

the screen are necessarily much less bright than the clouds themselves, and when these latter are pale or nearly uniform, or again when the daylight is feeble, the images in the dark room have not the clearness necessary for making good observations.

The preceding considerations have led me to construct a new nephoscope, which will render observations in the neighborhood of the zenith easy, and obviate the inconveniences of the dark room. It consists essentially of a horizontal frame upon which are stretched two orthogonal systems of parallel and equi-distant threads, forming a lattice. By standing above this frame and looking at the clouds through it, their direction may be determined by turning the frame in such a manner that one of the systems of threads will be parallel with it; the other system of threads is then perpendicular to the motion of the clouds and enables us to determine their relative velocity. As a matter of fact the observation is not made directly, but with the aid of an inclined plane mirror placed below the frame. This arrangement has a twofold advantage; first it relieves the observer from an uncomfortable position; and in the second place, for the same elevation of frame, it increases the useful length of the instrument by the distance which separates the eye from the mirror. The position of the eye is fixed by means of an eye hole which may be furnished with a piece of smoked glass, if it is thought necessary.

In the model constructed according to our instructions by Richard, the frame is circular and has a diameter of 0.65 meter; it is supported by three rods resting upon an annular metallic plate. This is the movable part of the instrument. The fixed base is formed of a wooden disk, the upper side of which is divided into degrees; this disk is set and fixed immovably upon a pillar or some kind of a pedestal. The support of the mirror, fixed to this wooden disk, fits the central part of the annular metallic plate and serves it as an axis of rotation. Upon the edge of this bevelled plate are engraved four reference lines, traced parallel to the threads of the frame. The direction is read upon the graduated scale of the disk, opposite to the reference mark on the side from whence the clouds come. The height of the instrument above its socket is 1.10 meters, but on account of the reflection from the mirror it seems as though the eye was exactly 1.50 meters below the frame. The space from one thread to the other, upon this frame, is 0.075 meter or $1/20$ the distance from the eye. Consequently, the relation of the height of the clouds, H , to their velocity V is given, as in the dark nephoscopic room, by the formula:

$$\frac{H}{V} = 20 \frac{t}{n}$$

n being the number of spaces passed over by the observed point and t the time occupied in passing over. Two nephoscopes of this pattern have been in use for more than six months at stations of the municipal meteorological service, where they are used specially in the study of the influence of Paris upon the movement of the upper currents. For researches of this kind, it was indispensable that the observations at each station should be made in close proximity to the zenith; and it was, therefore, advisable to put into the hands of the observers an instrument the field of which was limited to this part of the sky. In ordinary meteorological observations it will be advantageous to make use of this nephoscope whenever the layer of clouds whose motion it is intended to determine is situated in the neighborhood of the zenith.

THE EARTHQUAKE OF JANUARY 20, 1904, AT WASHINGTON, D. C.

By Prof. C. F. MARVIN.

The fourth great earthquake of very distant origin to be recorded at the Weather Bureau occurred on January 20, 1904,

at 9^h 58^m 38^s a. m., seventy-fifth meridian time. While the disturbance at Washington was wholly imperceptible to ordinary sensations, yet the horizontal movement of the ground was greater than in any of the earthquakes thus far recorded.

The apparatus by which this earthquake was recorded has already been described in the MONTHLY WEATHER REVIEW for June, 1903, page 271.

It is interesting to note, in connection with this earthquake, that for fully twenty-four hours preceding the disturbance the seismograph record showed minute waves of earth movement extending more or less continuously throughout the whole time. It is also to be remarked in this connection that a vast area of high barometer dominated the whole eastern area of the United States from January 18 to 20.

It is not to be inferred that the writer argues that there is any necessary connection between the earthquake and the high barometer. This is hardly probable, although the high barometer may in some way have contributed to produce the minute pulsations referred to.

The waves of displacement, as shown by the record, are unusually regular and of a simple sinusoidal type. The period is also, on the whole, relatively long.

The following table gives the times of the principal features of the disturbance. The north and south component of horizontal motion only is recorded:

January 20, 1904, a. m., seventy-fifth meridian time.

	<i>h.</i>	<i>m.</i>	<i>s.</i>	<i>h.</i>	<i>m.</i>	<i>s.</i>
First preliminary tremors	9	58	38 a. m.			
Second preliminary tremors	10	3	52 a. m.			
Principal portion began	10	8	50 a. m.			
Principal portion ended	10	11	50 a. m.			
Maximum waves at	10	11	16 a. m.			
End of earthquake	10	51	51 a. m.			
Duration of first preliminary tremor				0	5	14
Duration of second preliminary tremor				0	4	58
Average period of waves in principal portion (seven complete waves in 2 ^m 45 ^s)						23.6
Period of slow waves of principal portion						25.8
Period of shorter and maximum waves of principal portion						19.0
Period of uniform waves in final portion						17.3
Period of pendulum						26.0
Maximum double amplitude of actual displacement of earth at seismograph				0.4		mm.
Magnification of record					10	

LUNAR HALO OF JANUARY 30, 1904.

By Rev. F. L. ODENBACH, S. J.

A halo was observed on January 30, 1904, at Ignatius College Observatory, Cleveland, Ohio, 7:20 p. m., seventy-fifth meridian time.

The sky at the time was evenly covered with a thin pallium of stratus; stars of the first magnitude were visible through it.

I observed four of the so-called Newton's rings around the moon.

I Ring.—Blue, white, yellow, red, 2°.

II Ring.—Blue, green, yellow, red, 6°.

III Ring.—Blue, green, red, 10°.

IV Ring.—Red, 12° to 15°.

It was very brilliant, in fact the most perfect and elaborate I have ever seen. The measurements were taken with a theodolite, the tube of which is plain and without lenses, made for this kind of work. The angles were read in a hurry and to the nearest degree, since I followed the same method as in the observations of the Hevelian halo of 90° in 1901, and with the same luck, as the phenomenon lasted only for about five to eight minutes.

After that the pallium thickened and finally broke into denser cloud, strato-cumulus, the altitude of which I measured and found to be 4783 feet (method described in 8th Annual Report of the Ignatius College Observatory, 1902-03).

The most prominent part of the corona was the yellow and