

those who have used this instrument extensively must be, that it is liable to many objections, and that in particular if the current be beneath the surface, or, for want of a better term, may be denominated *submarine*, no result can be obtained by its use. If not perfect, however, the current log was at least a useful indicator; and its regular use, which was ordered to take place whenever the state of the sea would permit, served to keep the subject of currents continually before us. It is unnecessary to recount the number of the experiments that were performed; suffice it to say, that they were made both by day and by night, and were persevered in until the record of them became an almost daily portion of our journals; and the interest in them was extended from the officers, until they became a subject of inquiry even among the crews.

Upon the chart that exhibits the tracks of the squadron when united, and of the vessels when separate, the direction and force of the upper currents is indicated. The results thus expressed were obtained by a comparison of the position assigned to the vessels by the dead reckoning, and the true place shown by astronomic observations. This method, when practised by good observers, and particularly when furnished with chronometers of such excellence as can now be obtained, is in my opinion that which is liable to the fewest objections. Still it is to be desired that the allowances in the dead reckoning for lee-way, the heave of the sea, steerage, &c., should be founded on principles so certain as to admit them to be applied separately, and that less was left to the mere judgment of the navigator. The use of steam in navigation, and the introduction of improvements in the log, will probably bring about this desirable result.

In order to attain greater certainty, every calculation on which the rate and direction of a current was founded, has been made anew since the return of the Expedition; and it is trusted that the chart now exhibits a full and correct representation of the action which influenced the position of the vessels, freed in a great measure from the causes of uncertainty of which I have spoken above.

On the same chart are represented the courses of the winds, and the isothermal lines for every five degrees of the thermometer, from 30° to 95°. The zones lying between these lines are coloured in tints varying from cold to warm, in order that at a single glance the curves may be conspicuous. By simple inspection it will be seen how close is the connexion between the position of these lines and the figure of the zones they enclose, with the flow of the streams of which I am about to treat. It will at least be obvious that the distribution of the temperature at the surface of the ocean is affected by causes very