

extent, and reasons were adduced, in the absence of data for calculating the exact height, for concluding that it does not extend to the moon. It was argued on the hypothesis of the atomic constitution of bodies, that the upward resultant of the molecular forces on any atom, since it decreases as the height increases, must eventually become just equal to the force of gravity, and that beyond the height at which this equality is satisfied, there can be no more atoms, the atmosphere terminating with a small finite density. It has been generally supposed that the earth's atmosphere is about 70 miles high, but on no definite grounds, and the estimates of the height have been very various. Against the opinion that it extends as far as the moon, it was argued that, as the moon would in that case attach to itself a considerable portion by its gravitation, which would necessarily have some connexion with the rest, there would be a continual *drag* on the portion more immediately surrounding the earth, and intermediately on the earth itself, which would in some degree retard the rotation on its axis. Hence if, as there is reason to suppose, the rotation be strictly uniform, the earth's atmosphere cannot extend to the moon. The author also stated that if by balloon ascents the barometer and thermometer were observed at two heights ascertained by observation, one considerably above the other, and both above the region in which the currents from the equator influence the temperature, data would be furnished by which an approximate determination of the height of the atmosphere might be attempted.

*On the "Boussole Burnier," a new French Pocket Instrument for measuring Vertical and Horizontal Angles. By F. GALTON, F.R.S., F.R.G.S.*

This instrument is about 3 inches long and  $\frac{3}{4}$  inch deep. Its outside is composed of two faces of brass with pear-shaped outlines, separated by vertical sides. In the body of the instrument are two delicate circles placed in parallel planes; at its smaller end is a cylindrical lens, which views the nearer graduations on the rims of the two circles; on the upper face of the instrument are sight-vanes like those of an azimuth compass; on the lower face is a light universal joint, which is used when the instrument is attached to a support, and not held, as it may be, in the hand.

One of the circles is of aluminium, and is borne by a compass-needle; it gives horizontal angles when the instrument is held horizontally. The other is of silvered copper, unequally weighted, and is supported by a delicate axis playing in jewelled holes: it gives vertical circles through the action of gravity when the instrument is held vertically, just as the compass-circle gives azimuthal angles through the action of the magnetic force when the instrument is held horizontally.

The remarkable simplicity and compactness of the Boussole Burnier would make it useful to the traveller, the geologist, and the military engineer. It is the invention of Lieut.-Col. Burnier of the French Engineers, and has been perfected in its details by M. Balbreck, No. 81 Boulevard Mt. Parnasse, Paris.

*European Weather-Charts for December 1861. By F. GALTON, F.R.S., F.R.G.S.*

The author submitted for examination a series of printed and stereotyped charts, compiled by himself, that contained the usual meteorological observations made at eighty stations in Europe, on the morning, afternoon, and evening of each day of December 1861. They were printed partly in symbols and partly in figures, in such a form that each separate group of observations occupies a small label, whose centre coincides with the geographical position of the station where the observations were made. The amount of cloud is expressed by shaded types, the direction of the wind by an equivalent to an arrow, and its force by a symbolical mark. The temperature of the wet and dry thermometers, and the barometric readings (reduced to zero and sea-level) are given in figures. As the charts had been too recently printed to admit of a thorough examination, and as they were ultimately to appear as a separate publication, the author abstained from other deductions than those that were obvious on inspection. Among these, the enormous range and the simultaneity of the wind-changes, testifying to the remarkable mobility of the air, were exceedingly conspicuous.