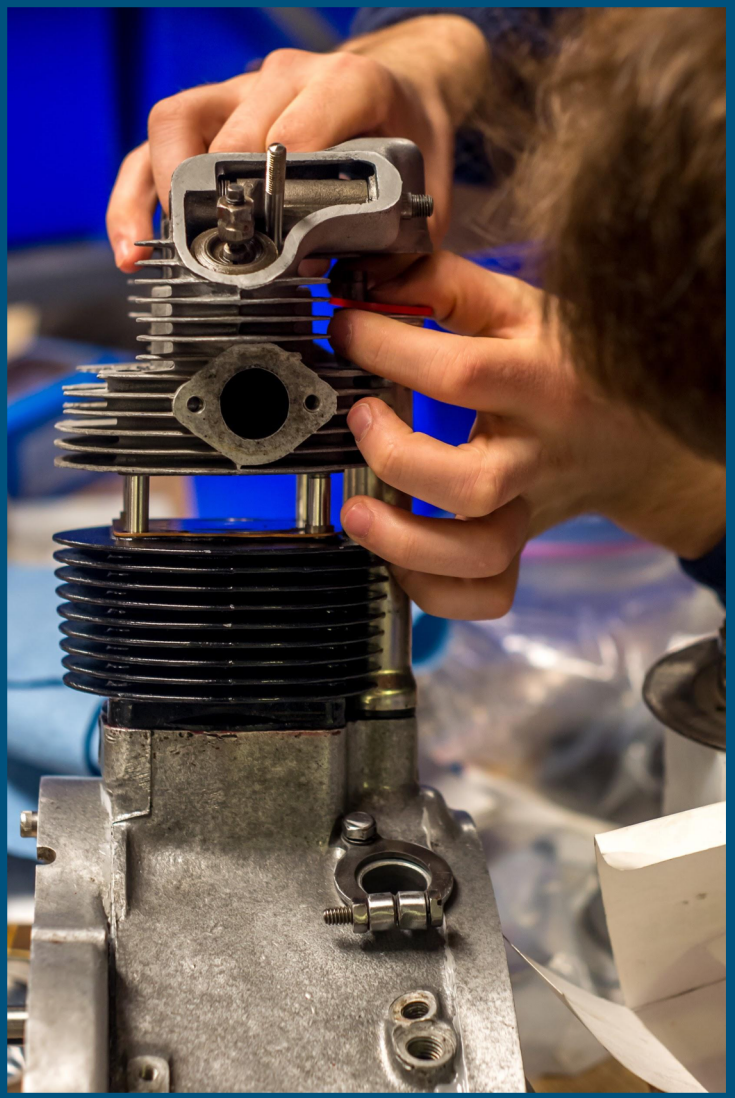
Top End Hardware: **Barrel, Piston**

Piston: rides inside cylinder

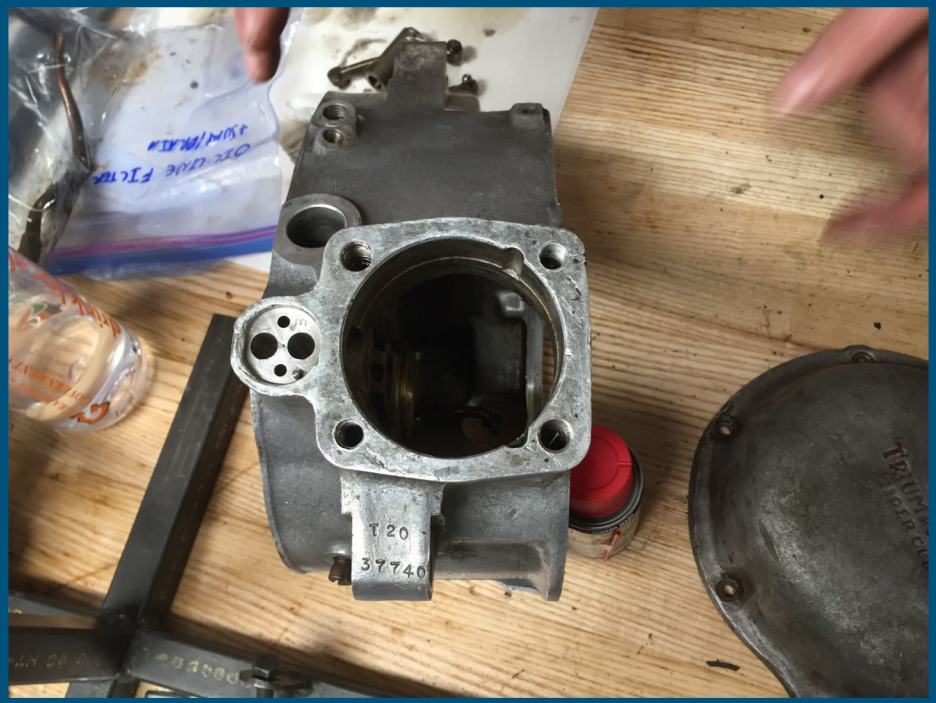
Barrel: constant volume housing for piston

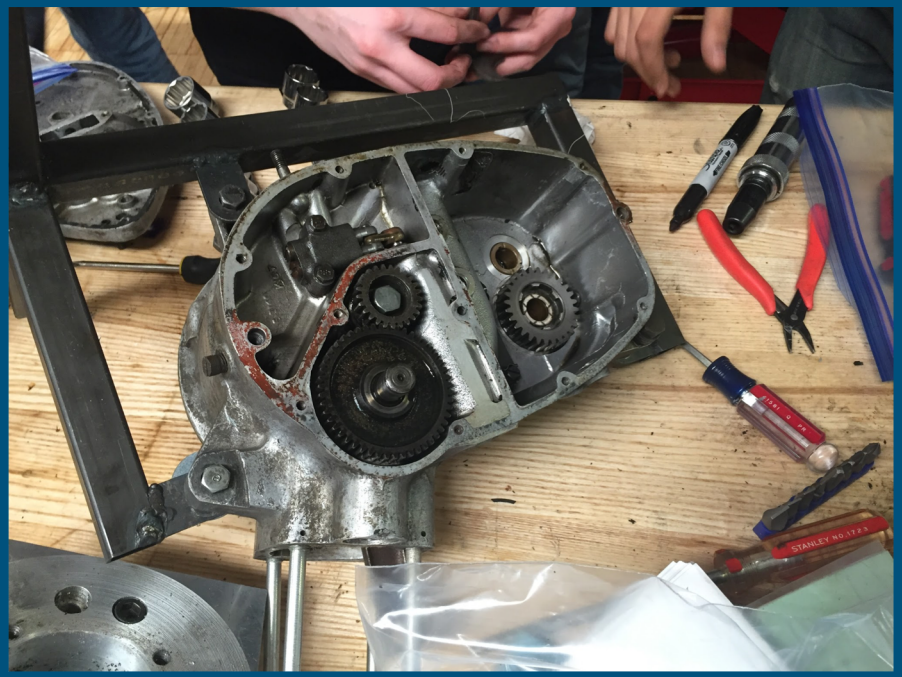
Must be smooth to cut down on friction and wear - honing

Boring: make room for an oversize piston (0.030”)



Top End Hardware: **Camshaft, Tappets, Pushrods**





Top End Hardware: **Camshaft, Tappets, Pushrods**

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

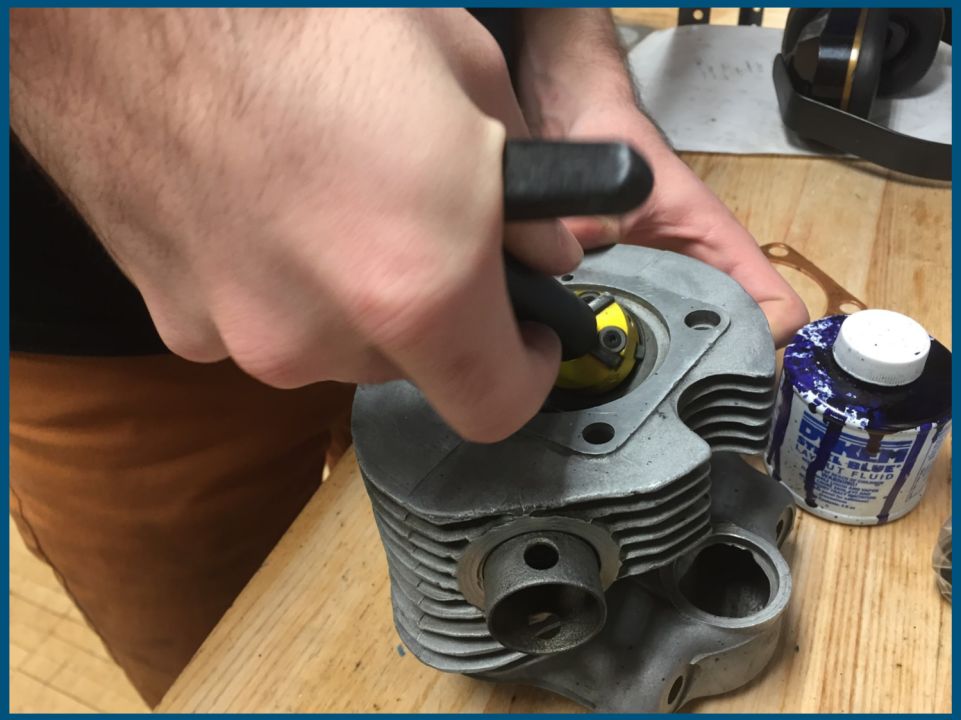
Camshaft(s)

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

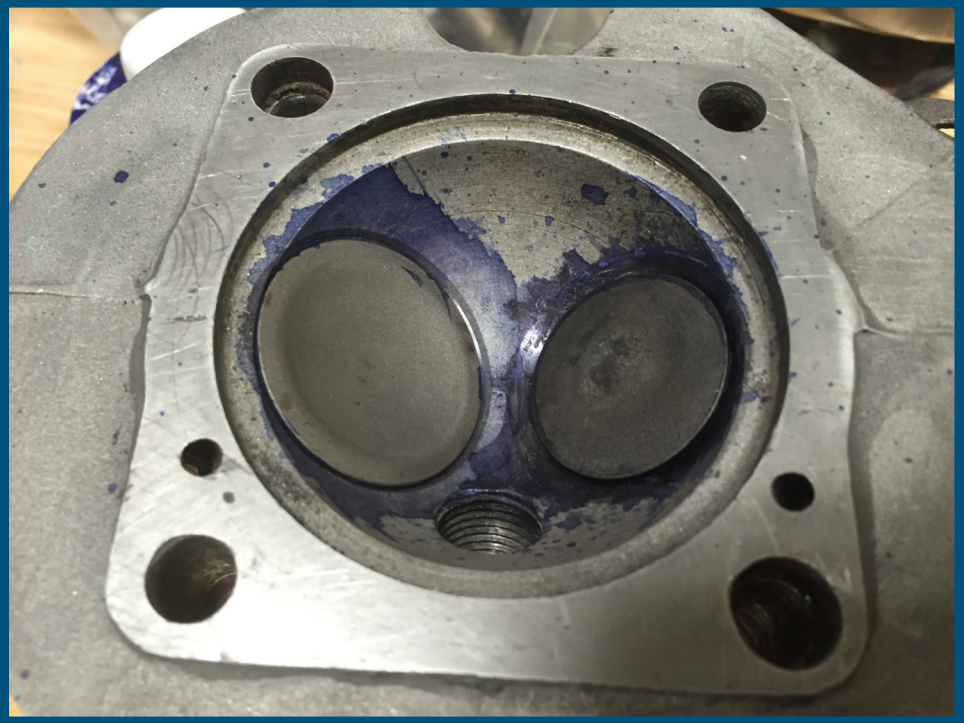
Top End Hardware: **Valves**



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**



Top End Hardware: **Head**

Function: cap for the barrel; house the valves and rockers

Sand blasted

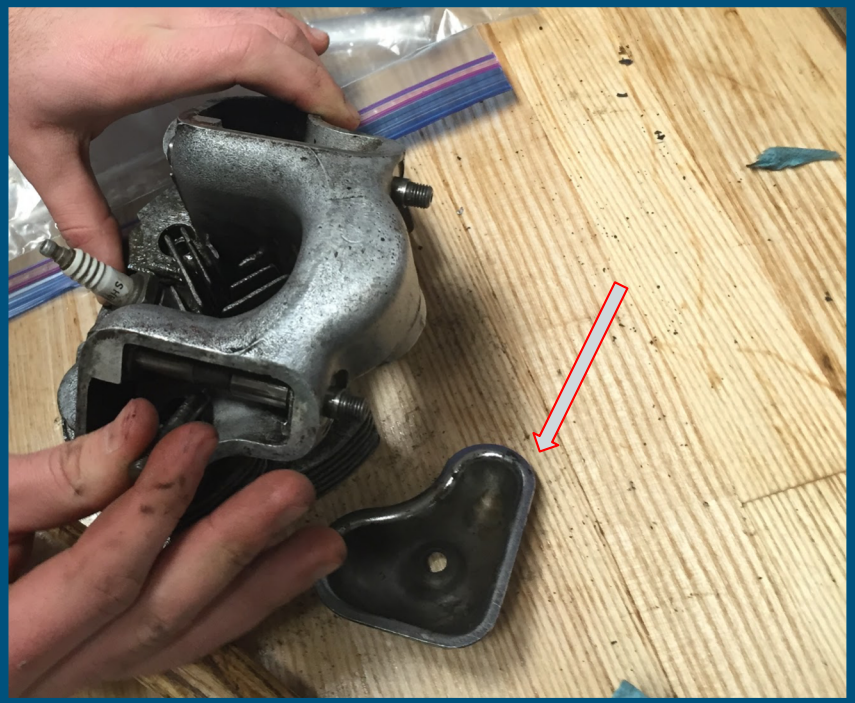
Valve seats lapped

Copper head gasket (why?)

This is where the spark plug is screwed in

Hemispherical

Top End Hardware: **Valve Covers**

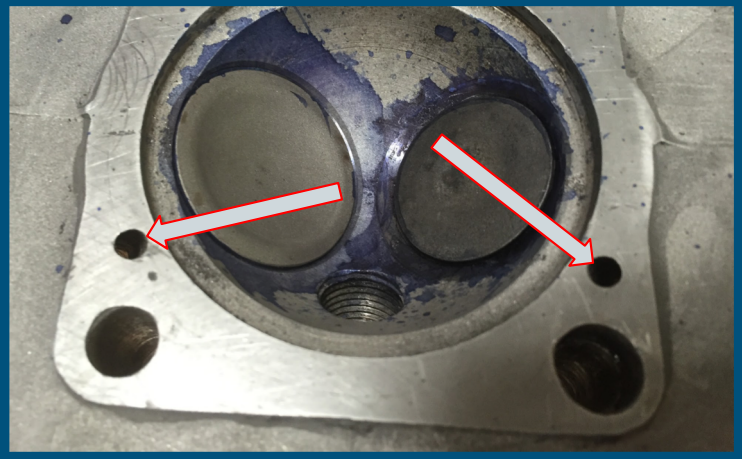


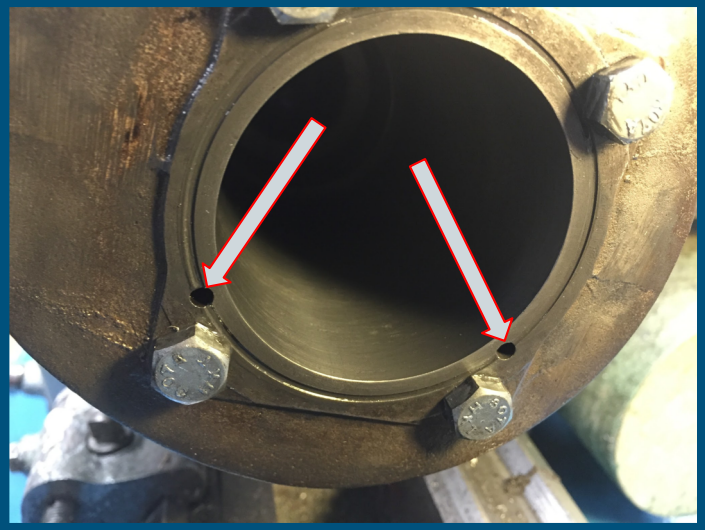
Top End Hardware: **Valve Covers**

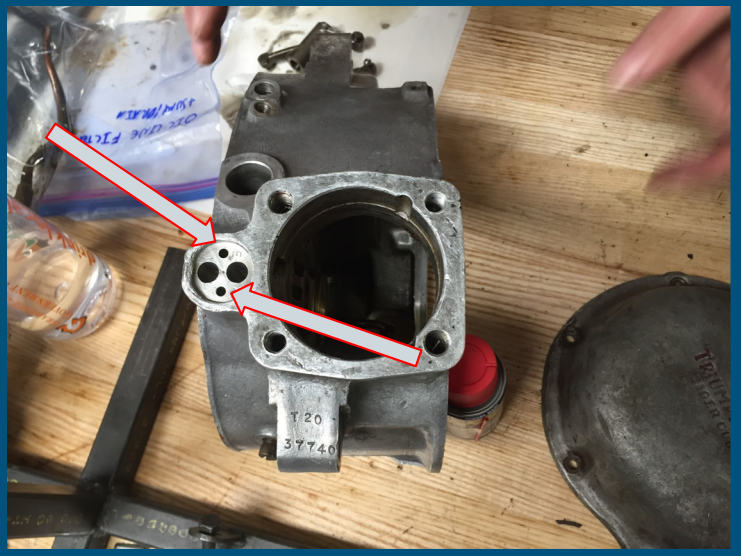
- Prevents dirt from getting in and oil from getting out
- Lapping the sealing surfaces changed them slightly
- 3D scan existing cover and try to make a model in CREO
  - Did not work
- Took measurements of valve cover and made another model in CREO to make on CNC
  - Rough and imperfect but should work (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



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