A water well is an excavation or structure created in the ground by digging, driving, boring, or drilling to access groundwater in underground aquifers. The well water is often drawn by a pump (Figure 1). Unfortunately, it impossible to pump water from very deep in the ground with just a surface pump. The key to understanding why is realizing that suction generated by the pump is not a force, but simply removing an opposing force to the force of air pressure which is already there. When you stick a pipe down a deep hole into a pool of water at the bottom of a well, air inside the pipe is pushing down on the water in the pipe, and air outside the pipe is pushing down on the water outside the pipe, which in turn pushes up on water inside the pipe - all is in a balance.

Let's say you suck out the air inside the pipe. The water is pushed up the same as it was before, but there is no counteracting force pushing the water down, so it begins to rise inside the pipe (Figure 2). So far so good, but the water stops rising at some height since the water is pulled down by gravity (i.e., the more water in the pipe, the more it weighs). Since the force of the air outside the pipe is not changing, eventually the weight of the water is equal to the air pressure outside the pipe. When this happens, the system is in balance again and water stops flowing.

Suction is not a force, the atmospheric pressure is.

Water is pumped from a well by creating a partial vacuum above the water by the pump. The amount of vacuum is equal to the weight of the column of water from the water table to the surface. Atmospheric pressure at sea level is 760 mm of mercury (1.01 \times 10^5 \text{ Pascals}), which is equivalent to a 10.3-meter column of water. This is how deep water can be pumped from (with a surface pump; other pressurized pumps can go deeper).
Figure 2: Cross section and details of a surface pump used in a well. Image used with permission (CC BY-SA 3.0; Manco Capac).