Bulletin of the American Geographical Society, Vol. 31.
Whymper, E. A New Mountain Aneroid Barometer. P. 75.
La Nature, Paris, 27*me. Année.*
Plumandon. J. R. Les extrêmes de température dans le monde. P. 226.
Das Wetter, Berlin, Jan. 1899.
Arendt, Theodor. Ueber die Zunahme der Blitzgefahr. [Concluded.] p. 32.
Annalen der Physik und Chemie. Leipzig. Band 67.
Mannesmann, O. Luftwiderstandsmessungen mit einen neuen Rotationsapparat. P. 105.
Comptes Rendus, Paris, Tome 128.
Deherain, P. P. Le travail du sol. P. 474.
Pallodine, W. Influence de la lumière sur la formation des substances azotes vivantes dans les tissues des végétaux. P. 377.
Philosophical Magazine, London, Vol. 147.
Raleigh, *Lord.*—Cooling of Air by Radiation and Conduction, and the Propagation of Sound. P. 308.
Ciel et Terre, Bruxelles, 19*me. année.*
Spring, W. Sur l'origine de la couleur bleue du ciel. P. 587.
Roquiny-Adanson, G. de. Les orages en janvier dans le centre de la France. P. 599.
Ciel et Terre, Bruxelles, 20*me année.*
St. Hepites. Climatologie du littoral roumain de la mer Noire. P. 1.
——Consommation d'eau par les arbres. [From Die Natur.] P. 23.
Meteorologische Zeitschrift, Wien, Band 16.
Bornstein, R. Böenstudien gelegentlich des Gewitters vom 22 Juni 1898. P. 1.
Kohlbrugge, J. H. F. Meteorologische Beobachtungen zu Tosari. (Java.) P. 5.
Laska, W. Ueber die Form der Hagelwolken. P. 22.
Hann, J. Klima von Lima. P. 32.
Zeitschrift für Luftschiffhart. Berlin. 17 *Jahrg.*
Platte, A. Zur Theorie der Luftschiffahrt mit theilweiser Entlastung. P. 245.
Berson, A. In den Fusstappen Glascher. P. 255.
Annuaire de la Société Météorologique de France, 46 *année.*
Lobat. Température de la mer. P. 72.
Scottish Geographical Magazine. Edinburg. Vol. 15.
Taylor, W. A. Egyptian Sudan. [Climate, etc.] P. 57.
Symons Meteorological Magazine. London. Vol. 34.
Symons, G. J. Frost and anticyclones. P. 6.
Dansey, R. P. Temperature reversal [case of]. P. 8.
Journal of the Franklin Institute. Philadelphia. Vol. 147.
Griffith, C. E. Anthracite Coal in Peru. [Contains account of Climate of Peru.] P. 227.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Mariano Bárcena, Director, and Señor José Zendejas, vice-director, of the Central Meteorologico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the *Boletin Mensual;* an abstract translated into English measures is here given in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mexican data for February, 1899.

Stations.	Altitude.	Mean barometer.	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
	Feet.	*Inch.*	°*F.*	°*F.*	°*F.*	%	*Inch.*		
Colima	1,656	28.30	86.9	49.3	70.0	58	.....	wsw.	sw.
Durango (Seminario)	6,243	24.39	80.6	26.6	54.9	34	.....	sw.	e.
Jalapa (1)	4,593	25.56	78.8	46.4	58.3	86	8.09	nw.	....
Leon (Guanajuato)	5,934	24.28	74.4	30.4	57.6	84	.....	sw.	sw.
Magdalena (Sonora)	2,618	......	......	....	58.5	......	0.91	s.	n.
Mexico (Obs. Cent.)	7,472	23.04	74.7	40.1	56.8	48	0.13	ne.	nw., sw.
Morelia (Seminario)	6,401	23.96	77.9	40.5	59.9	55	.....	sw.	sw.
Oaxaca	5,164	25.06	87.4	35.2	66.7	55	.....	se.	sw.
Puebla (Col. Cat.)	7,112	23.34	74.3	34.0	59.2	62	.....	sse.	....
San Isidro	......	......	82.4	51.8	......	......	.....	w.	....
Tuxpan (Vera Cruz)	19	30.00	98.2	29.8	67.3	79	2.66	nw., ne.	n.
Zapotlan (Seminario)	5,078	25.16	80.1	40.5	63.5	65	.....	sse.	wsw.

(1) The altitude of Jalapa differs from that formerly given, i.e., 4,757 feet, by 50 meters.

WAVE OR BILLOW CLOUDS.

ALFRED J. HENRY, Chief of Division.

A remarkably perfect type of wave or billow clouds, parallel bands or ridges, separated by a small space of clear sky, as a furrow separates the rows of grain in a field, was seen at Washington, D. C., at 8 a. m. November 23, 1898.

Plates I, II, III and IV have been reproduced from photographs made by the writer at 8:25, 8:30, 9:35 and 9:40 a. m., seventy-fifth meridian time, respectively. Plate I is a transverse view of the clouds as they approached from the southwest. The photograph from which the illustration was reproduced was made on the roof of the Weather Bureau building in Washington, D. C.

Plate II is a longitudinal view of the same clouds made in the same position but looking eastward, the camera being turned through an angle of about 90°.

Plates III and IV are views made about an hour later, viz, at 9:35 and 9:40 a. m. The position of the camera in the last-named views was not quite the same as those made earlier in the day, as may be seen by the horizon line.

The clouds were probably in the alto-cumulus level, possibly a little lower, and their apparent motion was rather rapid. The direction of the parallel bands, when first observed, was approximately east and west. Later it seemed to change slightly, taking a direction, say from north 80° west to south 80° east. The degradation of the clouds began about 9 o'clock; an hour later the last vestige had disappeared, although the sky was almost half covered with cirrus and cirro-stratus. The last named appear in Plate III and less distinctly in Plate IV.

In the lower left-hand corner of Plate II small, detached clouds may be seen. While looking at this portion of the sky at 9 a. m., a remarkably distinct file of five or six small clouds was observed in the rear of a larger cloud mass. In a moment a small cloud became visible directly in the rear of the file above referred to. It seemed to remain motionless for a few seconds, increasing in size meanwhile, and finally moving forward in the line of march, and this process was repeated until there were 12 small clouds moving forward in column formation where there had been but 5 or 6 originally. The clouds now began to decrease in size, and the formation of new clouds ceased.

The general weather conditions at the surface of the ground, as shown by the morning weather map of the 23d were as follows: An area of high pressure with cold, northwesterly winds was approaching from the west. Pressure was relatively low off the Carolina coast, 29.94 at Hatteras. It was snowing in western Pennsylvania and raining in the eastern part of the state as also in New Jersey. The rain had ceased at Washington, the wind having shifted from southeast to northwest at 9:30 p. m. of the 22d; the temperature at that hour was about 53°; it began to fall soon thereafter and continued falling during the night, reaching a minimum of 34°, from which point it had risen to 36° at the time the first photograph was made. The wind was blowing steadily from the northwest at a velocity of 12 miles per hour. Pressure was 30.10 inches, having risen 0.18 inch during the last twenty-four hours.

Plates V and VI show a somewhat similar cloud formation on January 27, 1899.

The clouds were moving toward the northeast, as in the case first mentioned. The weather conditions were also similar in many respects. An area of high pressure and lower temperature was approaching from the west. The storm, central the preceding morning in upper Michigan, had moved rapidly to the Gulf of St. Lawrence, accompanied by violent westerly gales on the lower Lakes. High northerly winds prevailed over the region about Washington, while the cloud motion would seem to indicate a rapid movement of the upper currents toward the center of the depression over the Gulf of St. Lawrence.

The formation of billow clouds has been explained by various persons: Professor Cleveland Abbe, in this country; the Reverend Clement Ley, in England; Professor H. von Helmholtz, and Dr. von Bezold, in Germany, and doubtless others.

So far as observed, wave clouds have no particular significance, in this country at least, although Dr. Kassner, of Berlin, is of opinion that in many cases they are an indication of precipitation. (Meteorologische Zeitschrift, 1894, p. 434.)

NOTES BY THE EDITOR.

THE WEIGHT OR MASS OF THE ATMOSPHERE.

A correspondent has recently asked for "the computed weights of the earth and of the atmosphere." The weight of any mass as ordinarily determined is frequently confounded with the mass itself, whereas it is strictly speaking a special property of the mass. We use a standard piece of metal called a "pound weight" and balance that against any other object, and say that the latter weighs a pound; we mean that the latter has the same mass as that of the pound weight. In doing this we assume that the same force of gravity acts upon the object and the standard weight, and that too in exact proportion to their masses. If, on the other hand, the force of gravity acts with less intensity on the object than on the standard weight then the fact that they counterbalance each other would tell us nothing about the relative masses.

As the reply to our correspondent may be helpful to others, and illustrates a principle that is important in meteorology, we have revised the figures originally communicated to him and submit the following:

(1). *The computed weight of the earth.*—The weight of any mass depends upon the force of gravity and can, therefore, not be stated except for some definite locality. The standard value of gravity is usually assumed to be that which prevails on the earth's surface at 45° latitude and sea level. At this place a pound of water considered as a mass has a weight or produces a pressure of one standard pound considered as a weight or pressure. A cubic foot of water at this place will weigh about 62.5 pounds, and a cubic foot of the average earth will weigh about 343.75 pounds, because the average density of the whole earth has been determined to be about 5.5 times the density of water. The whole earth, if it were compressed into so small a space that this standard gravity could act uniformly on it, would, therefore, at this place weigh as many pounds as the product of 343.75 multiplied by the volume of the earth expressed in cubic feet. This volume, as given by Woodward's Smithsonian Tables, page LXV, is 259,880,000,000 cubic miles, and a cubic mile contains 5,280× 5,280×5,280 cubic feet.

Latitude.	Mean pressure at sea level.	Cosine latitude.	Latitude.	Mean pressure at sea level.	Cosine latitude.	Latitude.	Mean pressure at sea level.	Cosine latitude.
°	*Inches.*		°	*Inches.*		°	*Inches.*	
N. 90	29.95?	0.0000	25	29.94	0.9063	35	30.02	0.8191
85	29.95?	0.0872	20	29.89	0.9397	40	29.94	0.7660
80	29.94	0.1738	15	29.85	0.9659	45	29.82	0.7071
75	29.92	0.2588	10	29.84	0.9848	50	29.65	0.6428
70	29.87	0.3420	N. 5	29.84	0.9961	55	29.46	0.5736
65	29.85	0.4226	0	29.84	1.0000	60	29.27	0.5000
60	29.87	0.5000	S. 5	29.85	0.9961	65	29.12	0.4226
55	29.91	0.5736	10	29.89	0.9848	70	29.06	0.3420
50	29.95	0.6438	15	29.93	0.9659	75	28.98?	0.2588
45	29.98	0.7071	20	29.99	0.9397	80	28.92?	0.1737
40	30.00	0.7660	25	30.05	0.9063	85	28.89?	0.0872
35	30.02	0.8192	30	30.06	0.8660	S. 90	28.87?	0.0000
30	29.99	0.8660						

The above gives the exact arithmetical data needed for computing the weight of the earth. The result is 13,150 followed by 21 figures, or $13,150\times 10^{21}$. This computed weight refers to the solid and liquid earth, and does not include the atmosphere.

(2). *The computed weight of the atmosphere.*—The atmosphere covers the earth in a very unequal layer, so that even at sea level in some places the pressure is as high as 31 barometric inches, and in other places is not higher than 29. From careful measurements on Buchan's charts of the mean annual pressure over the whole globe, Ferrel found that the average air pressure at sea level for each zone of latitude is about as given in the preceding table. (See Ferrel's "Contributions to Meteorology," No. 1, p. 400, or Waldo's "Elementary Meteorology," p. 96). The figures here marked with a query are supplied by extrapolation, and are slightly less reliable than the others.

Buchan's charts give the pressure as measured by a mercurial barometer reduced to standard temperature and gravity and sea level, they, therefore, assume air to be present where the continents and islands protrude above the ocean.

The figures in the accompanying table mean that at sea level the average weight of a column of air extending from that level up to the top of the gaseous atmosphere is balanced by or equivalent to the weight of a column of mercury of standard density, having a height of 29 or 30 inches, and pulled downward by the standard force of gravity at 45° and sea level, which force is that which gives the mercury its weight. We ordinarily say that the pressure of the atmosphere is about 15 pounds to the square inch, this is because a column of mercury 30 inches high and one square inch in section weighs about 15 pounds, but this is not exactly the weight of the column of air that has one square inch in section and reaches up to the top of the atmosphere. We have simply balanced the sea-level pressure of the air by the pressure or weight of a mercurial column which is under the influence of standard gravity, although the greater part of the air is under a slightly diminished gravity. But as in the previous section we weighed the earth under standard gravity so we also must do for the atmosphere; it must be imagined to be compressed into a small bulk and weighed at the same level as the mercury.

The ordinary barometric measurement, in which a tall column of atmosphere balances a short column of mercury, reminds one of a very refined method of determining the absolute value of the force of gravity. In this method one weight is suspended by a long wire, the other by a short one. The two weights balance each other perfectly when the wires are of equal length, but imperfectly if one weight is nearer to the earth than the other. The lower weight is said to weigh more than the other one, although they both have the same mass precisely.

A column of atmosphere many miles high, balanced by 30 inches of mercury at sea level, would counterbalance at least 30.06 inches if it were all brought down to the region where standard gravity prevails, or, in other words, the pressure of this column of air would be increased by two one-thousandths of itself.

The second column of the preceding table will give the average pressure at sea level for the whole atmosphere by making proper allowance for the diminution of the circles of latitude as we approach the poles; the circumferences are proportional to the cosine of the latitude, as given in the third column. The

Plate I. Alto-cumulus Rolls. Washington, looking southward from the Weather Bureau, November 23, 1898, 8:25 a. m.

Plate II. Alto-cumulus Rolls. Washington, looking eastward from the Weather Bureau, November 23, 1898, 8:30 a. m.

Plate III. Alto-cumulus Rolls, with a Heavy Veil Beneath. Washington, looking south-southwestward from the Weather Bureau, November 23, 1898, 9:35 a. m.

Plate IV. Alto-cumulus Rolls, Dissipating. Washington, looking eastward from the Weather Bureau, November 23, 1898, 9:40 a. m.

Plate V. Alto-cumulus Rolls. Washington, looking eastward from the Weather Bureau, January 27, 1899, 8:55 a. m.

Plate VI. Alto-cumulus Rolls. Washington, looking eastward from the Weather Bureau, January 27, 1899, 9:02 a. m.