

Attraction
of the
land-masses.

than at others; the gravitational attraction of emerged land causes a heaping-up of the sea around continental and other coasts. The extent of this heaping-up near elevated continents, and consequent lowering of the sea-surface far from land, appear to have been much exaggerated. The difference of level due to this cause has sometimes been estimated at thousands of feet. Recent researches indicate that the differences of level at different points of the sea-surface do not depart more than 300 or 400 feet from a true spheroid of revolution.

The other causes which, in addition to the tides, may affect the level of the ocean are meteorologic, such as barometric pressure, temperature, the action of wind, evaporation, precipitation, the inflow of rivers, but in no cases do these affect the level of the ocean more than a few inches or a few feet.

Measurements
of depth.

All depths recorded by the sounding-line in the open sea are referred to the surface of the ocean, and near coasts to mean sea-level. The first method of ascertaining the depth of the ocean was by means of the hand line and lead, armed with tallow, used by ordinary sailors. A great advance was made when Lieutenant Brooke, of the United States Navy, devised the apparatus for detaching the weight or sinker when it struck the bottom, the line bringing up only a small tube with a sample of the bottom-deposit. During the "Challenger" Expedition the line used was a fine hempen rope, and the time when each 100-fathoms mark passed over the ship's side was carefully noted. When a great change of the rate was observed, the lead was known to have reached the bottom. It is believed that even the deepest soundings taken in this way are correct to within 100 feet.

Hand line.

Brooke's
sounding
machine.

Hemp line
for sounding.

Wire for
sounding.

Another advance was made when fine wire was used for the soundings, and the machine recorded automatically the moment when the sinker struck the bottom. There are many types of wire deep-sea sounding machines now in use, but the most compact and practical of these is the Lucas sounding machine. Sounding instruments are referred to in greater detail in another chapter (see p. 30).

Number of
deep-sea
soundings.

To give the total number of deep soundings recorded by British and other ships up to the present day, even in depths exceeding 1000 fathoms, would be difficult. An approximation has been made by counting the number of soundings in depths exceeding 1000 fathoms laid down on the latest charts. It must be remembered that not all the recorded soundings can be laid down on small scale charts where they are at all numerous.

In 1886 Sir John Murray had three hemispheres drawn on