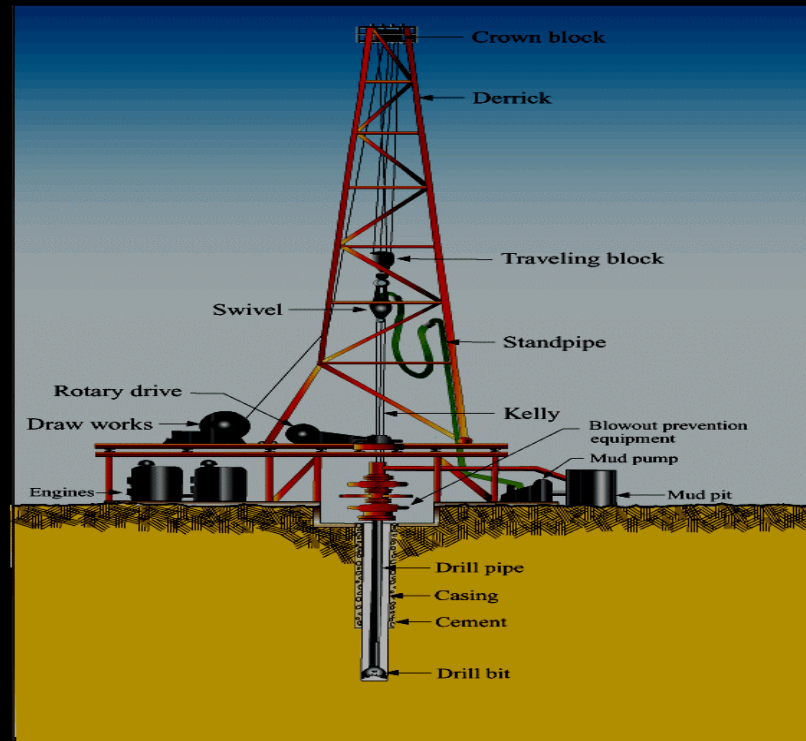


Geothermal Drilling

Functions of drilling rig components



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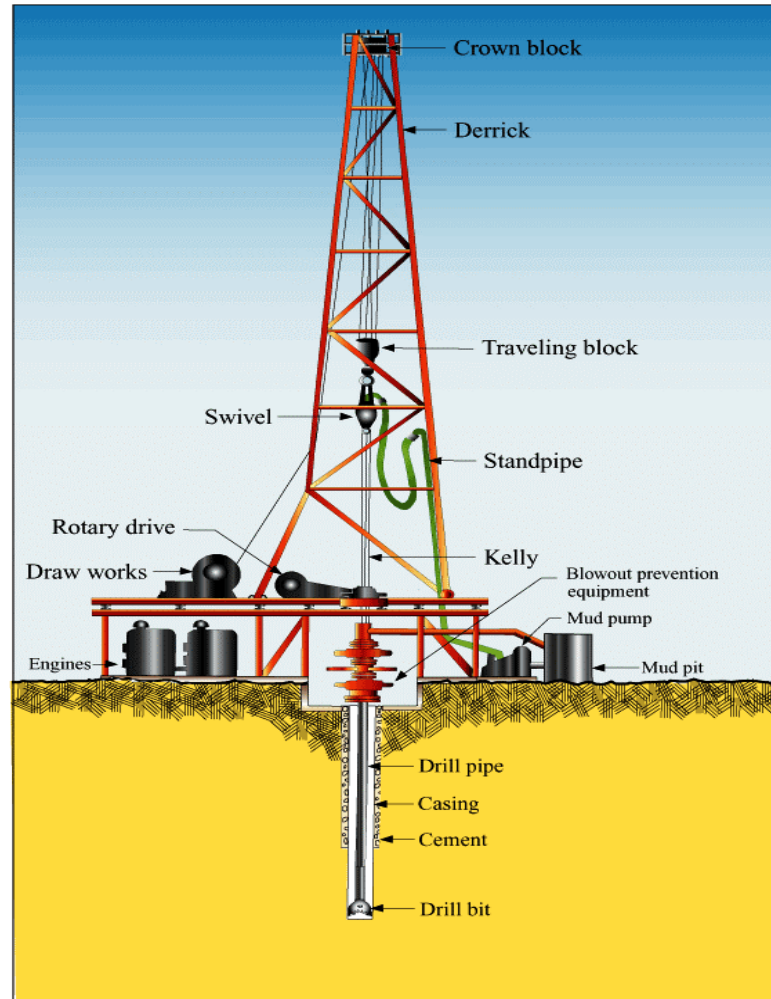
Introduction

- Drilling rigs create boreholes on that are used in natural gas extraction
- A rig that can drill a 10,000ft (3km) well requires 50-75 people, 35-45 semi tracks to move and assemble it.
- Drilling operations continue 24hrs and 7days for almost full year

Classification

- By power: mechanical, electrical, hydraulic, steam and so on
- By pipe used: cable, metallic or plastic drill, coil tubing
- By height: single, double, triple
- By rotation type: rotary table, top drive, sonic..
- By position of derrick: vertical, slant

Typical drilling rig



Source

http://www.conservation.ca.gov/dog/picture_a_well/Pages/gh_drill_rig.aspx

Crown block

- An assembly of sheaves or pulleys mounted on beams
- The drilling line is run over it down and threaded



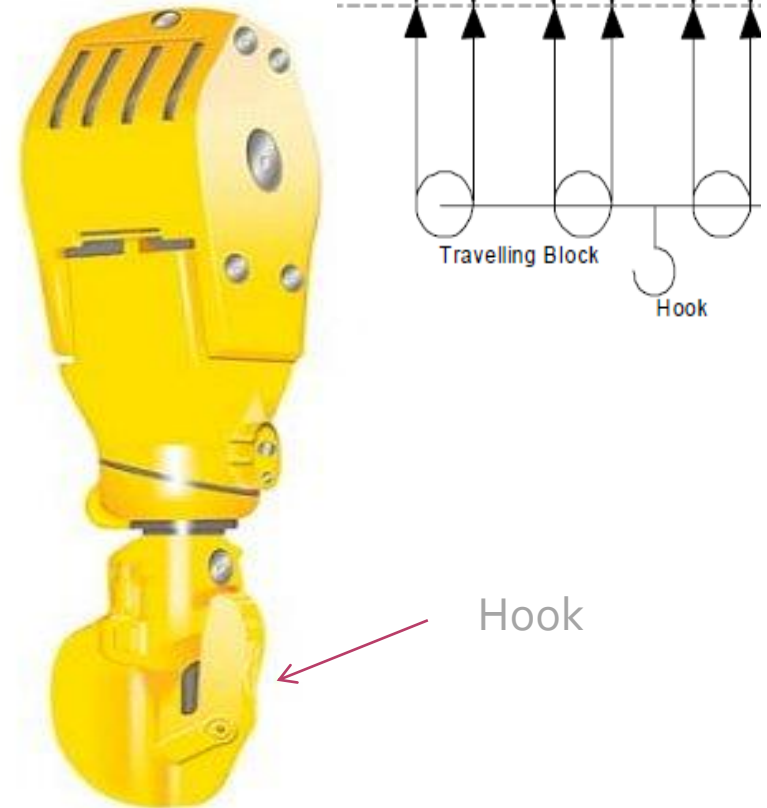
Source

<http://www.glossary.oilfield.slb.com/DisplayImage.cfm?ID>

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Travelling block

- An assembly of sheaves or pulleys
- The combination of travelling block with crown block and drill line lifts weight



Source <http://www.rigmanufacturer.com/travelling-block.html>

Derrick

- It is a four legged load carrying structure
- It is the most critical structure as it determines the rig's depth limit
- It carries the load of the crown block and travelling block
- It should be designed properly to carry largest dry weights of these loads



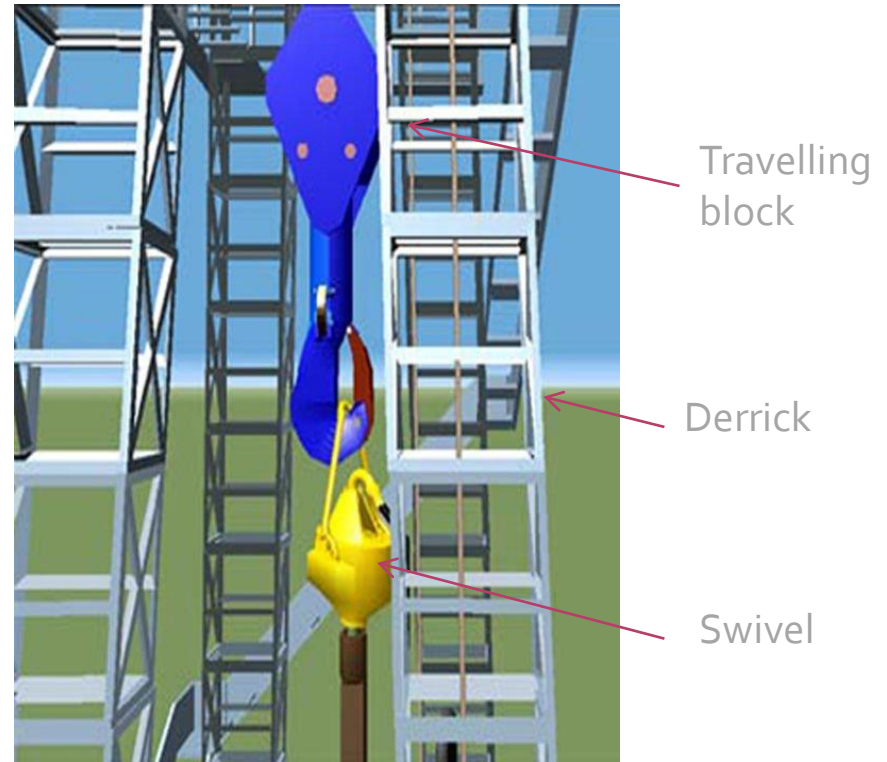
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Swivel

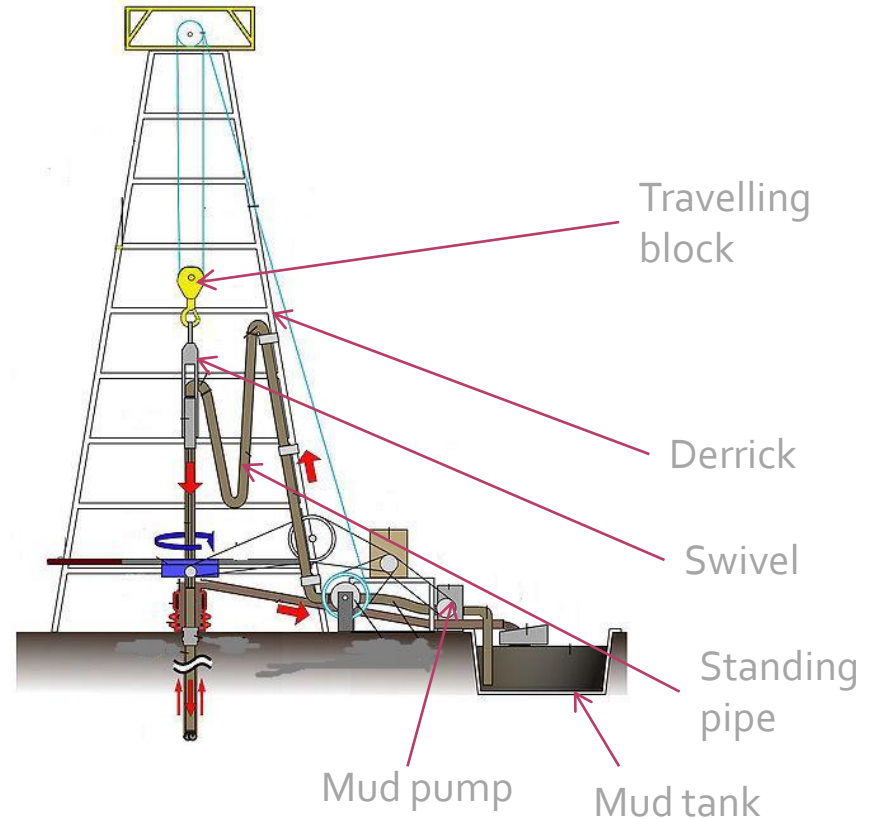
- Suspends the weight of the drilling pipe
- It is part of fluid circulation system and allows for the flow of drilling mud from the standpipe without leaking
- It allows the part below it to rotate



Source <http://petroequip.placecat.net/product-1127116--power-swivel-used-in-drilling-rigs.html>

Standpipe

- Is a part of the circulation systems that affects the success of drilling operation
- Standing pipe: allows the drilling mud to travel up the derrick and connect to swivel
- Drilling mud is pumped from mud tanks by mud pump up the standpipe



Source http://en.wikipedia.org/wiki/File:Oil_Rig_NT8.jpg

Kelly

- Is used to turn the drilling pipe
- It is a special section of pipe that is attached to the bottom of the swivel by threading.
- Drilling pipe rotates as the rotary table turns. The kelly connects these structures to the swivel

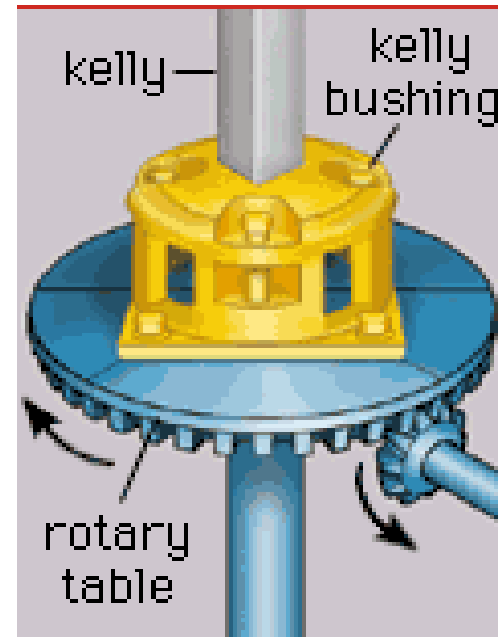
Kelly fitted into drive bushing



Source http://en.wikipedia.org/wiki/File:Oil_Rig_NT8.jpg

Kelly system components

- A powered gear located inside the rotary table turns the master bushing.
- The master bushing turns the Kelly bushing.
- The square or hexagonal opening in the Kelly Bushing fits against the flat sides of the Kelly itself and causes it to spin.
- The Kelly slides up and down freely inside the opening in the Kelly Bushing allowing it to move down as the bit drills into the hole
- The drill stem and bit are turned by the Kelly.



Source http://en.wikipedia.org/wiki/File:Oil_Rig_NT8.jpg

Rotary table

- It is used in both the Kelly system and Top Drive system.
- The rotary table is located on the floor of the rig and it is capable of producing a strong rotating force called
- Additional equipment transmits torque from the rotary table to the drill bit.



Source <http://www.shutterstock.com/>

The Kelly System Video

- <http://www.youtube.com/watch?v=K9x4atwaCvs>

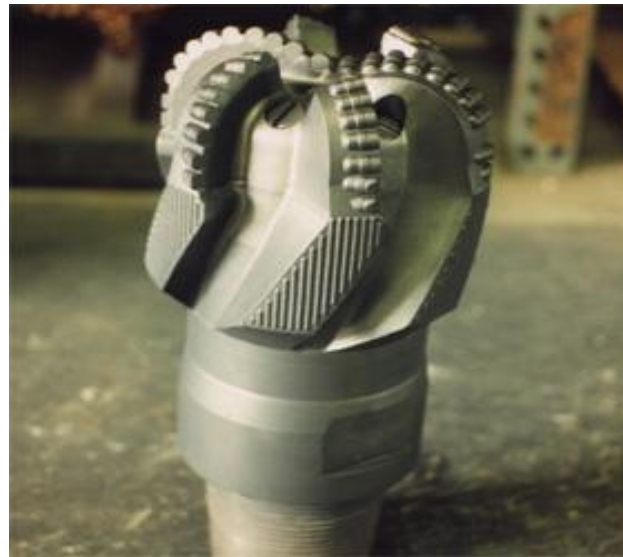
Drill pipe

- Drill Pipe forms the upper part of the drill string.
- Each section of pipe is called a joint with a box (female) and pin (male) located on the ends.
- Drill pipe is threaded together or assembled in sections and put into the hole as the bit turns.
- Drill pipe is hollow and allows fluid or transmitting wires to pass through



Drill bit

- It is Located at the bottom end of the drill string and make contact with the subsurface layers, and drilling through them.



• http://www.nov.com/Downhole/Drill_Bits.aspx

Drilling pipe and Bit Video

- <http://www.youtube.com/watch?v=fl8L4qSqSqE&feature=related>
-

Blowout prevention equipment

- The assembly of preventers, spools, valves, and nipples connected to the top of the wellhead
- prevent the uncontrolled escape of steam or water during drilling operations.



<http://www.mediafire.com/?uuay2bclaid2nr>
taringa.net

Mud pump and mud pit

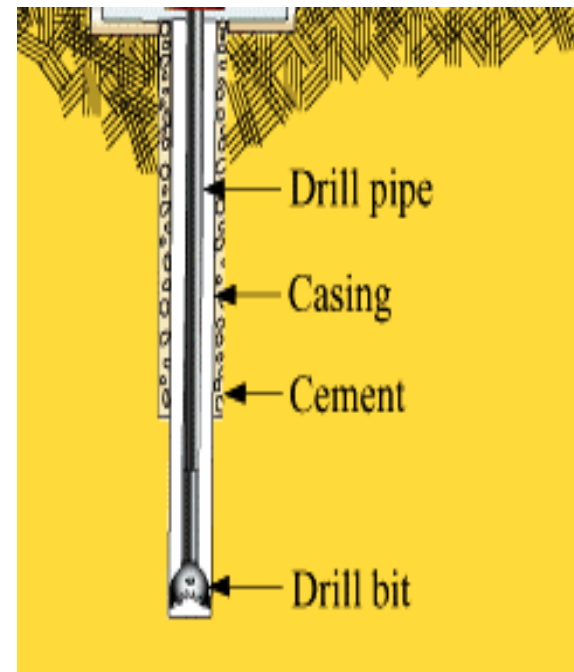
- Mud pump: A large, high-pressure reciprocating pump used to circulate the mud on a drilling rig.
- Pressure is as high as 52MPa
- **Mud pit:** Originally, an open pit dug in the ground to hold drilling mud or waste materials such as well bore cuttings or mud sediments.
- Steel tanks are much more commonly used for these purposes now, but they are still usually referred to as pits.



<http://www.mediafire.com/?uuay2bclaid2nr>
taringa.net

Casing

- It is made of heavy steel pipe
- lines the walls of the hole to prevent the wall of the hole from caving in
- prevents movement of fluids from one formation to another, and to aid in well control.
- The space between the wall of the hole and the casing is filled by cement



Limitations and future directions

- Friction caused by the drilling operation will tend to reduce the outside diameter of the drill bit.
- Air must be delivered to the piston at sufficient pressure to activate the reciprocating action, and in turn drive the head into the rock with sufficient strength to fracture and pulverise it
- New non-contact effective drilling technologies: are based on the utilization of water jet, chemical plasma, hydrothermal spallation or laser

High energetic electrical plasma

- very promising in deep drilling applications
- produce boreholes with large constant diameter without frequent replacement of the drill bits
- It would decrease time and money consumption
- It is in research phase

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