

having been $\frac{1}{10700}$: the value resulting from the satellite-observations is preferred. A further account of this important memoir by the eminent American astronomer is reserved for next week.

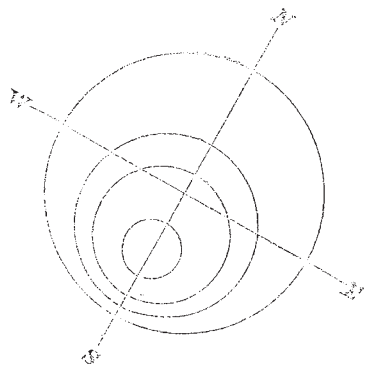
THE MINOR PLANETS.—M. Leverrier's *Bulletin International* of Sept. 30 mentions the observation of a small planet, on Sept. 21st, by M. Perrotin at Toulouse, 13th mag., which may possibly be new, though at present there is a chance of its identity with No. 77, which is in the same quarter of the sky and has not been observed since 1868, or with No. 137, of which no elements have yet appeared. Its place at 8 P.M. was in R.A. 23h. 16m. 8s., and N.P.D. $95^{\circ} 12'$.

THE TOTAL SOLAR ECLIPSE OF 1878, JULY 29.—The *American Ephemeris* for 1878 is published. The elements of the total eclipse of the sun on July 29, derived from the Lunar Tables of Prof. Peirce, which are adopted for the calculations in that work, are almost identical with those of the *Nautical Almanac*, founded upon the Tables of Hansen, Denver. Colorado appears to be one of the principal places within the limits of the shadow, though some distance from the central line. The sun will be centrally eclipsed on the meridian, according to the *American Ephemeris*, in long. $139^{\circ} 8' W.$, lat. $60^{\circ} 32' N.$; and according to the *Nautical Almanac*, in long. $139^{\circ} 10' W.$, lat. $60^{\circ} 27' N.$

MAYER'S METHOD OF OBTAINING THE ISOTHERMALS OF THE SOLAR DISC

THE short notice which I published of my "Discovery of a method of obtaining thermographs of the isothermal lines of the solar disc" was so concisely written that the precautions which are necessary in this new method of research were omitted; but as the republication of my paper in NATURE (vol. xii. p. 301) and in other European journals may induce those engaged in astronomical physics to try the process, I think it proper that I should call attention to some very important experimental conditions to be fulfilled before accurate results can be reached.

1. Special precautions must be taken to prevent currents of air from acting on the film of double iodide.
2. If the image of the sun be formed on the blackened side of the paper, it is absolutely necessary that uniformity should be given to this coating of lamp-black. So diffi-



cult is this to achieve that I have generally formed the sun's image directly on the film of iodide. Slight irregularities in this film do not appear to affect the form of the isothermals; but the latter follow irregularities in the smoked surface.

3. The most important, and indeed absolutely essential, condition in these experiments is that the image of the sun shall be formed on a truly horizontal surface; for the centre of gravity of any isothermal formed on an inclined surface is always above the centre of the sun's image and

in a vertical plane passing through this centre. Hence all isothermals thus formed are very excentric when referred to the sun's centre. They are also elliptical. The accompanying figure gives isothermals obtained on an inclined surface. *NS* is the solar axis. On obtaining these same isothermals on a horizontal surface they were, as near as could be seen, circular and concentric with the sun's image.

Of the influence of an inclined surface in displacing the isothermals there can be no doubt, and the same action has effected all of the results which have been obtained in the employment of thermopiles in connection with the sun's image received on screens attached to equatorial telescopes. This displacement would mislead an observer, and would cause him to be of the opinion that there existed a decided difference of temperature between the north and south solar poles, and between the portions of the periphery of the sun's image near the poles and near the solar equator. Do not these facts reached by me explain the difference in the results obtained by Secchi and Langley?

The above effects of inclined surfaces appear to be caused by a film of hot air which flows up over these surfaces, and especially on the lower surface of the screen. If the sun's image is received on a film of iodide enclosed between plates of glass or of mica, the excentricity of the isothermals is hardly apparent at first; but after some time it appears, produced by the action of the ascending film on the surface of the glass.

The proper method of research is to use a simple Fahrenheit's heliostat with a good plane mirror, and to throw the solar rays in the direction of the polar axis of the instrument. These rays traverse lenses of from 12 to 30 feet focus, and just before they have converged to form the solar image they are reflected perpendicularly, by another plane mirror, on to the horizontal surface of the iodide.

ALFRED M. MAYER

FAYE ON THE LAWS OF STORMS*

Examination of the Theory of Aspiration.—After a somewhat detailed account of opinions held regarding waterspouts in the prehistoric and Roman epochs, and from the sixteenth century downwards, all agreeing in this, that the water of the sea is sucked up to the clouds by these meteors (Fig. 6), M. Faye inquires, How then could it be doubted that waterspouts, and consequently tornadoes, typhoons, &c. are simply phenomena of aspiration?† Such has been in reality, since the time of Franklin, the point of departure for meteorologists; and hence the prevailing notions regarding hurricanes, that they are centripetal and formed by horizontal currents of air flowing from all quarters towards the centre of aspiration.

Clearly in this case the conclusions have not been drawn with the caution which science demands. To accept, with the eyes shut, the most astounding assertions without examination or verification; to believe, for example, that a waterspout could suck up the water of the sea to a height of 2,000 feet when the most powerful pump could not raise it to the height of forty feet; to admit that insubstantial vapours could form a tube whose sides are capable of resisting the whirling masses of water supposed to ascend through it; to assert that deluges of sea-water are engulfed in the clouds where the clouds cannot retain simple drops of rain, is not in accord with the usage of science, and indeed can only be explained by the dominating power of an old preju-

* Continued from p. 459.

† It not being considered as disputed that a tornado is nothing but a large waterspout, a typhoon only a large tornado, and that there is no essential difference between a cyclone and a typhoon, M. Faye proceeds to test the theory of centripetal aspiration as regards waterspouts and tornadoes, and conceives that the conclusions thus arrived at will have equal weight when applied to the theory of cyclones.