TABLE 3.—*Wind velocity and direction.*

Station.	Mean maximum velocity by direction.								Relative frequency by direction.							
	N.	NE.	E.	SE.	S.	SW.	W.	NW.	N.	NE.	E.	SE.	S.	SW.	W.	NW.
Eastport, Me.	...	46	49	38	44	....	38	32	0	[1] 21	15	5	5	0	5	7
Portland, Me.	30	35	37	39	33	27	31	38	2	9	3	9	5	2	2	[1] 25
Boston, Mass.	31	38	34	38	29	30	38	36	4	8	9	2	2	4	[1] 19	15
Nantucket	43	51	54	48	45	53	49	43	4	[1] 25	3	2	3	19	2	2
Block Island	54	50	54	60	...	35	53	56	1	8	6	1	0	2	12	[1] 30
Sandy Hook	50	62	57	60	57	55	63	53	7	3	3	1	11	2	10	[1] 26
Atlantic City	19	35	24	30	25	23	26	32	3	[1] 15	5	8	14	6	2	13
Cape May	...	30	34	34	45	35	34	33	0	5	5	8	4	1	1	[1] 14
Cape Henry	48	49	57	....	48	46	....	49	[1] 25	20	3	0	1	1	0	10
Hatteras	47	44	62	55	50	45	45	47	[1] 20	4	1	1	4	8	9	15
Wilmington	30	37	24	37	35	31	32	38	4	11	5	2	5	[1] 21	10	2
Charleston	38	37	31	35	41	33	38	35	6	[1] 21	4	4	9	10	5	5
Savannah	35	44	31	39	38	44	41	43	4	3	10	6	5	3	13	[1] 18
Jacksonville	44	41	39	37	44	47	52	45	3	6	2	3	6	[1] 20	3	6

[1] Indicates prevailing direction.

NOTE.—Data from the following stations is missing: For Cape May, April, July, and August, 1918; January, February, and March, 1919; for Hatteras, October, 1918; for Jacksonville, January, February, March, and April, 1915.

THE ACCURACY OF WIND OBSERVATIONS IN LARGE CITIES.

By G. HELLMANN.

[Abstracted from Bericht über die Tätigkeit des Preussischen Meteorologischen Instituts in den Jahren 1917, 1918, 1919, pp. 24-29.]

The necessity of observing the direction of the wind from wind vanes has led to the placing of vanes on buildings in cities which are but poorly exposed to the wind, and, being influenced by eddies and deflected currents from adjacent buildings, they not only fail to agree in results with those exposed openly but also disagree with other poorly exposed vanes.

The author has investigated this question for five years, 1911–1915, at three stations located in Berlin. The Urban municipal hospital is located near the south limit of Berlin, the Agricultural high school is 4.5 kilometers northwest of Urban, and a third station located in Seestrasse was 3.1 kilometers northwest of the high school on the northwest limit of Berlin. The relative number of wind directions recorded by the three stations in those years is as follows:

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
Urban	100.4	40.0	142.8	77.6	211.4	172.8	193.8	132.2	24.6
High school	66.4	103.4	126.0	115.0	118.7	163.2	256.5	124.2	22.2
Seestrasse	87.0	112.0	135.2	83.6	158.6	158.0	266.4	84.2	10.6

Most conspicuous in this table are the differences between the three stations with south and with northeast winds. The Urban station recorded about twice as many south winds as the high school, while the Seestrasse station recorded three times as many northeast winds as the Urban station. This is probably due to the situation of these stations with respect to the city. Seestrasse, on the northwest received more northeast winds; Urban, on the south, had a preponderance of south winds.

Of interest, also, are records made between 1775 and 1787 within Berlin, which, then, of course, was much smaller than now. One observer was Beguelin, who observed from the old observatory in Dorotheenstrasse for the Academy of Sciences, and the other was Gronau, the minister of the Parochialkirche, who observed the vane on his church steeple. The two points lay about 1.5 kilometers apart. Their records show very poor agreement as to frequency. The best agreement occurred in the months of May, June, and July when the north wind is prevailing. Throughout the year Gronau had more southwest winds than Beguelin, and, in general, he also recorded more west winds, while Beguelin noted more north, south, and southeast winds.

These records show how unreliable are many of the records of wind direction obtained in cities. The observations of Beguelin and Gronau show also that recording instruments are essential, for their best agreement was in those months when long daylight and clear weather aided their observing in morning and evening.—*C. L. M.*

GROUND TEMPERATURES COMPARED WITH AIR TEMPERATURES IN A SHELTER.

By GEORGE REEDER.

[Weather Bureau, Columbia, Mo., Oct. 19, 1920.]

SYNOPSIS.

A series of observations was made at the United States Weather Bureau Station, University of Missouri, Columbia, during the months of September and October, 1907, to determine how much exposed thermometers on the ground differed from sheltered thermometers 11 feet above the ground. To test the problem further, three beds were made, one of bare soil, one of blue-grass sod, and one of sand. Observations made during the passage of cumulus clouds and upon the effect of a shade area 20 feet distant showed that all the instruments responded to cloud shadows, but that only ground thermometers showed the effect of the building shadow. The latter shadow caused a perceptible movement of air toward the sunlit area. This paper serves to present the collected data from these observations.

RESULTS.

Equipment.—The equipment consisted of maximum, minimum, wet and dry bulb thermometers and a thermograph, in the shelter, and of one minimum and one dry bulb thermometer on each of three beds. The beds consisted of small adjoining plots of bare soil, blue-grass sod, and sand, each 18 inches square. The shelter, which was of the usual Weather Bureau type, stood 11 feet above the ground. The beds lay on the south side of the shelter so that on bright days the shelter shadow was thrown away from the thermometers exposed in the beds. The thermometers were placed, with the bulbs partly, but not wholly, covered, pointing to the north. For protection from interference and accidents, the three beds were covered with a strong 3-inch mesh wire cage, the four corner wires being driven into the ground. The observations were made with the dry bulb thermometers at 2 p. m. and sunset and each morning with the minimum thermometer.

The accompanying tables and diagram show that during September nights bare soil cools slower than either sod or sand. Generally, it was cooler on the ground during clear nights than in the shelter; during calm, clear, dewy nights bare soil was the warmest, as a rule. In the middle of the day during September, under bright sunshine, bare soil and sand went to higher temperatures than the sod; and the temperature changes with the passage of a cloud also were greater on bare soil and sand than on sod. During cloudy, damp weather ground-surface temperatures were moderate and varied but little. The loss of heat from the bare soil surface was quite marked after September 20.

The warmest period was from September 11 to the 19th, inclusive (see fig. 1). The 16th was the warmest