degree, then the heat given off would be sufficient to raise the temperature of a stratum of air covering the whole of Europe to a height of 4000 metres on an average ten degrees. This explains how the Gulf Stream renders the climate of northern Europe so much milder in winter than would be expected from its northerly latitude. We shall see later on that the oceanographical researches of the last few years give reason to hope that it will even be possible to predict the winter temperature of northern Europe from the temperature of the sea some time in advance.

Gulf Stream.

The salts of the sea.

There are many different salts in the sea. Salinity means the total amount of salts in a given quantity of sea-water, and is usually stated in parts per thousand (*per mille*), indicating how many grams of salt are contained in one kilogram of sea-water.

Salinity determined from water-samples.

The salinity of the sea varies considerably both horizontally and vertically, and its distribution is determined by examining samples of water from different parts and different depths; these samples are secured by means of various water-bottles.

Obtaining samples from surface and shallow water.

From the surface a sample may be drawn with an ordinary bucket. For shallow waters down to 30 or 40 metres a common glass bottle is often employed; the line is bound to the neck of the bottle and a weight is suspended underneath. The stopper is fastened to the line a little way above the bottle, and is inserted when the bottle is lowered. When this simple water-bottle has arrived at the depth from which the sample is to be taken, the line is given a sharp pull, so that the stopper is drawn out and the bottle fills. In hauling up, a little water from the upper layers may, of course, enter the bottle, but this simple method does well enough for shallow water near land, where the variations are so great as to render extreme accuracy unnecessary.

Obtaining samples from deep water.

Many varieties of water-bottles for investigations in deep water have been constructed. A few of those most in use, and most effective in working, may be described, and the different principles involved explained.

Buchanan's stopcock water-bottle.

We will begin with an apparatus designed by J. Y. Buchanan for the "Challenger" Expedition, a so-called stopcock water-bottle (Fig. 161). It consists of a brass tube (A), which can be closed at both ends by means of metal stopcocks (B,B); the latter are, through two levers (D,D), connected with a rigid rod (O,O). When the side-rod is in the upper position, as seen in the left-hand and central figures, the cocks are open. A tilting plate