inches; length of arm from center of axis to center of cup, 7 inches.

When Mr. Hancock gave up observing at the end of 1897, Mr. C. O. Plageman removed these instruments to his residence, which is about 200 feet above the sea, and exposed them very much in the same way as did Mr. Hancock, the greatest difference being in the anemometer, which he placed upon a platform 25 feet above the ground, especially erected for it. Being now 200 feet above sea, 0.2 inch was added to the barometer readings to reduce them to sea level.

The details of the results of Mr. Hancock's and Mr. Plageman's meteorological labors are given in Table 2, which it is advisable to study in connection with Table 1, as the basis for the latter. In obtaining the dew-point and the relative humidity, Molesworth's Psychrometric Tables were used. A day's wind record began with the morning observation, that is if the observation was taken at 9 a. m. the miles of wind were counted from 9 a. m. to 9 a. m., and if the observation was taken at 10 a. m. the wind record was counted from 10 a. m. to 10 a. m.

It is unnecessary to enter into a description of the data taken from the records of the local office of the United States Weather Bureau, as the instruments, method of exposure and reducing, etc., are all known. It ought to be stated, however, that the 8 a. m. and 8 p. m. means for January and February, as given in Table 1, are those of 1900, and all the other months, from March to December, inclusive, are those of 1899. It was thought best to use the January and February means for 1900 because the observations were made at 6 a. m. and 6 p. m. during January and the first fifteen days of February, 1899. The 12 noon means are taken from the Richard barograph traces for 1899, which are supposed to represent the actual readings of the barometer, therefore 0.03 inch has been added to get the sea-level readings.

THE HOT WEATHER OF AUGUST, 1900.

By ALFRED J. HENRY, Professor of Meteorology.

In normal summer weather, areas of low pressure (cyclones), drift eastward over the northern third of the United States at irregular intervals, generally, however, separated by a period of three or four days. As these lows move across the country the districts within their southern and eastern quadrants come successively within the influence of warm south and southwest winds in advance of the cyclone and there results a temporary warm wave. The warm wave is, however, quickly terminated by local rains and thunderstorms, after which the temperature again rises and the same sequence of events is repeated. In some years the normal eastward movement of areas of low pressure (cyclones) is checked; in such years they form as usual on the eastern side of the Rocky Mountains, or move into the United States from the British Possessions, but instead of drifting eastward persist for days over Montana, the Dakotas, Nebraska, Kansas, Colorado, and Wyoming. The barrier to their eastern movement appears to be the area of high pressure which covers the south Atlantic coast States, and also stretches across the Atlantic to the Azores and the shores of southern Europe.

This area of high pressure is merely a portion of the belt of high pressure which surrounds the globe having its maximum about the parallel of thirty degrees. It should not be conceived that pressure is uniformly high within this belt. A more accurate conception would be to consider the belt of high pressure as consisting of a series of detached areas of high pressure separated by trough-like valleys of lower pressure, the whole system having a very slow movement eastward.

The course of areas of high pressure in the United States, in summer, is generally eastward or southeastward from some point north of the Lake region. When the southeasterly course is pursued the high very often merges with the permanent high off the south Atlantic coast, and passes beyond the field of observation. In some years, however, the lower layers of the atmosphere become stagnated, and the movement of both highs and lows is sluggish and uncertain.

The initial movement which led to the hot wave during August was the slow drift of an area of high pressure southward and southwestward from southern New York, where it was located on August 4, to the Ohio and Middle Mississippi valleys, in which region it culminated about the 8th, in pressures ranging from 30.20 to 30.30 inches. During the prevalence of high pressures over the eastern half of the United States pressure was relatively low over the Atlantic south of the fortieth parallel.

The character of the weather during the heated term, as regards the amount of rain that fell and the vapor contents of the air, varied greatly. In Nebraska, the Dakotas, and Minnesota great quantities of rain fell. In North Dakota the average for the State was about five times the normal. The winds were fresh to brisk, mostly southerly or southeasterly. In Colorado, Kansas, and quite generally east of the Mississippi, there was a deficiency in the rainfall, amounting in some States to 75 per cent of the normal. The winds were gentle, and mostly from a southerly quarter, except in certain districts to be mentioned later. The periods of extremely high temperature were also times of great dryness, and the physical discomfort experienced was not so great as would have been the case with lower temperature and higher humidity. On the other hand it should be remembered that, almost without exception, the days of moderate temperature were also days of high humidity, and caused as much, if not more suffering than those of very high temperature and low humidity.

The geographic extent of the hot wave is shown by the text chart, fig. 2, below. It will be noticed that the warm weather extended from the backbone of the Rocky Mountains eastward to the Atlantic. The temperature on the mountain summits was generally above the normal, but throughout the great basin and the Plateau region it was below normal by amounts ranging from 2° to 6° daily.

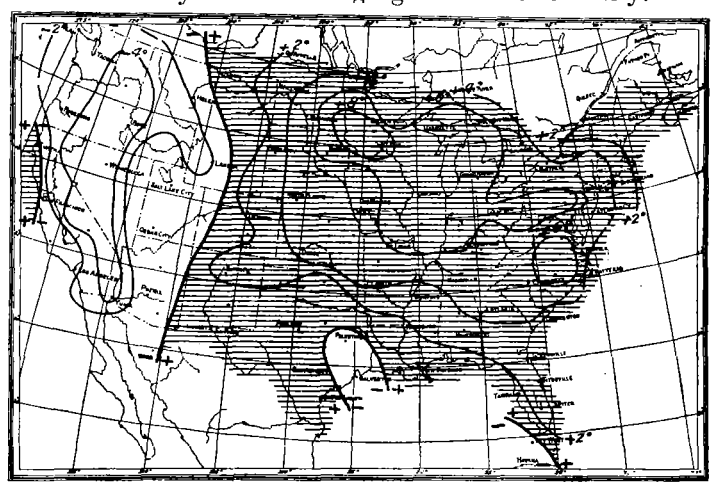

Fig. 2.—Departure from normal temperature, August, 1900.

Within the general area of high temperature may be found small areas of excessive heating, as in the neighborhood of St. Paul and St. Louis. The monthly mean temperature for August at St. Paul was 77.2°, a higher average than has ever before been recorded, and the record goes back to 1820 (using the Army record made at Fort Snelling). At St. Louis the August mean was higher than any that had hitherto been observed; the record in this case goes back to 1836.

Additional statistical details are given in the table following:

Comparative data of temperature and relative humidity for August, 1900.

Stations.	Monthly mean.			Maximum.			Number of days above 90°.			Relative humidity, per cent.	
	Aug., 1900.	Highest previous.	Year.	Aug., 1900.	Highest previous.	Year.	Aug., 1900.	Number previous.	Year.	Aug., 1900.	Departure from normal.
	°	°		°	°					%	
Omaha	79.0	80.2	1881	94	105	1874	14	18	1881	72.2	+ 3.0
Davenport	79.8	78.1	1873	97	98	1894	15	12	1881	71.3	+ 3.4
St. Paul	77.2	72.9	1881	96	100	1896	11	7	(1878) (1881) (1886)	69.9	+ 1.5
St. Louis	83.8	82.5	1881	99	106	1881	24	23	1881	74.6	+ 7.3
Chicago	76.3	75.0	1881	94	98	(1881) (1896)	10	6	1896	81.6	+13.7
Detroit	75.5	74.1	1881	94	99	1881	8	8	1881	76.6	+ 8.3
Louisville	82.5	81.1	1881	101	105	1881	26	20	1881	73.0	+ 7.2
Nashville	82.4	83.1	1881	98	104	1874	25	.....	.....	71.8	— 0.5
Cincinnati	80.0	79.5	1881	96	101	1881	15	18	1881	72.2	+ 6.9
Pittsburg	78.7	74.5	1895	98	100	1881	12	15	1881	66.6	— 1.7
Philadelphia	79.2	77.4	1895	101	99	1881	13	10	1896	68.8	— 2.4
New York	76.8	75.5	1872	95	96	(1881) (1888)	8	7	1896	70.8	— 4.1
Washington	79.6	79.0	1872	101	101	1881	17	16	1872	72.6	— 2.8
Charlotte	81.9	80.9	1881	99	100	(1881) (1888)	25	20	1896	65.2	—13 0
Augusta	84.0	83.7	1878	102	105	1878	26	27	1878	68.6	—12.0
Savannah	83.9	84.7	1878	102	100	(1878) (1899)	25	24	1878	83.2	— 0.2

From the 6th to 11th, the period during which the highest temperatures of the month were recorded in Pennsylvania, Maryland, the District of Columbia, and Virginia, the winds were from a northerly quarter. This apparent anomaly may need a word of explanation.

The circulation of air within an area of high pressure, it may be remembered, is clockwise. In the hot spells generally experienced over the eastern part of the United States only a portion of the South Atlantic high extends over the land, the center usually being some distance off the coast. The pressure distribution in such a case would cause southerly or southwesterly winds in the vicinity of Washington, D. C., depending somewhat, of course, upon the position of the center of the high with respect to that city. In the present case the center of the area of high pressure which dominated the weather during the days in question was wholly within and over the land area of the United States, viz, to the southwest of Washington. In this position the natural circulation of the wind in the northeastern quadrant of the high would be from the north or northwest, and such was the case. It is but fair to say, however, that the high temperature in Washington was primarily due to south and southwest winds on the 6th, yet we had the rather extraordinary spectacle of warm, dry northwesterly winds and continued high temperatures for several days in succession, as may be seen by an inspection of the tables following.

The length of time a hot wave will continue is always a matter of some uncertainty. The conditions that favor its continuance are intense local insolation, light variable winds, and possibly the importation of warm, dry air from the trans-Mississippi region.

There is a strong and persistent flow of warm and dry air from the middle Mississippi and Missouri valleys into the semipermanent area of low pressure which covers the Dakotas and the northeastern Rocky Mountain slope during the prevalence of abnormally hot weather in the Ohio Valley and the Middle States. In its ascent this warm, dry air probably mixes very little with the air of contiguous regions, but flows eastward in the general circulation as a fairly homogeneous mass of warm, dry air, with temperature and dew-point considerably above the normal for the season and altitude.

This warm, dry air, flowing easterly in the upper currents should, according to theory, descend in the region of high pressure. Color is lent to the theory that it does so descend by the freedom of the region of high pressure from clouds and the presence of dust and haze. The ordinary Washington summers are free from dust and haze in the upper levels of the atmosphere, but so soon as a hot spell sets in the air

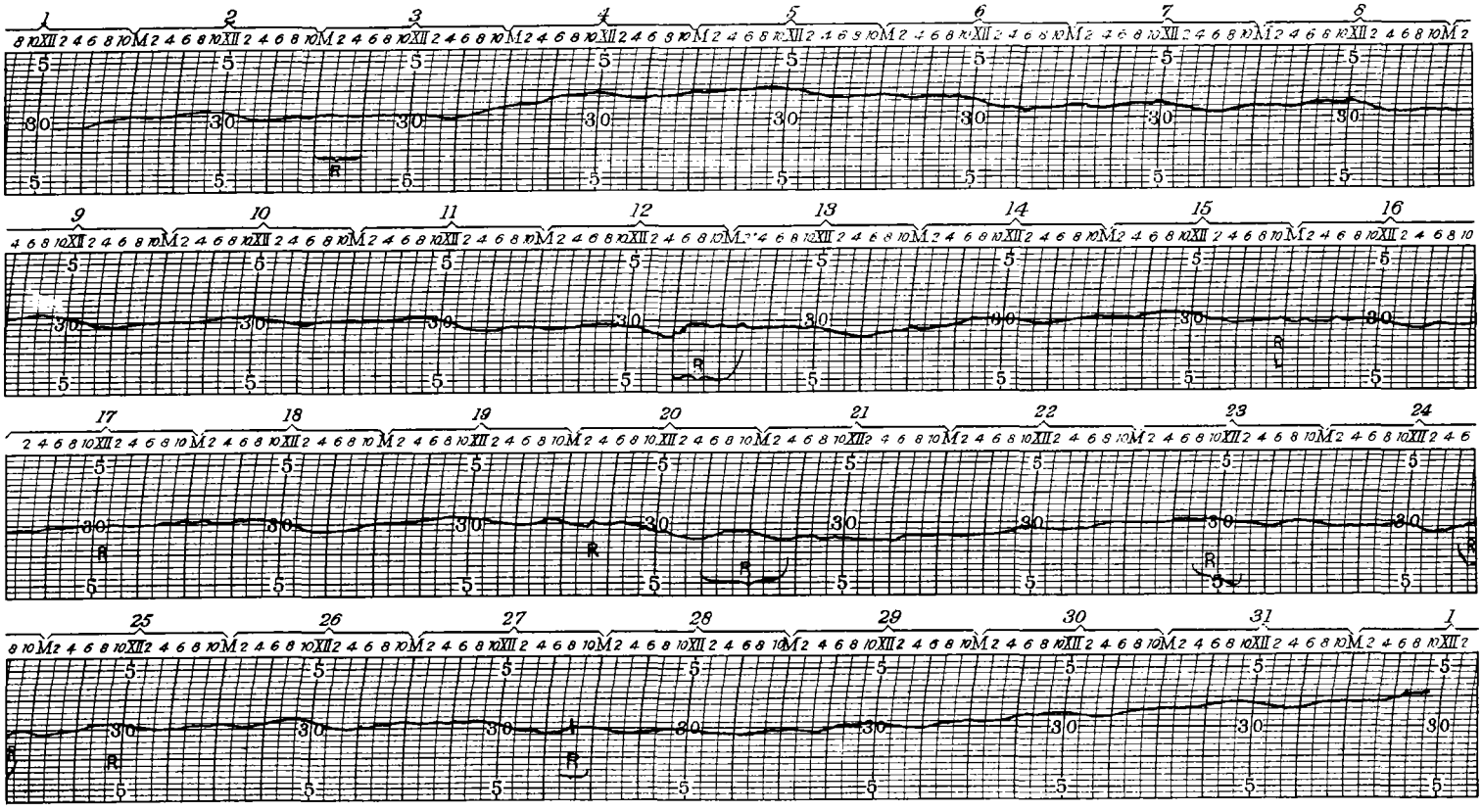

Fig. 3.—Pressure curves for August, 1900.

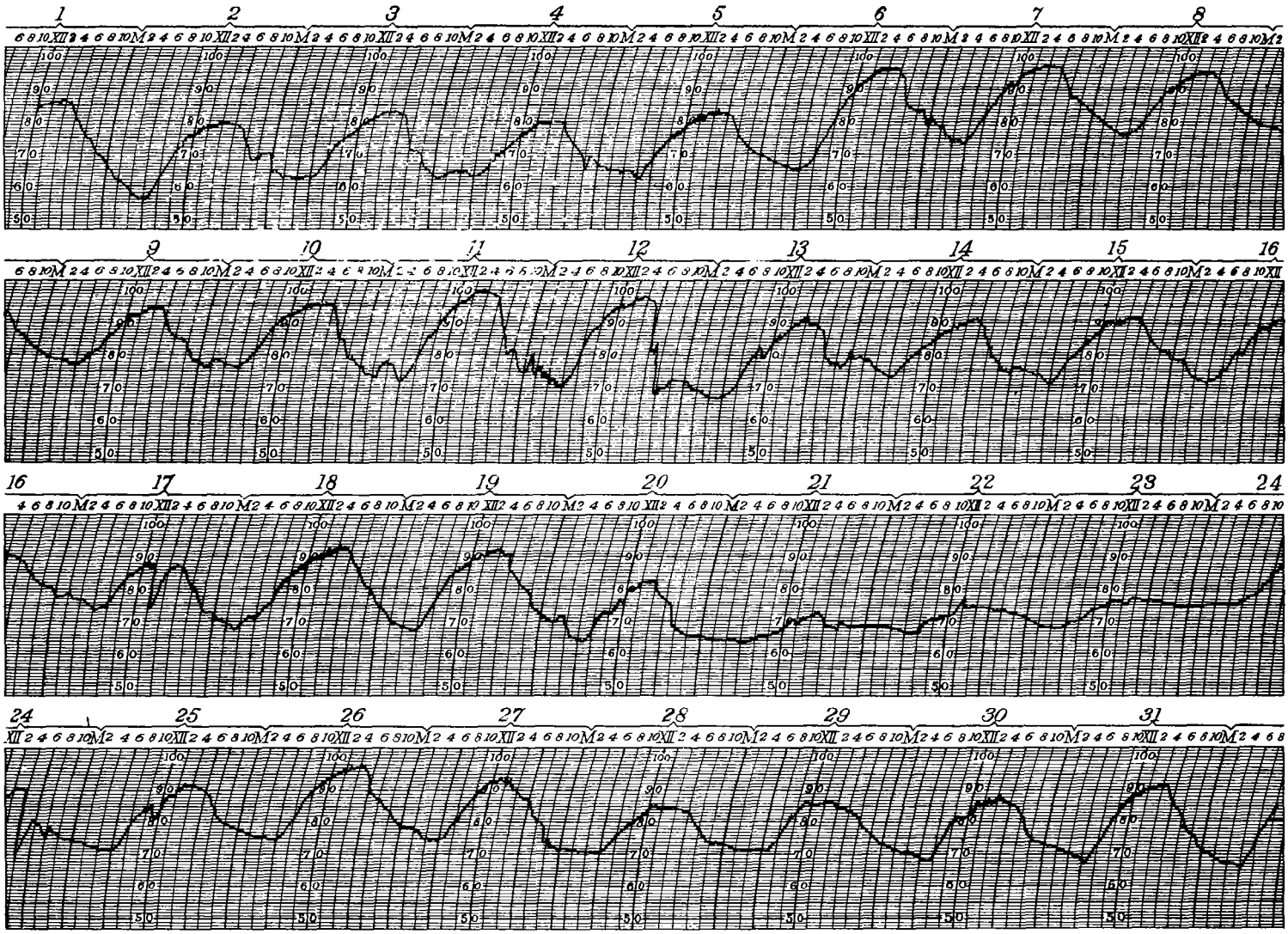

Fig. 4.—Temperature curves for August, 1900.

becomes dusty and hazy; hence we conclude that the hazy condition is due to the importation of dust particles from the westward.

There is some evidence, fragmentary, it is true, that the upper currents, in the level of the higher clouds at least, do not flow constantly from west to east during hot spells as under normal conditions. On several occasions, during the continuance of the hot weather, cirrus and cirro-stratus clouds were observed moving from an easterly toward a westerly quadrant. A number of cases of upper clouds moving from a northerly toward a southerly quarter were also observed. This would indicate, at most, merely a temporary disarrangement or weakening of the prevailing westerly currents in the cirrus cloud level.

Whatever may be the primary cause of the hot wave, it is evident that during its continuance the lower layers of the atmosphere are heated to a much greater altitude than during normal weather conditions, and a much greater impulse is therefore required to overturn existing conditions and bring about rain and cooler weather, thus exemplifying the old saying, "All signs fail in dry weather."

We reproduce in the text, figs. 3 and 4 the automatic records of pressure and temperature at Washington, D. C., for the entire month of August. These instrumental records enable one to form a clear mental picture of two only of the more important elements which are concerned in the development and continuance of a hot wave. The humidity is not recorded except at 8 a. m. and 8 p. m. and its variations for each hour of the day can not, therefore, be given.

The record of the barograph is most interesting; from the 3d to the 6th an area of high pressure moved from southern New York down the coast and spread westward over the Ohio Valley and Tennessee. It will be noticed that while the high was passing over Washington moderate temperatures prevailed, but as soon as pressure began to fall temperature began to rise, even though the winds were northwesterly (see table). After the area of high pressure came the period of high temperature and generally low humidity from the 6th to the 12th. During this period the skies were mostly free from clouds. A few ragged cumuli formed and hung lazily around the horizon, disappearing by sunset. The barometer rose and fell with the regularity of the tide, indeed one could almost tell the time of day by the barometer. This rythmic movement of the barometer is best exemplified in the calm and tranquil atmosphere of the tropics.

On the afternoon of the 12th pressure dropped a little below the usual afternoon minimum and rain fell the first since the 2d. The letter R on the barograph sheets indicates the occurrence of rain. During the remainder of the month the barometer varied but slightly from 30.00 inches until the 30th, when a second high approached from the northeast.

Maximum temperatures and direction of the wind as registered by automatic instruments for each day of the period August 2–11, 1900.

[Wind directions are expressed in percentages.]

CHICAGO, ILL.

Date.	Max. temp.	Percentage of time wind blew from—								
		N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
2	77	4	29	6	6	12	33	7	3	
3	78		7	18	53	17	5			
4	94					42	48	10		
5	94				12	21	62	5		
6	93					32	66	2		
7	92					13	81	6		
8	92				1	7	76	16		
9	94					3	93	4		
10	94					5	91	4		
11	91	2				11	65	21	1	
Averages		0.6	3.6	2.4	7.4	16.3	62.0	7.5	0.4	

DETROIT, MICH.

2	74	2	32	3		4	45	11	3	
3	78	23	15	34	5	12	10		1	
4	81		5	11	36	34	11	3		
5	94				1	26	59	14		
6	93					1	79	20		
7	92						75	25		
8	94						45	55		
9	90						56	44		
10	93						81	19		
11	93						75	25		
Averages		2.5	5.2	4.8	4.2	7.7	53.6	21.6	0.4	

Maximum temperatures and direction of the wind, etc.—Continued.

PITTSBURG, PA.

Date.	Max. temp.	Percentage of time wind blew from—								
		N	NE.	E.	SE.	S.	SW.	W.	NW.	C.
2	78	9	10	12	18	2	6	7	46	
3	82	83	10						7	
4	85	38	17	16	8	2			19	
5	92	21	18	4	2	13	17	4	21	
6	97	13			8		6	21	51	6
7	95	20						1	79	
8	96	31							69	
9	96	21							79	
10	97	23							77	
11	98	33					4	20	43	
Averages		29.2	5.5	3.2	3.1	1.7	3.3	5.3	49.1	0.6

WASHINGTON, D. C.

2	80	48						5	47	
3	83	2	3	17	5			5	68	
4	80	37	12	8	21				22	
5	84				41	59				
6	96	1				46	13	38	2	
7	98		25					23	52	
8	96	1						30	69	
9	96	1						1	98	
10	97	4						4	87	5
11	101							38	62	
Averages		9.4	4.0	1.5	6.7	10.5	1.3	14.4	50.7	0.5

NOTES BY THE EDITOR.

WEATHER BUREAU MEN AS INSTRUCTORS.

It has long been evident that meteorology is but too slowly making its way into universities and colleges as an important branch of study. Some progress has been achieved in the public schools where meteorology is sometimes taught independently but more frequently as a branch of physics or as an essential part of physical geography. It has long been known that the Weather Bureau observers and officials have done all that they could do, consistently with other duties, to supply the demand for instruction and to dissipate the ignorance that prevails in many minds by reason of which meteorology has been associated with astrology, folklore, animal instinct, and other obscure, if not unscientific, fields of thought.

There is no better method of learning all that is known about a given subject than by undergoing the labor involved in preparing a lecture thereon, either for the public or for the college student. To do this successfully one must follow the Baconian rule, he must read in order to become full, he must write in order to become accurate, and must talk in order to become fluent. Of the many lines of work by which the members of the Weather Bureau service may benefit the service and the country, we put the ability to lecture and instruct in the front rank alongside of the ability to make better forecasts, or long-range forecasts, or to invent devices for prevention against damage by hail, frost, wind, and other meteorological elements.

The Editor conceives it to be quite important that the members of the service should stimulate each other in this good work. To this end he has compiled the following extensive collection of abstracts from both the annual reports of the respective stations and especially from the replies to a special circular letter of July 14, 1900. These abstracts are generally in the exact words of the original replies, the few changes that have been made being necessary only for greater perspicacity.

A.—EXTRACTS FROM LAST ANNUAL REPORT OF STATIONS.

P. Connor, Local Forecast Official, Kansas City, Mo.:

The subject of meteorology has been kept before the community quite prominently. The official in charge delivered a discourse before one of the high schools, and read a paper entitled: "The weather—something regarding its make up and effects," before the Commercial Club, at the solicitation of that body. Another paper was prepared (and approved by the Central Office) to be read before the Academy of Sciences toward the close of the year, but the absence from the city of several of the more prominent members, suggested the advisability of holding it for a future occasion.

The central high school has adopted meteorology in its curriculum, and made it one of the elective studies. The first class was formed during the winter and numbered about 25. Next year a large class is anticipated. The class and teacher have visited this office to see the practical side of the subject.

Maps and weather information generally have been eagerly sought by schools in Kansas and western Missouri, and many teachers from those States have visited this office.

S. W. Glenn, Local Forecast Official and Section Director, Huron, S. Dak.:

Informal lectures on the use of meteorological instruments and weather maps were given to the local high school class in physics, and by mutual understanding between the official in charge and the president of the State Agricultural College, the students of that institution visit the office singly and in numbers for instruction in meteorology.

T. B. Jennings, Section Director, Topeka, Kans.:

In February last I delivered an address, by invitation, before the Farmers' Institute at Berrytown, this county, on the United States Weather Bureau in its relation to agricultural interests.

In November, January, and March, I lectured before the teachers' association of this city, treating of the composition of the atmosphere, its changes in weight, temperature, and moisture, its general and accidental movements, instruments for measuring its weight, temperature, moisture, and movements, explanation of the instruments, the "photographing" the conditions twice daily by means of synchronous observations charted on maps, and the construction of such a map from a bulletin published in one of the Chicago dailies.

In June such a lecture was also delivered before the County Teachers' Institute at the High School Building.