

not only to the principles and practice of navigation, but also to the general interests of the world.

The Atlantic Ocean is the especial object of our author's labours, and occupies a large portion of his volume; the first two chapters, indeed, are devoted to a single current in it—the Gulf-stream—some of the most peculiar features of which he beautifully describes in the following passage:—

“There is a river in the ocean. In the severest droughts it never fails, and in the mightiest floods it never overflows. Its banks and its bottom are of cold water, while its current is of warm. The Gulf of Mexico is its fountain, and its mouth is in the Arctic Seas. It is the Gulf Stream. There is in the world no other such majestic flow of waters. Its current is more rapid than the Mississippi or the Amazon, and its volume more than a thousand times greater. Its waters, as far out from the Gulf as the Carolina coasts, are of an indigo blue. They are so distinctly marked that their line of junction with the common sea-water may be traced by the eye. Often one half of the vessel may be perceived floating in Gulf Stream water, while the other half is in common water of the sea; so sharp is the line, and such the want of affinity between those waters, and such, too, the reluctance, so to speak, on the part of the Gulf Stream to mingle with the common water of the sea.”

There are other features no less striking and peculiar to be observed in this wonderful ocean-stream—features so remarkable that it will not be unprofitable to consider them somewhat in detail. The general aspect of the Gulf-stream is that of a strong and rapid river, as it were, flowing forth from the Mexican Gulf and Caribbean Sea, and passing round the southern coast of Florida. It then proceeds to the north-east in a line almost parallel to the coast of the United States, as far as the Grand Banks of Newfoundland; here, being unrestrained, it widens its bounds, and slackens its speed, though such is its impetus that even to the coasts of Great Britain and Ireland, the Norwegian shores, and down to the Bay of Biscay, this mighty marine river continues to roll its wonderful waters. Throughout its course of many thousand miles it preserves its remarkable physical characters—the only change it undergoes being that of degree. As its waters gradually mingle with those of the surrounding ocean, their deep blue tint becomes more faint, their temperature diminishes, and the speed with which they advance declines. When the stream first emerges from the Gulf, and passes through the Channel of Bemini, its velocity is about 4 miles an hour; when it reaches Cape Hatteras, having attained a breadth of 75 miles, its speed is reduced to 3 miles an hour; and on its arrival at the Banks, it is still further diminished to $1\frac{1}{2}$ miles an hour. Its temperature also undergoes a corresponding change. In the Straits of Florida it has been observed as high as $88^{\circ} 52'$ Fah.; in latitude 40°

its warmth is still about 25° above that of the surrounding ocean. And even when it reaches the coasts of Northern Europe, its heat, though much diminished, is not altogether lost; as far north, indeed, as the polar basin of Spitzbergen its waters are 6 or 7 degrees warmer than those around them. To quote our author's words—“it is the influence of this stream that makes Erin the ‘Emerald Isle of the Sea,’ and that clothes the shores of Albion in evergreen robes; while in the same latitude on this side, the coasts of Labrador are fast bound in fetters of ice.” He declares also, that “the quantity of heat discharged over the Atlantic from the Gulf Stream in a winter's day, would be sufficient to raise the whole column of atmosphere that rests upon France and the British Isles from the freezing point to summer heat.”

Many theories have been put forward with regard to the causes that produce this vast and important stream. Some rest upon very insufficient grounds, and others are palpably absurd. It is now, however, generally agreed that one main influence which puts it in motion is “the tendency of the polar and equatorial waters to equalize their temperature by currents flowing at different depths through the ocean.” Another cause, which combines with the foregoing, and produces the north-easterly flow of the current, is the daily rotation of the earth upon its axis. In addition to these, there must also be taken into consideration the influence and action of the atmosphere, the tides, and the variations of temperature in different regions. The trade-winds, too, no doubt, perform their share of the task of keeping up the flow of this vast stream, which carries to the northern parts of the eastern hemisphere the warmth derived from the perpetual summer of the equatorial seas.

But our limited space forbids our dwelling any longer upon this very interesting subject; we must be content merely to draw the attention of our readers to some of its most remarkable features, a full account of which can be found in the work itself. Other topics, too, of interest and importance to all, are discussed in the volume before us; foremost among which may be mentioned that of the atmosphere in its various relations to the physical geography of the sea, as displayed in the winds, rains, and fogs, and in the phenomena of evaporation and electrical changes. Next, we have an account of the Salts of the Sea; the Geological Agency of the Winds; the Depths of the Ocean, with a description of the apparatus for determining them; the “Telegraphic Plateau” of the Atlantic; the Winds and Storms; the Climate of the Ocean; its Drift; and the Routes commonly ob-