

deeper waters. This return current, however, acts on the water below the discontinuity layer just as the current of wind acts on the natural surface of the loch, and a secondary current is produced at the surface of discontinuity. This secondary surface current is much slower than the surface current produced by the winds, but to take the place of the water carried along by it there is a secondary return current at the bottom of the lake. The secondary return current is very slow, and its existence was first suggested to the writer by experiments carried out in a glass trough, but observations support the view taken. The current systems thus described are shown in Fig. 70.

Another effect of the separation of the loch into two compartments by the surface of discontinuity, is to render possible the temperature seiche. The surface current produced by the wind transfers a large quantity of warm water to the lee end of the loch, with the result that the surface of discontinuity is deeper at the lee than at the windward end of the loch. When the wind moderates or ceases a temperature seiche is started, just as a seiche is started in a basin of water which has been tilted. The temperature seiche was also studied experimentally, and was made possible by superimposing a layer of paraffin on a layer of water. By driving the paraffin to one end of the trough by a current of air, the water, corresponding to the water below the surface of discontinuity in a loch, received a tilt, and when the current of air was stopped, a seiche started in the lower layer of water independently of the upper layer of paraffin.

The temperature seiche was first described by Mr. E. R. Watson in the autumn of 1903, and a good deal of doubt was expressed as to the accuracy of his views, but the theory of a temperature seiche was established by the observations taken in 1904. For a considerable period observations were taken at Fort Augustus every two hours, so as to obtain a continuous record of temperature. Fig. 71 is drawn from the observations taken in July and August, 1904, and shows the temperature variations at Fort Augustus at the surface and at depths of 50, 100, 150, and 200 feet. It will be observed that in July changes at the surface, which are chiefly produced by winds, are accompanied by similar changes at all depths, but that in August, when the discontinuity layer has been formed, the temperature variations at the surface are independent of the variations at a depth of 100 feet, where the variations are principally due to the temperature seiche.

Observations made at the two ends of the loch further support the theory, as showing that the layer of discontinuity was in general rising at one end when it was falling at the other end. Continuous records obtained from the Callendar recorder are also easily explained by the temperature seiche. Rough calculations were made of what should be the period of this seiche, based on the assumption that the loch contained two layers of water of different but uniform density. The observed