

visitor finds himself in the library, now embracing nearly six thousand volumes. These are mostly works of the highest standard value, astronomical and meteorological observations and discussions, some being as old as the year 1482, others representing the full work of the European observatories and learned societies to the present date.

From the library we pass into the transit-circle room, built in 1869, to admire the beautiful instrument, with its collimators and its chronograph. The focal length of the object-glass is 12 feet 1 inch; its clear aperture 8.52 inches; and the power of its eyepieces 135 to 396. The diameter of its circles at the outer edge is 45.30 inches, and at the graduation 43.40 inches, both circles being divided to every two minutes. The power of the reading microscopes is 45.3 diameters. Its collimators have a focal length of 2 feet 11 inches. This instrument, under Professors Newcomb, Harkness, and Eastman, and their assistants, has had for its chief work the more accurate determination of the stars whose places are computed in the *Nautical Almanac*, and of those needed by the Coast Survey. The chronograph, made by Alvan Clark, is of the form known as the Hipp chronograph, with modifications by Professor Harkness.

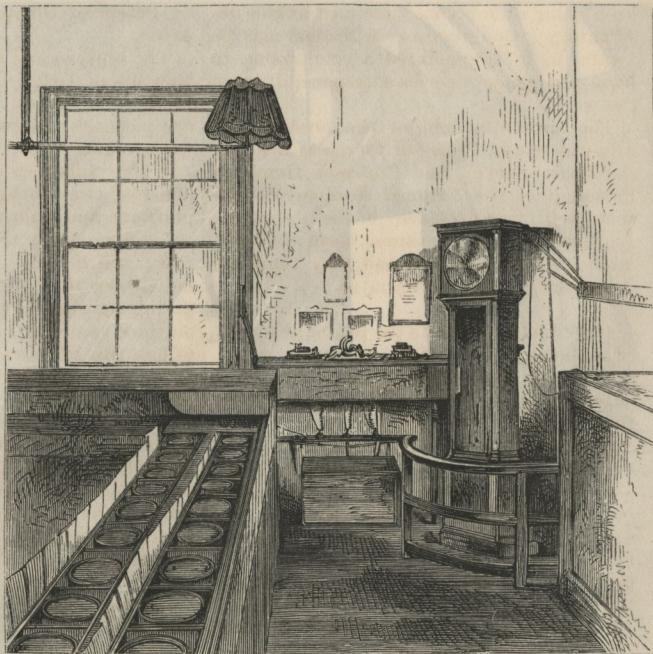
If the visitor now pass to the eastern wing of the observatory, he will find, side by side, the mural circle and the smaller transit instrument, with their clock and chronograph. The mural circle has an object-glass of 4.10 inches, and a focal length of 5 feet 3.8 inches, the highest power of the eyepieces being 240. The diameter of the circle at its outer edge, where the graduation is placed, is 60.35 inches. It is divided to every five minutes; the power of its reading microscope is 17.1 diameters. The transit has a focal length of 7 feet 0.4 inches, and its object-glass an aperture of 5.33 inches.

The open door of our plate on page 538 leads us into the chronometer-room. This shows another and a distinct but important office of the observatory. The relation of all its work to the interests of practical

navigation is sufficiently clear. The whole series of astronomical observations made by the different instruments is designed, like those of the Greenwich Observatory, as expressed in the royal warrant of the astronomer, "to rectify the tables of the motions of the heavens and the places of the fixed stars, in order to find out the so-much desired longitude at sea, and perfect the art of navigation." But the direct appliance of the navigator at sea to determine his longitude, in addition to the use of these and of his own observations of the heavens, is found in his faithful chronometer at his side. The room is usually well filled with these, which are daily wound and compared with a standard clock. A close record is kept of their rates. The rule of their trial is, to apply twice the difference between the greatest and the least rates during a period of at least six months; rejecting those whose variation exceeds eight seconds.

On the purchase of new instruments, or on the return of the United States vessels from their cruises, chronometers are usually sent to the observatory for inspection and rating. On the vessel's going again into commission, chronometers are furnished from this room, being packed with great care, with their self-registering thermometers, and dispatched by the hands of a trusty officer to the navigating officer of the sea-going vessel.

More than 200 time-keepers have been at one time under care in this room. As many as eighty in 1867 were condemned and with-



PART OF THE CHRONOMETER-ROOM—UNITED STATES NAVAL OBSERVATORY.