great elevations in different parts of the earth might have on the axis of rotation. No doubt the removal of a large quantity of solid matter from one part of the globe to another would sensibly alter the principal axis, as well as the axis of rotation, which so nearly coincides with it; but it could be shown that it would produce in the latter only about 1-300th part of the change produced in the former. We know too little of the changes in the interior of the earth accompanying such changes on its surface to be able to state results with certainty. But he estimated that an elevation, for example, of 600 feet on a tract of the earth's surface 1,000 miles square and 10 miles in thickness would only alter the position of the principal axis by *one-third of a second*, or 34 feet. He called attention to the effect of tidal friction and subterranean viscosity in reducing any such deviation, and pointed out that it must be exceedingly slow; using for evidence the observationally proved slowness of the diminution of the earth's rotational velocity, and of the inclination of its equator to the ecliptic. It therefore seemed probable that geological changes had not produced any perceptible change in the principal axis or in the axis of rotation within the period of geological history.

OBSERVATIONS OF MAXIMUM AND MINIMUM SEA-TEMPERATURES BY CONTINUOUS IMMERSION

WHEN the Scotch Meteorological Society was instituted, now nearly twenty years ago, observations on sea-temperature were set on foot at the suggestion of the late Prof. Fleming, and have since been continued. These observations were made by the immersion of thermometers with small cisterns attached, and were taken at the surface and at a depth of 6 feet. Besides these, special observations were made for me on the temperature of the flood and ebb tide at depths extending to 50 feet in the Pentland Frith,* and hourly observations continued at intervals during four years ending in 1863 by Capt. Thomas, R.N., at depths extending to 60 feet.† Such occasional observations seemed to me to be insufficient to show properly the changes in temperature to which the sea is subject, and in August 1872 I suggested to my friend, Prof. Wyville Thomson, the propriety of ascertaining, on his exploring voyage, maximum and minimum temperatures by means of thermometers constantly immersed in the sea. For this purpose a thin malleable iron plate of an oval shape, as shown in Fig. 1, is fixed to the outside skin of the ship so as to form a small cell into which the sea-water finds ready ingress through numerous perforations. This cell, which need not project more than two inches, so as not to cause any appreciable obstruction to the speed of the vessel, should extend so far under the smooth water level as to prevent its lower end from rising above the trough of the sea, or an upright pipe might be placed within the vessel. In sailing ships there might be a cell on each side so as to secure constant immersion while the ship "is on a wind." In this cell a frame carrying a maximum and minimum thermometer slides in checks so as to be capable of being raised above water to the level of the cabin or the deck, where there should be a porthole to admit of the instruments being read and the indices being readjusted.

An arrangement similar in principle to that described was made in the *Challenger* exploring vessel before she left on her voyage.

In this way, during the whole of an over-sea voyage, regular observations of maxima and minima may be obtained as often as may be desired. This arrangement is peculiarly suitable to floating lights, and the Scotch Meteorological Society have been in correspondence with the Mersey Board in order to establish observations at the North-West Lightship.

The Marquis of Tweeddale in 1872 proposed that the Scotch Meteorological Society should enter upon the investigation of the migrations of fishes, and particularly those of the herring, in connection with sea-temperatures and weather generally, and his Lordship informed me that in his opinion it was likely that the herrings followed belts of water of a higher temperature than that of the sea generally.

In carrying out his Lordship's suggestion the Society has been favoured through the courtesy of the Fishery Board with returns of the daily catch of herrings and of the weather from the different fishing districts of Scotland for the last two years; and already two elaborate reports on the subject have been drawn up by Mr. Buchan, the Secretary, and published, which give good ground to hope that some positive results of considerable importance will be obtained. With reference to this investigation, I suggested, for piers and harbours, the adoption of a cast-iron pipe for containing the thermometer as shown in Fig. 2, and application was accordingly made to the Trustees of Peterhead harbour, where observations by continuous immersion have been made by Mr. William Boyd, F.R.S.E., since May 1873. It is to be regretted that these observations have in the meantime been stopped, owing to a ship having come in contact with the pipe.

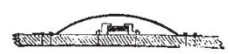

FIG. 1.

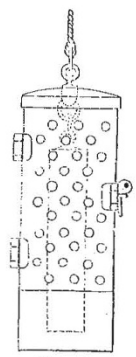

FIG. 3.

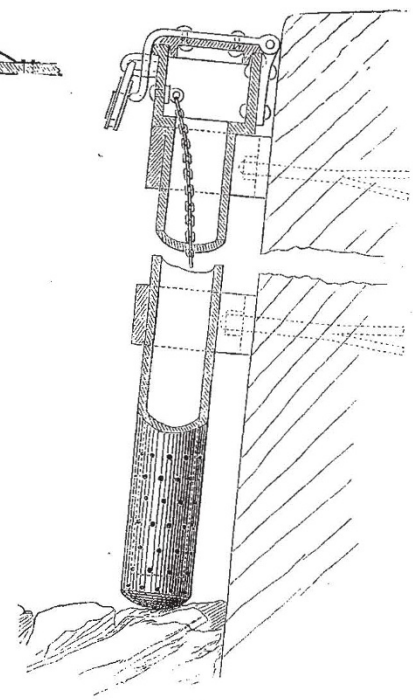

FIG. 2.

In addition to observations near the surface at floating lights, it would be extremely desirable to have thermometers immersed at greater depths, and for this purpose a copper vessel weighted below should be used, as represented in Fig. 3, with perforations in the upper part and a cistern about 4 in. deep in the lower part. The Scotch Meteorological Society, at its meeting on February 9 last, authorized an application to the different lighthouse authorities for sanctioning these deep-water observations as well as those of the surface and of the air.

THOMAS STEVENSON.

* "Edin. Phil. Jour." Nov. 25, 1857.
† "Jour. Scot. Met. Soc," vol. i., p. 256.