was placed at a depth of 18 feet (three fathoms) which is the standard depth adopted in this survey from the beginning; as it is necessary for accuracy to measure the velocity below the level of the keel of the steamer, which has a draught of 13 feet 6 inches. The direction of the current at 18 feet was readily observed during the day time, by noting the position of the meter in the water. This direction often differed as much as two points from the direction at the surface. The direction in which the current would set a vessel of ordinary draught was, therefore, better given by taking the average between the direction on the surface, and the direction at 18 feet. This average is given in the results shown in the plates, whenever the double observations were obtained, as there noted. The velocity of the current was noted from the counter attached to the meter, every half hour during the day time; but the importance of the velocity measurements did not warrant the continuance of these observations during the night; and the direction at 18 feet could not then be seen. The meter was, therefore, kept at work for 12 hours a day only.

The under-currents were examined by means of a "deep fan," consisting of two sheets of galvanized iron passing through each other at right angles, and thus forming four equal wings; and suspended in the water by patent sounding wire. This appliance was used with a Thomson sounding machine, on which the depth at any moment could be read off very conveniently. The fan was 26 inches deep, and each wing was 9 inches wide; and its area, which was practically the same in any position in the water, was 3·25 square feet. The fan itself weighed 14½ pounds, and in these slow currents it was used without the addition of any further weight or sinker. The sounding wire by which it was supported consisted of three strands of fine wire braided over; its thickness over all being a little less than one-tenth of an inch. This simple appliance was found to afford a very delicate means of determining both the direction and strengh of the under-current at any depth, where the currents themselves were so low in their velocity. The fan would swing out from the vertical in the direction of the current, and the supporting wire was so fine that the current nearer the surface had practically no hold upon it. In this way the direction could usually be found to the nearest point. The velocity could also be ascertained very closely by reading the inclination of the supporting wire to the nearest degree with a clinometer. The velocity corresponding to each inclination was determined by direct experiments, from which a table was made to reduce the observations. To obtain the correct depth, the fan was lowered to the surface of the water and the dial of the sounding machine set at zero. The reading on the dial then gave the depth below the surface correctly if the inclination of the wire did not exceed 15° from the vertical. When the angle was higher than this, additional wire was let out to allow the fan to reach the true depth. The amount required was found in a moment by means of a table of cosines of angles. This was carefully attended to in making the experimental observations for the velocity corresponding to the inclination.

For this purpose the calmest days were chosen, and the fan was lowered to 18 feet, the same depth as the meter. The meter register for the velocity and the inclination of the wire of the fan were taken at exact intervals of five minutes. In this way 43 determinations were obtained of the velocities corresponding to the various inclinations from 10° to 30°. These were first classified according to the inclinations, and the average velocity for each inclination was obtained. The velocities so found were then plotted graphically, and a mean curve drawn through the points. This curve was a parabola, for which the best form of equation is as follows:

$$v^2 = 1{\cdot}067 \tan i,$$

in which v is the velocity in knots per hour, and i the inclination of the wire from the vertical. The form of the curve shows also that for inclinations beyond 30°, which sometimes occurred, proportional values may be correctly used. A few values may be given as samples, from the tables thus obtained, which will serve to show that the velocities of the under-current, which are given in tabular form with this report, are quite reliable to the tenth of a knot, which is as closely as they are