3. Origin of the Forms of Reefs, - the Atoll and the Distant Barrier.

The origin of the atoll form of reefs was first explained by Darwin. According to his theory, each atoll began as a fringing reef, around an ordinary island; and the slow sinking of the island till it disappeared, while the reef continued to grow upward, left the reef at the surface, a ring of coral around a lake.

As reef-forming corals grow only within depths not greater than 150 feet, the bottom on which they began must have been no deeper than this; and as such a shallow depth is to be found, with rare exceptions, only along the shores of lands or islands, the reef formed would be at first nothing but a fringing reef.

A fringing reef, the first step in coral formations, being begun, slow subsidence would make it a *barrier* reef.

In the lower part of Fig. 148, a section of a high island, ATPB, is represented. The horizontal line 1 is the level of the sea, f a section of the fringing reef on the left, and f' of that on the right. The reef depends for its upward progress on the growth of the coral, and on the waves. The waves act only on the outer margin of a reef, while the dirt and fresh water



Section of an island bordered by a coral reef, to illustrate the effects of a subsidence.

of the land directly retard the inner part. Hence the outer portion increases most rapidly, and retains itself at the surface, during a slow subsidence that would submerge the inner portion. The first step, therefore, in such a subsidence, is to change a fringing reef into a barrier reef (or one with a channel of water separating it from the shore). Continued subsidence widens and deepens this channel. Then, as the island begins to disappear, the channel becomes a lake, with a few peaks above its surface; and later, a single peak of the old land is all that is left. Finally this peak disappears, and the coral reef comes forth an atoll, with its lagoon complete.

Referring again to the figure: if, in the subsidence, the horizontal line 2 becomes the sea level, the former fringing reef f is then at b, a barrier reef, and f' is at b', and ch, ch', ch'' are sections of parts of the broad channel or area of water within; over one of the peaks, P, of the sinking island, there is an islet of coral, i; when the subsidence has made the horizontal line 3 the sea level, the former land has wholly disappeared, leaving the barrier