

or those in which reef-making corals grow, so that the coral-reef seas and Torrid Zone thus have the same limits.

In the Pacific, the effects are no less striking than in the Atlantic, on the *west* side of the American continent. Owing to the cold-latitude waters that flow equatorward, the isotherm of  $68^{\circ}$  reaches the South American coast at its west cape in latitude  $4^{\circ}$  S., and thus a tropical temperature is excluded from nearly the whole of it. In the north Pacific, the cooling effect is much less, because of the barrier to the arctic waters at the shallow Bering Strait; the isotherm terminates against the coast at  $23^{\circ}$ . But on the east border of Asia and Australia, or the west side of the ocean, the width of the area between the north and south isotherms of  $68^{\circ}$  is  $65^{\circ}$ , and the mean width in the central Pacific is about  $55^{\circ}$ .

The warm Gulf Stream extends its effects over the whole breadth of the north Atlantic, even to Great Britain and Iceland and the polar seas, as is indicated on the map by the long loops in the isotherm of  $44^{\circ}$  and  $35^{\circ}$ . The warm waters extend to Spitzbergen near  $82^{\circ}$  N., and to the west side of Nova Zembla, where the absence of ice in summer is its effect; and in favorable times it goes still farther east. Thus the heat of the tropics is made to temper arctic climate. But by the time the waters have reached the polar circle they have lost all tropical heat, and are warm only from contrast with the mean temperature of the northern latitude.

The effects of the polar waters along the east borders of North America are strongly marked, because they there pass alongside of the warm Gulf Stream from the south. The southward course near the continent of the isotherm of  $35^{\circ}$  to the southern angle of Newfoundland, and the termination of the isotherms of  $50^{\circ}$ ,  $56^{\circ}$ , and  $62^{\circ}$  at Cape Hatteras, are a consequence of the Labrador waters. Down to this cape these cold waters cover a cold belt inside of the Gulf Stream; but farther south they are excluded by this stream.

The polar waters are also felt, but to a less extent, on the borders of northwest Europe. The effect is manifest also along the east Asiatic coast, where, as the map shows, the isotherm of  $35^{\circ}$  extends down to  $45^{\circ}$  N., and that of  $68^{\circ}$  even down to  $15^{\circ}$  N.

*Deep-water effects.*—The great currents of the ocean have also deep-water effects. They are, as has been shown, *deep-water* currents. The Gulf Stream has a depth of 2500 to 1800 feet from the Florida straits to Cape Hatteras, and 1500 to 1000 north of the cape through the ocean; and the effects of the polar currents or movements are of all depths from the surface to the bottom. Between the two systems of movements, that of the tropical and that of the polar waters, the ocean derives its distribution of heat. South of Cape Hatteras, the deeper waters of the Gulf Stream give warmth to the bottom over a belt 50 to 75 miles wide; and north of this cape, the warm belt lies between the 65-fathom line on the west, where stands the cold wall of the Labrador current, and the 200-fathom line on the east; giving a temperature of  $53^{\circ}$  to  $47^{\circ}$  (Verrill) to the bottom, while on