Unconventional petroleum exploitation II: the process of drilling and fracking

Some of the steps in the process:

1. Conventional drilling and casing of a vertical borehole more than a thousand feet (commonly thousands of feet), to a few hundred feet above the targeted layer.

2. Use of a mud-motor to drill a borehole that curves to a layer-parallel orientation, and drilling within the targeted layer.

3. Casing of borehole (cementing of pipe into surrounding rock, and into surrounding pipe where present).

4. Testing of integrity of casing and of cement job.

5. Perforation of casing to establish communication with surrounding rock.

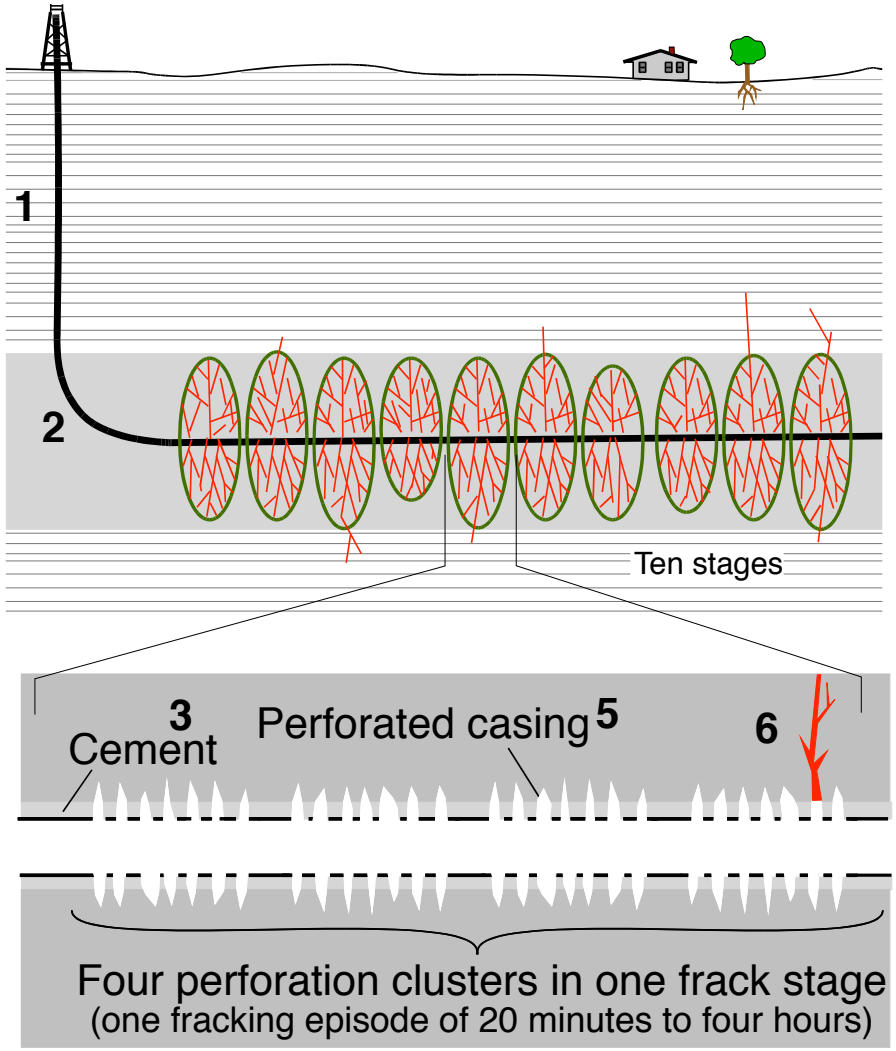
6. Pumping of fracking fluid to high pressure in one segment of hole, for one "stage" of fracking. Pressure induces fractures in the surrounding rock. Fluid carries proppant into the fractures.

7. Recovery of fracking fluid after stage is fracked.

8. Repetition of 6 and 7 for multiple stages (as many as twenty).

9. Clean-up to recover fluids and debris from well. Disposal of used fluid.

10. Production of hydrocarbons and associated water.



Fracking fluids consist of
- Water (usually the most abundant component, usually >90%, but can be replaced with liquified natural gas or propane)
- Hydrochloric acid coupled with corrosion inhibitors (commonly ammonium bisulfate)
- Biocides (commonly sodium hypochlorite and/or chlorine dioxide)
- Friction reducers (commonly polyacrylamide compounds)
- Surfactants (to promote flow of fluids into fractures – hence the term "slickwater")
- Proppants (natural sand and/or ceramic beads)
- Gelling compounds (guar gum or cellulose) to keep proppants in suspension
- Compounds to prevent precipitation of iron oxides (citric acid and acetic acid)

Sources include Prud'homme (2014) *Hydrofracking* and Holloway & Rudd (2013) *Fracking*.