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Stach, E. Die Anemometer-Prüfungsstation der westfälischen Berggewerkschaftskasse in der Bergschule in Bochum. Pp. 316-320.
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Reich, M. Einige Beobachtungen am Schlömilch-Wellen-detektor für drahtlose Telegraphie. Pp. 338-340.
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Lenard, P. Ueber Regen. Pp. 249-262.
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Wegener, K. Die Temperatur in 1000*m*. Seehöhe nach den Aufzeichnungen am Aeronautischen Observatorium des Königl. Meteorologischen Instituts bei Berlin. Pp. 273-276.
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Hann, J. Normale Temperatur in 1 *km*. Seehöhe über Berlin. Pp. 277-278.
Mack, K. Sonnenscheindauer in Hohenheim. Pp. 278-279.
Héjas, A. Häufigkeit der Gewitter bei verschiedenen Barometerständen in Ungarn. Pp. 280-281.
—— D. Pacini über die photoelektrische und thermische Strahlung der Sonne in Castelfranco im Sommer 1903. Pp. 281-282.
—— A. Pochettino über einige photometrische Messungen. P. 282.
—— C. Christoni's Pyrheliometer-Messungen zu Sestola und auf dem Monte Cimone, ausgeführt im Sommer 1900. P. 282.
—— H. Alt: Sauerstoff-und Stickstoffwolken. P. 282.
Topolansky, M. Periodische lokale Wolkenbildungen. P. 282.
Meusburger, —. Kugelblitze. P. 283.
—— Resultate der meteorologischen Beobachtungen auf der Zugspitze im Jahre 1903. P. 283.
—— Polis: Erdbodentemperatur zu Aachen. Pp. 283-284.
—— Klimatafel von Alexandrien. P. 284.
—— Klimatafel von Wadi Halfa. P. 285.
—— Maurer: Resultate der meteorologischen Beobachtungen in Tsingtau in dem Lustrum 1898-1903. Pp. 285-286.
H[ann], J[ulius]. Resultate der meteorologischen Beobachtungen zu Guatemala im Jahre 1902. Pp. 286-287.
—— Martin: Resultate der meteorologischen Beobachtungen von Puerto Montt in den Jahren 1888 und 1889. Pp. 287-288.
H[ann], J[ulius.] Meteorologische Beobachtungen an beiden Ausgängen der Magellansstrasse. Pp. 288-289.
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—— Spektrum des Blitzes. P. 294.
—— Spektrum des Nordlichtes. P. 294.

NOTES AND EXTRACTS.

REPRINTS.

Occasionally an author who reads his article as published in the MONTHLY WEATHER REVIEW at once writes for a few extra copies, but by the time his letter is received the whole edition of the REVIEW has been worked off, the type distributed, and the compositors are at work on the next number. In order to prevent disappointment, the contributor of an important article should request a definite number of extra copies when sending in the manuscript, if it seems to him likely that such copies will be needed.—*C. A.*

TEMPERATURES IN THE UPPER ATMOSPHERE.

The note and diagrams reprinted elsewhere[1] from a circular issued by Prof. Dr. Richard Assmann, Director of the Aeronautical Observatory at Berlin, illustrates so clearly the nature of some of the changes going on in the atmosphere that we can not forbear calling attention to some of the lessons that may be learned from these diagrams.

Our attention is inevitably directed, first, to the fact that irregular variations in the temperature of the air are not confined to the lowest stratum and the earth's surface. The balloon ascensions from October, 1902, to December, 1903, like the less frequent ascensions of previous years, show that the temperature of the air varies largely and irregularly even up to the very highest attainable altitudes. Thus, at 4000 meters we have observed temperatures of —10°, —14°, —20°, —6°, —8°, 0°, +4° C. in rather rapid alternation, with strong indications that on other days, when no high ascensions were made, the temperatures were alternately lower and higher than these. If we take the average of all the days of the year at the earth's surface and at different altitudes, throughout the year, we have, according to Teisserenc de Bort, an average range of about 13° C. at 4000 meters over Paris, and almost the same range at the ground and at 8000 meters. Above the latter level there appears to be a slight diminution, so that 10° C. would be a proper figure for the amplitude at 14,000 meters, but this may be only apparent and due in part to our sluggish thermometers and to the small number of observations. Professor Hann gives for the annual variation, as deduced from both the Berlin and the Paris ascensions, a maximum value of 16.7° C. at the altitude of 7000 meters, from which level it appears to diminish alike as we go upward and downward. It would therefore appear that if there be a region of the atmosphere for which the average annual range of temperature is zero, then this constant layer must be far above any altitude hitherto considered attainable by balloons. If the variation of temperature diminishes only 2° C. in ascending from 10 to 14 kilometers, then at that rate it would become 1° C. at an altitude of about 40 kilometers, so that it is somewhere in this neighborhood that we should look for the hypothetical layer of practically uniform temperature.

It has often been said that the important problems of meteorology have to do with the atmosphere at and below our highest mountains, or below 10,000 meters, but these balloon ascensions (about 600 at Paris and an even greater number in other parts of Europe), bringing us reliable information from 17,000 and even 20,000 meters, force us to broaden our views. Undoubtedly the air that descends in our areas of high pressure and that which flows out of the polar regions may come from the upper limits of the atmosphere, and with equal probability the air that ascends in our areas of low pressure may continue its journey upward to those same heights. The descent of air is characterized by the following processes, which are well illustrated in the series of 15 monthly charts, from

[1] The Monthly Weather Review, April, 1904, p. 177.