NNE. from Hesketh Park, there is a free exposure. The vane is 62 feet above the ground, which is flat and open. There is no tree or other obstruction within ½ mile (except some very low buildings to the SE.); while from WSW. through N. to E. is absolutely open.

The records for the instruments at this station, two Dines anemometers and a Baxendell anemoscope with twin recording cylinders, show far less gustiness than those from Hesketh Park.

The differences between the directions of the wind at the two stations are sometimes very striking. They mostly occur with fairly light winds from easterly points. There was a striking example on the night of October 1 and 2, 1917. The speed of the wind at Marshside at 23h. 30m. was 3.5 m/s and the veer from N., 124°. Up to midnight, the wind freshened and reached 5.4 m/s, then it fell off again to 2.7 m/s at 0h. 35m. During the whole of this time it was veering slowly, the direction being given by 138° at midnight and 146° at 0h. 35m.

On the other hand, at Hesketh Park, during the same period, the wind was too light for measurable speed to be given by the anemobiagraph. The direction from 23h. 30m. to midnight was about 150° from N., i. e., not far different from that at Marshside, but at midnight there was a sudden shift to 70°. Agreement was not restored for half an hour.

It will be seen that the wind at Hesketh Park during this half hour had no apparent relation to the general flow of air, such as would be shown on a weather map. It may be noted that the temperature of the air at 16h. at Hesketh Park had been 294A. At 23h. 30m. it was 284 A. so that there was probably a well-marked inversion in the upper air. As the wind at Marshside strengthened, there was a fall of the Hesketh Park temperature to 283 A. at midnight, and this was followed by a corresponding rise as the wind dropped. The direction differences are, however, by no means always associated with temperature peculiarities, and often occur with somewhat higher wind speeds than in the foregoing instance, and last longer

ON THE VELOCITY OF THE WIND IN THE STRATOSPHERE.

By J. ROUCH.

[Abstract of note in Comptes Rendus, Paris, 1919, vol. 168, pp. 1281–1283.]

In view of the generally accepted statement to the effect that winds of the stratosphere are light, the following note may be of interest. The mean wind velocity during 78 pilot-balloon ascensions which reached 10 km. altitude from coastal stations in France is as follows, for each kilometer from 0 to 10: 3.3, 5.1, 5.1, 5.0, 6.0, 6.4, 7.3, 7.9, 8.5, 9.5, 11.8. Thirty-six of these reached or exceeded 11 km. and 7 went above 15 km. If we may assume that the stratosphere was from 11 km. up, the winds in the stratosphere were stronger than those at 10 km. two times out of three. This is the case with clear weather and moderate winds below. What the conditions are when the sky is cloudy, or when the winds of the troposphere carry the balloon out of sight before it can reach the stratosphere, is unknown.—*C.F.B.*

THE DRIFT OF METEOR TRAILS.

[Abstracted from Nature, London, May 23, 1918, p. 232.]

Observations made upon the enduring trails of meteors have given some clue as to the speeds of the upper winds as well as the directions. The data as a whole are not of sufficiently accurate a character to enable definite conclusions to be drawn; nevertheless, there can be little doubt as to the general correctness of the results. The streaks of the Perseids and Leonids, which are usually seen at an altitude of 55 or 60 miles, have yielded an average movement eastward of 121 miles per hour. The individual speeds varied from nil to 360 miles per hour. Certain streaks gave evidence of a series of differing currents underlying each other, the upper sections drifting in different directions from the lower.

NOTE.—In reference to the above article in Nature, Dr. C. J. P. Cave has replied that the trails of meteors remain luminous too long to be due to heating of the air by the passage of the body. He suggests that the trail is a result of the ionization of the air by the passage of the meteor and the subsequent flow of electricity through this ionized air. He questions the reasonableness of such rapid movements in the stratosphere.—*C. L. M.*

THE PREVAILING WINDS OF THE UNITED STATES.

By ROBERT DEC. WARD.

[Abstracted from Annals of the Association of American Geographers, vol. 6, 1916, pp. 99–119.]

One of the chief factors to be considered in discussing economic climatology is the wind. As a vehicle for the transportation of moisture and temperature, it wipes out the climatic boundaries, determines rainfall and the distribution of life. Nor is the speed less important than the direction, for upon it depend both physical comfort and many of the practical activities of life. As a source of power the winds are coming more and more to be appreciated in their full significance.

The greater part of our country lies in the belt of the prevailing westerlies, although the southern States share also in the trade winds. These winds find their great initial cause in the differences of temperature and pressure between the Equator and the Poles; but they are modified greatly by local effects introduced by the North American continent, such as seasonal changes of temperature and pressure, mountains and lowlands, and the Great Lakes. The general configuration of the country, the trend of mountains and valleys, locations to windward or leeward of mountains or lakes, the hour of day or night, land and sea breezes, all these have a part in controlling the direction and velocity of the wind at a station. Indeed, so strongly marked are some of these local effects that it is difficult to believe that the prevailing winds are westerly.

It is desirable, however, in studying the broad climatic effects, to eliminate as far as possible these local influences With this in view, the winds of January and July are discussed. (See figs. 1 and 2.) "From midwinter to midsummer, taking place gradually, as winter merges into spring and spring later merges into summer, there is a great swing of the winds over the eastern United States, from the pervailing northerly and northwesterly to a prevailing southwesterly or southerly direction in July." The warmest winds of the summer are those along the Atlantic seaboard. Sunstroke weather, cholera infantum epidemics, and suffering in the crowded cities are the result; sea bathing, electric fans, thin clothing, and cooling beverages are also closely applied to these warm winds. They are of economic importance in their relation to the spread of the brown-tail moth north and east from Massachusetts, and of the cotton boll weevil north from Texas.

While we can not claim the existence of monsoons, there is, nevertheless, a marked monsoonal tendency over a large section of the country. The general swing of the winds from northerly in winter to southerly in summer is very well marked in Texas. The cyclonic interruptions and weaker pressure controls, however, prevent any such strong or definitely marked effect as exists in India.

It is difficult to obtain accurate charts of wind velocities because the lack of uniformity of the data. In general, the highest average wind velocities are to be found along the Atlantic coast and over the Great Lakes. Hence the well-known stormy conditions off Cape Hatteras and the popular appelation of Chicago as the windy city—a term equally applicable to many Lake cities.

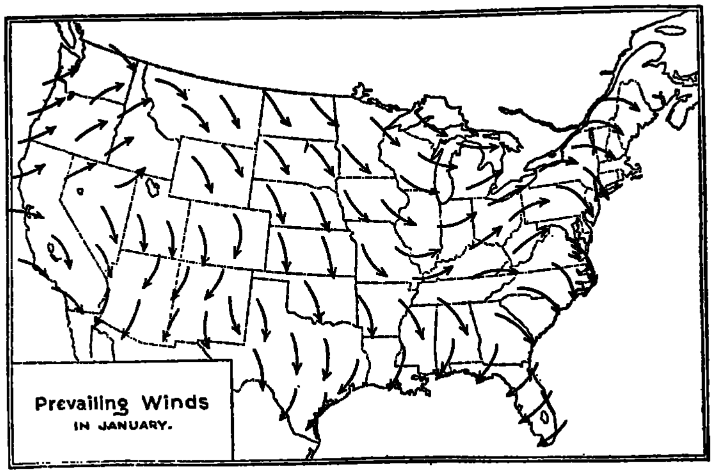

FIG. 1.—Prevailing winds in January.

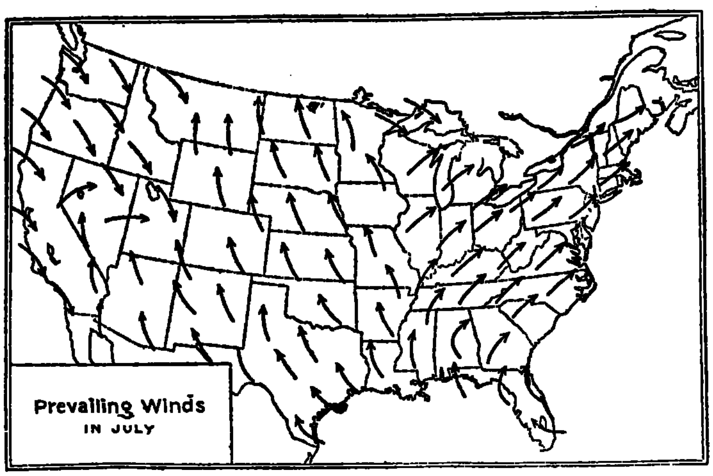

FIG. 2.—Prevailing winds in July.

Among the mountains, forests, and sheltered valleys, wind velocities are less. The Great Plains are almost ocean-like in their level monotony, and, as a result, higher winds are to be found there.

This is a fact of great economic importance for these winds are well adapted to driving windmills. Irrigation, stock raising, and domestic water supply in the Middle West are largely dependent upon underground currents of water. This necessitates pumping, and the wind conditions—relatively high velocity and steady—are so well adapted to this work as to make the raising of water economical and reliable. The Plateau region and the Pacific coast are irregular and variable in their wind velocities, so that it is difficult to estimate their economic possibilities, although, without doubt, there are many places where wind power could be used to great advantage.

Of course, the highest wind speeds are those of the tornado, which invariably destroy any recording apparatus, but which, it is estimated, attain as high as 300 miles per hour. Second to tornadoes in destructiveness come the sudden squalls which accompany thundershowers. West Indian hurricanes are responsible for the maximum wind velocities recorded on the Atlantic and Gulf coasts, while severe winter storms bring highest winds in the northern coast and Great Lakes regions. Maximum wind velocities are of importance because of their relation to shipping, uprooting of timber, and damaging of crops.

March is a proverbially windy month. This is true because it is a transition month, i. e., a time when the weather controls are passing from the winter to the summer, and there is a combined effect of the active winter controls and the rapidly increasing solar control. There is less seasonal variation over the Great Plains than in other parts of the country. This fact makes the winds in those regions conspicuous and important as a reliable source of power.—*C. L. M.*

THE WINDS OF BOSTON AND VICINITY.

By ALEXANDER MCADIE.

[Abstract from Annals of the Astronomical Observatory of Harvard College, vol. 73, part 3, 1916, pp. 211–231, and vol. 83, part 1, 1917, pp. 28–46. Plates]

The climate of a locality depends primarily upon the circulation of the lower atmosphere. In spite of the considerable impression which the chilly easterly winds make on people, they are the least frequent and west winds the most frequent. Owing to the difference in the exposure of anemometers in Boston and at the Blue Hill Observatory, the average wind velocity at Blue Hill is about 60 per cent greater than in the city. The average mid-winter wind velocity is 8.2 meters per second, and the average midsummer velocity is 5.5 meters per second. The diurnal maximum velocity occurs in the afternoon and the minimum in the forenoon, the latter amounting to about 80 per cent of the former.

The highest wind velocity ever recorded at Blue Hill was 32 meters per second from the southeast on January 2, 1893, and the same velocity on February 10, 1909, this time from the south. The extreme velocity for a single minute has frequently exceeded 35 meters per second. The winds of summer are weaker than those of winter regardless of their direction. The weakest winter winds are from the east, with a mean velocity of less than 7 meters per second, and the weakest summer winds are the east-southeast and east, with velocities averaging 4 meters per second.

In general, months of excessive rainfall are months in which the northeast wind has a maximum duration. The average rainfall along the New England coast is about 1000 mm., while inland about 100 miles this value shrinks to about 800 mm. Consequently, the Atlantic seaboard is generally said to have a moist climate. This is, of course, relatively true; nevertheless, the climate is essentially dry, because the prevailing winds blow from the land. "If it were possible to reverse the surface circulation and substitute for the west wind, the east wind, the total rainfall would be 50 per cent greater and the number of rainy days would exceed 250 instead of the present number 106, or approximately 9 per month."