40. What causes tools, pump rods, etc. to stick in my well, and often in two or three nearby wells at about the same time?

Slow movement along undetected faults can damage a wellbore.

Oilfield equipment can fail for a number of reasons. In some cases, rods in several close wells can fortuitously stick at the same time for different (or the same) reasons. However, there may be a geological explanation—"slow earthquakes." These are movements along faults that are too slow to produce seismic waves. Neither the faults nor motion can be detected by seismographs, hence, faults are unknown until they damage tools or well casing.

41. What kind of coal, and how much, does Oklahoma have?

About 8.1 billion short tons (1 short ton equals 2,000 pounds) of bituminous coal resources remain in about 8,000 square miles in 20 counties in eastern Oklahoma. About 1.6 billion short tons of bituminous coal reserves (the economically recoverable part of coal resources) remain in Oklahoma.

Bituminous coal is intermediate in rank between subbituminous coal and anthracite (Fig. 11). During "coalification," peat (unconsolidated plant remains) changes into lignite. As compaction and loss of water continues, lignite changes progressively into subbituminous coal, then bituminous coal, and finally anthracite. The most abundant rank of coal is bituminous.

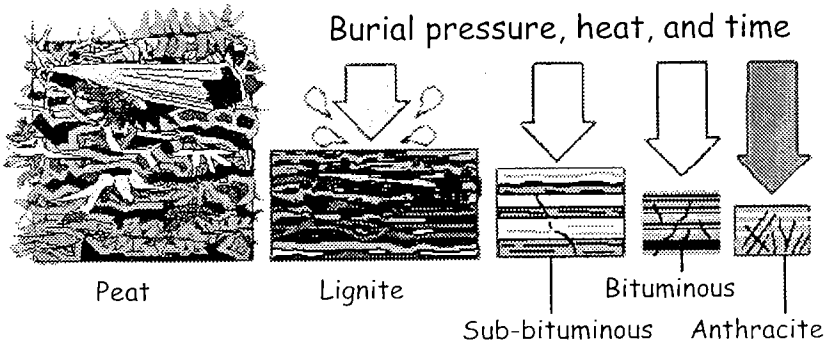

Figure 11 *(question 41)*. Diagram showing the transformation of peat into the different kinds of coal. As pressure and heat (typically due to increasing depth of burial) and time increase, water is expelled causing peat to change into lignite, then subbituminous, then bituminous coal. With continued increasing pressure, heat, and time, volatile matter (e.g., methane) is expelled and bituminous coal changes into anthracite. (Figure from Kentucky Geological Survey, accessed 2000.)

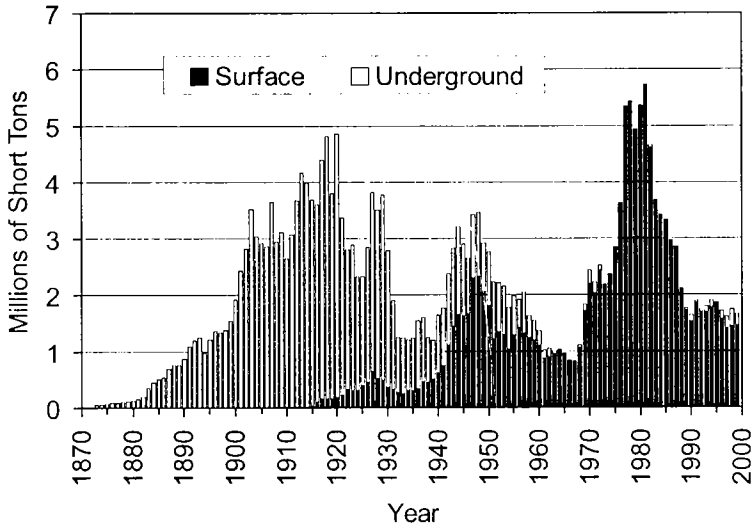

Figure 12 *(question 42)*. Graph showing coal production in Oklahoma from 1873 to 1999. (Graph by Brian J. Cardott, Oklahoma Geological Survey.)

42. How much coal has been produced in Oklahoma?

Since 1873, about 278 million short tons of bituminous coal. Annual coal production peaked in 1981 at about 5.7 million short tons (Fig. 12).