

tions themselves were so generally regarded as exceedingly simple, that the requisite care was not taken; it was always thought so easy to read a barometer or thermometer. The consequence was, that very often the requisite temperature correction was not applied to the reading of a barometer originally badly made, while a thermometer equally faulty was placed in a position where it could not possibly give the true temperature of the air.

No doubt, by a sufficient number of observations some knowledge of the elements of a particular place might be obtained; but there was always more or less uncertainty in comparing together observations made at different places and with different instruments. There was also an element of uncertainty in comparing together observations made at the same place and with the same instruments during a long series of years, for the constancy of the barometer could not be relied on, and the change that time produces in the two points of a thermometer was very generally overlooked. Now, an immense mass of observations of this nature, negligently made and irregularly published, if published at all, forms a not very promising collection out of which to deduce results; nor do we envy him the task who sets about gathering together the golden grains that may lie dispersed in such a mass. The observations have swollen to such an extent that the task would simply be impossible.

One defect inherent in all ordinary observations, even the best, ought here to be mentioned, and this is, that as far as weather is concerned, an observation requires to be made at the right moment. Let us say a squall comes on. Now, in order to know how this squall is travelling we ought to know at what moment the wind blows most fiercely and the barometer sinks lowest at a number of stations in the route of the squall. But in order to know this we ought to have self-registering instruments. But these are of very recent origin, and yet the instance we have just mentioned shows the paramount importance of such instruments in the science of meteorology.

And now let us mention, in few words, the practical results of all our observations. One of the most important of these is the very fair knowledge of the climate of various places which we have already obtained. A mode of graphical representation originally due to Halley, but introduced into meteorology by Humboldt, has been of service here. According to this method, we draw a line through all the various parts on the earth's surface that have any element of climate the same. Thus, an isothermal line embraces together all those places which have the same temperature, an isobaric line all those places that have the same atmospheric pressure; and so on. We have not yet, however, arrived at any precise knowledge of these secular changes that may take place after a long series of years in the climate of a country. At sea, again, thanks to Maury and others, we know the prevailing wind at different points, and also to some extent, though not completely, the course of the oceanic currents.

In the next place, with regard to the progress of certain kinds of weather, the chief extent of our information is, that at sea certain circular storms behave in a definite manner, so that we can lay down rules for the handling of a vessel that happens to be caught in one of these storms. This, and a beginning in storm-signalling made by Admiral Fitzroy and others, is nearly all we know about the subject. At this moment, as would appear from the Parliamentary Report recently published, he would be rash man who should venture to predict the kind of weather to be met with to-morrow, or foretell the character of next winter. Our readers who have followed us thus far will have perceived that the slow progress of meteorology has been due, in the first place, to difficulties inherent in the science, but, in the second place, to the want of system in the efforts made to extend our knowledge. Of late years, however, steps have been taken to remedy this latter evil.

The first of these which we shall mention is the establishment in this country by the British Association, of the Kew Observatory for verifying and improving meteorological and other instruments. By this arrangement an observer is no longer dependent upon the character of his optician for the accuracy of an instrument, but he may, if he chooses, have it sent to be verified at Kew upon the payment of a small fee. It is wonderful how quickly this system has operated in raising the character of the usual run of meteorological instruments made in this country. When a maker knows that his hand-work is liable to be examined at any moment by a competent authority, he very soon becomes more careful in the construction of his instruments. Before this system was introduced, the error of a barometer might be reckoned in tenths of an inch, now it is reckoned in thousands; a thermometer, again, might have been wrong a couple of degrees, not a couple of tenths is a large error.

The verifications of Kew Observatory are, however, not confined to meteorology, but they extend to geodetical and magnetical instruments; and, in fine, to all those instruments that may be employed in physical geography, using this word in its widest sense.

But, besides undertaking these verifications, the Kew Observatory has furthered the progress of meteorology by being the first to introduce self-recording photographic instruments; and we believe that a barograph, or self-recording barometer, now at work at the Kew Observatory, is the original instrument constructed by the well-known Francis Ronalds, once Director of that Observatory. Self-recording magnetographs have also been arranged by this Institution, and with such success that eight sets of these instruments, on the Kew plan, have been supplied to other Observatories.

The step we shall now allude to is of a more cosmopolitan nature.

About the year 1852 it came to be perceived that systematic co-operation, of a kind best attained by Government measures, was necessary to the progress of the science of meteorology. It was necessary that observers should work together with good instruments and on a good system, and also that the observations should be reduced and published systematically. This conviction led to the creation of the meteorological department of the Board of Trade, as is stated in the Parliamentary Bluebook before us, page 4, in the following words:—

"In and before the year 1852, the then Lieutenant Maury, acting under the sanction of the United States Government, had, by the help of the navy and the merchant ships of the United States, been for some time collecting meteorological observations made at sea. In 1852, Sir John Burgoyne, then Inspector-General of Fortifications, contemplated the establishment of a certain number of meteorological observations on land, to be managed by the Royal Engineers, and a suggestion was at his instance made to the United States Government, that the observations so carried on, and any observations made under the direction of that Government, should be conducted on one uniform plan. To this a counter proposition was made by the United States Government, to the effect that any uniform system should include observations at sea, and that the different maritime nations of the world should be invited to make such observations on one uniform plan. This counter proposal was submitted by the British Government to the Royal Society; and it was finally determined to postpone for the present the attempt to reduce to one uniform system the various meteorological observations by land which different nations were then already making; but that it was desirable to invite the various maritime nations of the world to collect through the medium of their national and mercantile navies, certain meteorological observations at sea, to discuss these observations, and to communicate the results to one another. A conference, consisting of representatives from different maritime countries, subsequently met at Brussels, in August and September 1853. This conference reported to the effect that it would be impracticable to obtain one great desideratum, viz, uniformity of scales and instruments; but they expressed a strong opinion that steps should be taken to secure the accuracy of the instruments that might be used. The meteorological department of the Board of Trade was subsequently constituted, and the late Admiral Fitzroy was appointed as its head."

A systematic course of research was thus inaugurated, and in order to insure correctness, all the instruments used by the meteorological department in this country were verified at the Kew Observatory.

The fruits of this system were soon apparent. Maury was enabled, by making use of the logs of many vessels, to lay down the directions of the prevailing winds in various parts of the ocean, in such a manner that the passage of vessels has been materially shortened in consequence. This is of itself a very great boon, and one which our nation can thoroughly appreciate. In our country, again, the late Admiral Fitzroy latterly turned his attention to the subject of storm-warnings to the various ports—a practical point of great interest in an island so exposed as ours; and in this branch he achieved a very considerable amount of success, for which we hardly think he has got sufficient credit from the Parliamentary Committee whose report we have referred to.

The lamented death of Admiral Fitzroy, who may be said to have fallen a victim to the duties of his office, has induced Government again to consult with the Royal Society. The Royal Society on being consulted immediately recommended that self-recording meteorological instruments should be introduced into some six stations on the British Isles, of which one should form the central station, to which the records of all the others should be sent for reduction and publication. They suggested Kew Observatory as perhaps the best for the office; and when it is recollected that the employment of photography to self-recording meteorological instruments was first introduced in this Observatory, we think the selection of Kew on the part of the Royal Society was only a just tribute to its past exertions and present standing.

From what we have previously said, our readers will perceive that the employment of self-recording instruments is quite essential to the progress of meteorology, and we earnestly hope that this proposal of