GREAT BRITAIN'S WONDERFUL WEATHER BUREAU.

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"He that is weatherwise
Is seldom otherwise,"

says the proverb, and the saying is not without a shrewd amount of truth. For perhaps nowhere can we find a more striking combination of imperfect observation and inconsistent deduction than in the saws which form the stock in trade of the ordinary would-be weather prophet. How common it is to find men full of the conviction that the weather must change at the so-called "changes of the moon," forgetful that

"If we'd no moon at all—
And that may seem strange—
We still should have weather
That's subject to change."

They will say truly enough, no doubt, that they have known the weather to change in "new" or "full," as the case may be, and they argue that it, therefore, must always do so. But in fact, they have only noted a few chance coincidences and have let the great number of discordances pass by unnoticed.

But observations of this kind seem scientific and respectable compared with those numerous weather proverbs which are based upon the mere jingle of a rhyme, as

"If the ash is out before the oak,
You may expect a thorough soak"—

a proverb which is deftly inserted in some districts by making "oak" rhyme to "choke."

Others again are based upon a mere childish fancy, as, for example, when the young moon "lying on her back" is supposed to bode a spell of dry weather, because it looks like a cup, and so might be thought of as able to hold the water.

During the present reign, however, a very different method of weather study has come into action, and the foundations of a true weather wisdom have been laid. These have been based, not on fancied analogies or old wives' rhymes, or a few forechosen coincidences, but upon observations carried on for long periods of time and over wide areas of country, and discussed in their entirety without selection and bias. Above all, mathematical analysis has been applied to the motion of the air and ideas, ever gaining in precision and exactness, have been formulated of the general circulation of the atmosphere.

Ac compared with its sister science, astronomy, meteorology appears to be still in a very undeveloped state. There is such a difference between the power of the astronomer to foretell the precise position of sun, moon and planets for years, even for centuries, beforehand, and the failure of the meteorologist to predict the weather for a single season ahead, that the impression has been widely spread that there is yet no true meteorological science at all. It is forgotten that astronomy is offered us, in the movements of the heavenly bodies, the very simplest and easiest problem of related motion. Yet for how many thousands of years did men watch the planets and speculate concerning them before the labors of Tycho, Kepler and Newton culminated in the revelation of their meaning? For countless generations it was supposed that their movements regulated the lives, characters and private fortunes of individual men, just as quite recently it was fancied that the new moon falling on a Saturday or two full moons coming within the same calendar month brought bad weather.

It is still impossible to foresee the weather change for long ahead, but in some countries, especially in the United States, it has been found possible to predict the weather of the coming twenty-four hours with considerable exactness, and often to forecast the coming of a great storm several days ahead. This is the chief purpose of the two great observatories of the storm swept Indian and Chinese seas, Hongkong and Mauritius, and the value of the work which they have done in preventing the loss of ships and the consequent loss of lives and property has been beyond all estimate.

The Royal observatory, Greenwich, is a meteorological as well as an astronomical observatory, but it does not itself issue any weather forecasts. The Greenwich observations of weather are sent to the meteorological office, there to be combined with similar records from every part of the British isles, to form the basis of the daily forecasts which the latter office publishes. To each of these three offices, therefore, the Royal observatory, Greenwich, stands in the relation of a purveyor. It supplies them with the original observations more or less in reduced and corrected form, without which they could not carry on most important portions of their work.

Let it be noted how closely the three several departments—the Nautical Almanac office, the time department and the meteorological office—are related to practical navigation. Whatever question of pure science—of knowledge that is apart from its useful application—may arise out of the following up of these several inquiries, yet the first thought, the first principle of each, is to render navigation more sure.

The first of all meteorological instruments is the barometer, which, under its two chief forms of mercurial and aneroid, is simply a means of measuring the pressure exerted by the atmosphere.

There are two important corrections to which its readings are subject. The first is for the hight of the station above the level of the sea; the second is for the effect of temperature upon mercury in the barometer itself, lengthening the column. To overcome these the hight of the standard barometer at Greenwich above sea level has been most carefully ascertained, and the hights relative to it of the other barometers of the observatory, particularly those in rooms occupied by fundamental telescopes, have also been determined, while the self-recording barometer is mounted in a basement, where it is almost completely protected from changes of temperature.

Next in importance to the barometer as a meteorological instrument comes the thermometer. The great difficulty in the observatory use of the thermometer is to secure a perfectly unexceptional exposure so that the thermomter may be in free and perfect contact with the air and yet completely sheltered from any direct ray of the sun. This is secured in the great thermometer shed at Greenwich by a double series of "louvre" boards on the east, south and west sides of the shed, the north side being open. The shed itself is made a very roomy one in order to give access to a greater body of air.

A most important use of the thermometer is in the measurement of the amount of moisture in the air. To obtain this a pair of thermometers are mounted close together, the bulb of one being covered by damp muslin, and consequently the two thermometers will read the same. But if the air be comparatively dry the wet bulb and its temperature will sink to that at which the air would be fully saturated with the moisture it already contained. For the higher the temperature the greater its power of containing moisture. The difference of the reading of the two thermometers is therefore an index of humidity. The greater the difference the greater the power of absorbing moisture, or, in other words, the dryness of the air. The great shed already alluded to is devoted to these companion thermometers.

Very closely connected with atmospheric pressure, as shown us by the barometer, is the study of the direction of the winds. If we take a map of the British isles and the neighboring countries, and put down upon them the barometer readings from a great number of observing stations and then join together the different places which show the same barometric pressure, we shall find that these lines of equal pressure—technically called "isobars"—are apt to run much nearer together in some places than in others. Clearly where the isobars are close together it means that in a very short difference of country we have a great difference of atmospheric pressure. In this case we are likely to get a very strong wind blowing from the region of high pressure to the region of low pressure, in order to restore the balance.

If, further, we had information from these various observing stations of the direction in which the wind was blowing, we should soon preceive other relationships. For instance, if we found that the barometer read about the same in a line of country from east to west, but that it was higher in the north of the islands than in the south, we should then have a general set of winds to the east, and a similar relation would hold good if the barometer were highest in some other quarter; that is, the prevailing wind will come from a quarter at right angles to the region of highest barometer,or, as it is expressed in what is known as "Buys Ballot's law," "Stand with your back to the wind and the barometer will be lower on the left hand than on your right." This law holds good for the northern hemisphere generally, except near to the equator; in the southern hemisphere the left hand is the side of low barometer.

The instruments for wind observation are of two classes—vanes to show its direction and anemometers to show its speed and its pressure. These may be regarded as two different modes in which the strength of the wind manifests itself. Pressure anemometers are usually of two forms—one in which a heavy plate is allowed to swing by its upper edge in a position fronting the wind, the amount of its deviation from the vertical being measured; and the other in which the plate is supported by springs, the degree of compression of the springs being the quantity registered in that case. Of the speed anemometers, the best known form is the "Robison," inwhich four hemispherical cups are carried at the extremities of a couple of cross-bars.

The two chief remaining instruments are those for measuring the amount of rainfall and of full sunshine. The rain guage consists essentially of a funnel to collect the rain and a graduated glass to measure it. The sunshine recorder usually consists of a large glass globe arranged to throw an image of the sun on a piece of specially prepared paper. This image moves along the paper as the sun moves in the sky, charring it as it moves, and at the end of the day it is easy to see from the broken, burnt trace at what hours the sun was shining clear, and when it was hidden by a cloud.

An amusing difficulty was encountered in an attempt to set on foot another inquiry. The superintendent of the meteorological department at the time wished to have a measure of the rate at which evaporation took place, and therefore exposed carefully measured quantities of water in the open air in a shallow vesse. For a few days the record seemed quite satisfactory. Then the evaporation showed a sudden increase, and developed in the most erratic and inexplicable manner until it was found that some sparrows had come to the conclusion that the saucer full of water was a kindly provision