

let into the wall, each of which represents the length of a standard measure, such as a yard, foot, &c. And let us here say a few words about the standards. To the uninitiated, a yard is simply three feet, and a foot is twelve inches—an inch being, we are told in our "Tables," the length of three barley-corns. Now, as the length of a barley-corn varies considerably, it requires something more definite than this to determine our national measures. Thus, the question, what is a foot? is more difficult to answer than at first sight appears. Many years ago, the French perceived the difficulty appertaining to the national standard, and they therefore decided that a metre should be the ten-millionth part of one-fourth of the earth's circumference—that is, ten-millionth of the distance from the equator to the Pole. But here another difficulty was encountered, because different calculators found this arc of different lengths. By law, however, it was decided that one measurement only was correct, and so the metre was fixed at 3.0794 Paris feet; though, since then, more accurate observations and improved instruments have shown these measured arcs to have been very incorrectly ascertained, and, thus the French method failed when practically tried.

The length of a seconds' pendulum oscillating in a certain latitude, has been our method of obtaining a standard; but this, also, has its weak points; so that to obtain a constant standard, it is necessary to have some pattern which is unchangeable; and thus a metal has been chosen that expands or contracts but little either with heat or cold; and this, at a certain temperature, is the standard measure, and such a standard may be seen on the exterior wall of Greenwich Observatory.

On entering the doorway—which is guarded by a Greenwich pensioner, who will possibly first peep at the visitor, in order to see who the individual may be who is desirous to tread within the sacred precincts—one finds a court-yard, on the left of which are the transit-room, the computing-room, and the chronometer-room. The transit-room takes its name from the instrument therein, which is a large "transit." This consists of a large telescope, the outside of which is not unlike a heavy cannon, as it is of solid iron. The instrument is supported by trunnions, which allow the telescope to be elevated, or depressed to point south or north, and, in fact, to make a complete revolution, but never to diverge from the north or south line. The magnifying power of this instrument is not very great, but its field of view is large, so that it admits plenty of light, for it is intended not as a searcher for, or for gazing at celestial objects, but for the purpose of noting the exact time at which stars and planets pass south or north of Greenwich. Upon looking through this telescope, the observer's eye is first attracted by a vertical row of what seem to be iron bars, placed at equal distances from each other. These, however, prove to be only spiders' webs, and are used for the purpose of taking time of passage of a star over each wire, and thus to ascertain the exact instant of its being in the centre of the telescope. During even the finest and calmest nights, there is occasionally found a tremulousness in the instrument, which, as it is rigidly fixed to the walls of the building, must be due to a slight vibration in the ground itself. Thus, many a feeble earthquake, unfelt by the outsider, may be perceived by the astronomer by the aid of his delicate instruments.

The various stars seem to be travelling at an immense rate when seen in the field of the transit-telescope, and it is really nervous work noting the exact time when each wire is passed. The experienced observer, however, not only will give the minute and second, but also the decimal of a second when the star was on the wire. This result is obtained by counting the beats of a clock the face of which is opposite the observer. Thus, if at three the star seems as much short of the wire as at four it had passed it, then 3.5 might be the instant of "transit."

At noon each day the sun's passage is observed by nearly the whole staff of observers. One individual looks through the telescope, and gives the time for each wire, while others examine a

variety of micrometers in order to ascertain the fractional parts of seconds, &c.—these micrometers being placed at the side of the instrument.

In the morning, the principal work consists in making what are termed the "reductions" to the observations of the previous night. These reductions are the corrections requisite for the slight instrumental inaccuracy, for the refraction of the atmosphere, and for the known constant error of the observer. When, therefore, a bright winter's night has occurred, the work on the following morning is usually very heavy. At noon the sun's time of transit is taken, and at one o'clock the "ball" is dropped, by means of which the various vessels in the Docks and in the Thames set their chronometers, or ascertain their rate. In addition to this, the time is sent by electricity to Deal and one or two other seaports, in order that every vessel may be able to know the accurate time, if within sight of those places.

Not the least interesting portion of the observatory is the chronometer-room. For a very small charge, manufacturers or owners may have their chronometers rated at Greenwich, which is accomplished in the following manner:

The chronometer is placed in the chronometer-room, and compared with the large electric clock in the room, this clock being kept in order by the stars. Each day the chronometer is examined, and thus its rate is ascertained in its then temperature. It is afterwards placed in a sort of closet warmed by gas, a condition supposed to represent the tropics, and it is there kept for a certain period, being tested each day as before. This change of temperature is found to produce very little effect on the best instruments, which, when they have passed the ordeal, are returned to the owners with their character ticketed to them. Some hundred chronometers are often placed in this room; and to compare them is a science, the "expert" by a glance discovering the difference between the two instruments, whilst a novice would require to mentally add or subtract, and thus slowly to arrive at the same results.

As soon as it becomes dark enough to see stars by the aid of a telescope, one of the staff commences his observations. These are continued during the night; and a register is kept of each star, planet, comet, or moon, which is "doctored" in the morning by the computers.

As all mortals are fallible, it is desirable to bring machinery into use where possible, and this has been managed in connection with astronomical observations. Instead of the computer registering by judgment the time of a star's transit over the various wires, he strikes a small indicator, which, completing the electric circuit, causes a prickler to fall and make a hole in a piece of paper that is attached to a slowly revolving barrel. Each time the star passes a wire, the prickler descends and leaves its mark, and the interval between these marks being measured by scale, the mean time of transit may be obtained.

There is usually a feeling of the sublime that comes over us when we reflect upon the vast unexplored regions of space, or contemplate the stellar world that shines upon us. The magnitude and grandeur of some of the planets in the solar system strike us with a feeling of awe and wonder, while we are puzzled at the mysteries attending comets, double stars, nebulae, &c. No such feelings or sentiments, however, are allowed to enter into the constitution or mind of an observer at Greenwich. Saturn, the glorious ringed planet, with its galaxy of moons, is simply "Saturn, Right Ascension 10 hours 3 min. 12 sec., North Declination 16° 12' 2". Anything appertaining to the physical constitution, the probable cause of the ring, or the object of so grand an orb, does not come within the range of the observations at Greenwich, which are limited to matter-of-fact business-work.

The southern portion of the observatory ground is devoted to the investigation of meteorological subjects, and it is under the superintendence of Mr. Glaisher, who is now well known as an aerial voyager. It is here that an exact record is kept of the amount of rain that daily falls, of the direction and force of the wind, of the magnetic

changes, of the temperature, amount of ozone, &c.—all matters which may, and probably will, lead us eventually to the discovery of some laws connected with the states of weather, and enable us to predict what may be expected from day to day. Whilst we are now able to calculate to a few seconds, and for years in advance, the instant when an eclipse may occur, and to explain the causes of the various planetary movements, yet we are in a sad state of ignorance as regards the causes of hurricanes, thunder-storms, continued rains and droughts, and thus we find that all the would-be prophets who from time to time spring up and oracularly announce a coming frost or fine weather, or the reverse, are perpetually meeting with most signal failures, which, however, does not deter future adventurers from attempting to gain a cheap temporary renown by trying their luck at a prophecy.

The perpetual accumulation of facts at Greenwich, whether these be of an astronomical nature, or appertaining to the air we breathe and its subtle changes, is a proceeding that must eventually lead us on to a correct knowledge of the laws which govern these matters, and also keep us acquainted with any variations that may be occurring in the elements that surround us.

The order and quietness necessary in such calculations as those carried on at Greenwich prevent it from being a "show" establishment, and hence visitors are not admitted except on special business. Then, however, every aid and assistance are offered to the student and inquirer; the use of books and instruments is freely given; and such information supplied as the little spare time of those belonging to the establishment enables them to afford. Thus a visit to or a period of study at Greenwich Observatory will amply repay those who wish to gain the latest and most accurate information on astronomical subjects, or to practise themselves at the adjustments and use of the instruments; and to those who have not such opportunity, we offer this slight sketch of our National Observatory at Greenwich.

EARLY CELTIC STORIES.

II.

THE BIG AMADHAN.

The Big Fool was the strongest man in the world, body and fist. As he and his true love were one day walking in a lovely valley near Loch Lene (Killarney), they saw a nobleman resembling a chief approaching. He had on a rich mantle, and bore a golden cup in one hand, and when he came near he hailed them. "Fair couple, tell me your name and the name of this valley." "Maev is the name of this young woman, I am called the Big Amadhan, and the name of the valley I know not; I never was here before. If you have liquor in that cup worthy of a *Gaica* (hero) let me take a drink." "A thousand welcomes, but be moderate!" "Oh, to be sure," but the Big Fool never took the goblet from his lips while a drop remained, for it was sweeter than the sweetest mead.

Just as he let it go from his mouth, his two legs dropped off from his knees, and down he came on his stumps. Bitter were the tears that Maev of the white shoulders shed at her husband's mischance. "Is it thus that you show hospitality to your visitors, man of ill-fortune?" "The fault is your own. If you had drunk sparingly, no harm would have befallen you!" "By the hand of my gossip, I won't leave a pair of legs on any one I meet, beginning with yourself, till I recover them." "Don't mind me if you are wise. I have only to mutter one word to draw your strength from your body, and weaken you like the child of yesterday. Are these your hounds coming down the glen?"

A stag was sweeping down the valley, and hounds and mounted men were pursuing him. A white dog was foremost of the pack, and swift as the deer went, the Big Amadhan kept within seven paces of him, and seven paces behind the hero came the dog. Never was there so long a valley; never were matched deer, man, and dog.