

WESTERN CLOUD.

While the eastern tornado was by far the larger and more destructive, it was not seen by nearly so many people as was the western cloud. (Figs. 1, 8, 9-11.) It was this spectacular western funnel which practically every one was watching while the eastern funnel formed and cut its destructive path through the southwestern portion of the county.

The wind from this cloud was first felt in contact with the ground at a point about 6 miles northwest of town, where some farm buildings were damaged. Its next important destruction was about 3 miles farther south, at the State school for the negro deaf, dumb, and blind. At this institution the industrial building, the laundry building, and a dormitory were destroyed. Moving in a southwestern direction and along a line practically parallel to the path of the eastern cloud, it next struck at Deep Eddy on the river's bank. At this point considerable property damage was done and two persons injured. Lifting a large volume of spray high into the air as it went, the whirl crossed the river, cut a path about 25 yards wide through the timbered hills, and eventually disappeared to the southwest. The path of this funnel while in contact with the ground was about 3 miles to the west of, and practically parallel to, the eastern funnel.

SOME OBSERVATIONS MADE ON THE ORIGIN, GROWTH, AND DISAPPEARANCE OF THE TORNADO WHICH PASSED WEST OF AUSTIN MAY 4, 1922.

By PAUL T. SEASHORE.

[University of Texas, June 14, 1922.]

While seated by a north window in Breckenridge Hall at the University of Texas on the afternoon of May 4 I became aware, due to the rumbling of thunder, of an accumulation of clouds in the north and northeast. On account of the heat of the early afternoon and of the knowledge that we were in an area of low pressure I thought it perhaps advisable to watch these clouds for symptoms of tornadic disturbances.

The clouds approached quite rapidly and seemed to be traveling in a southerly direction, perhaps slightly west of south. The approaching clouds were scarcely 5 miles away when I first became aware of the tornadic formative disturbance. In a position nearly due north a ragged edge, or that part which appears to an observer as being the bottom of the cloud had in one place dipped lower and had assumed the shape of a V with a slender threadlike appendage swinging from the bottom. This smoke-like wisp was continually being drawn up into the larger V-shaped body, staying there for the space of a second or two, and then trailing down to the earth again, swinging to the right and to the left. This phenomenon was continued for possibly two or three minutes, and then the V-shaped body with its appendage disappeared.

After being absent for about the same length of time that it had been present, the body reappeared as before, only it had grown larger and had shifted from north to a position a few degrees west of north. Directly above this miniature tornado small fragments of clouds were flying here and there with an irregular motion, confined, it seemed, however, to a certain area horizontally but not vertically. From this irregular boiling there gradu-

ally grew a regular movement, which was counterclockwise and assumed the shape of a narrow, slightly tapering cone inclined at an angle of about 30° with the horizontal. The small V-shaped body was drawn up into the larger cone, but the threadlike wisp of the former remained and was seen to grow larger, attach itself to the tip of the larger cone, and extend vertically to the ground. It remained on the ground for a few seconds and then drew up to a position about midway between the cone and the ground. The tornado at this stage was approximately north 25° west from my position. As the rapidly whirling gray cone passed to the west it assumed a more vertical position and appeared to grow slightly larger. Fragments of ragged clouds could be seen drawn into its vortex. After the cone had passed to the southwest of my point of observation it became funnel-shaped and again seemed to dip toward the earth. It now gradually broadened out, became bell-shaped and disappeared in a heavy rain.

This tornado was followed by a cloud having a bluish green color. The whirling cone itself had a grayish color until it became obliterated by the rain.

TORNADO FREQUENCY IN KANSAS.

By S. P. PETERSON, Meteorologist.

[Weather Bureau, Wichita, Kans., May 18, 1922.]

The following table has been compiled from the readily available records of tornadoes in Kansas so that there may be a clearer conception of the frequency of occurrence of tornadoes in that State. The records upon which the table is based are compiled from Mr. S. D. Flora's article on "Tornadoes in Kansas," published in the MONTHLY WEATHER REVIEW of December, 1915, and from the records of tornadoes found in the *Monthly Climatological Data* for Kansas for the years 1916 to 1921, inclusive, published by the Topeka Weather Bureau office, the *Climatological Data* having been carefully scanned for all records of tornadoes contained during that period. The total, apparently quite complete, records of tornadoes cover a period of 30 years—from 1874 to 1887, 1889 to 1896, and 1914 to 1921, inclusive. When tabulated we get the following results, showing the total number of tornadoes that have occurred in the various months during the period of record, from which is computed the average monthly frequency and the average number of tornadoes that may be expected to occur in Kansas per year.

TABLE 1.—Tornado frequency in Kansas, 30 years' record (by months).

	Total.	Average monthly frequency.
January.....	0	0.00
February.....	1	.03
March.....	19	.63
April.....	49	1.63
May.....	84	2.80
June.....	60	2.00
July.....	18	.60
August.....	16	.53
September.....	10	.33
October.....	5	.17
November.....	3	.10
December.....	0	.00
Total for 30 years.....	265	8.8
Average per year.....	8.8	8.8

From this table we find that no tornadoes are likely to occur in Kansas in January or December, that in only one year out of 30 is a tornado likely to occur in February, that the monthly frequency increases to three in each May, and that but one tornado occurs in each 10 years in November. The average annual frequency of tornadoes for the State is 8.8. However, since the area of destruction of a single tornado rarely exceeds 25

square miles,<sup>1</sup> and many cover a much smaller area, while the total area of Kansas is more than 80,000 square miles, it follows that, on the average, no given place in the State will experience a tornado oftener than once in about 600 years.

<sup>1</sup> Abbe, Cleveland: Tornado frequency per unit area. MONTHLY WEATHER REVIEW June, 1897, p. 250.

### KASSNER ON LEGAL METEOROLOGY.

By C. LeROY MEISINGER.

[Weather Bureau, Washington, D. C., June 21, 1922.]

The lawyer, perhaps more than other professionals, is often forced far afield in the prosecution of his profession. He is not infrequently obliged to interest himself, sometimes intensively, sometimes superficially, in subjects quite antipodal to the ordinary technique of the legalist. The sciences have often had their day in court. Astronomy, chemistry, medicine, engineering, meteorology, and others—all have contributed their expert witnesses. But one difficulty which confronts the lawyer upon examining the expert witness is his own lack of intimate familiarity with the science or data. Not knowing how the data were collected and by whom, not appreciating the full significance of the evidence he is bringing out, the attorney may fail to ask the proper questions or fail to ask them in the proper way. It is for the lawyer, the judge, the administrator, the business man, the layman, and, indeed, for all who may be confronted with the use of meteorological data in legal proceedings and in daily life that Doctor C. Kassner, of the Prussian Meteorological Institute, has written his *Gerichtliche und Verwaltungs-Meteorologie*.<sup>1</sup>

In spite of the frequent use of meteorological data in this way, Doctor Kassner's thorough and interesting book, based upon his 30 years of experience, is the first of its kind in the world's meteorological literature. The work is divided into three major divisions—the first dealing with the weather and its observation, the second with questioning concerning the weather, and the third with the giving of information concerning the weather.

The first section is a general compendium of information concerning instruments, units, stations of various orders and their equipment, principal weather services of the world and their addresses. This section enables one unfamiliar with meteorological organizations to get a fair idea in a short time of the character and scope of the work they perform and the data they collect.

The second major section is devoted largely to that phase of the use of meteorological evidence mentioned in the opening paragraph of this review, namely, the intelligent questioning of the expert. Questioners are divided by Doctor Kassner into five groups: (1) Technicians; (2) military officials; (3) attorneys; (4) magistrates; and (5) private individuals.

The author believes that in many instances the German proverb *Wie man in den Wald ruft, schallt's wieder heraus*, is quite applicable to the questions that often are asked and the replies that must be given, for "as one asks, so shall he be answered." He points out the unnecessary circumlocutions often employed in the statement of the question and urges brief and pointed statements. He deprecates the lack of proper use of ordi-

nary terms, incorrect spelling (for example, metrological, meteological, metriological, etc.), and loose ideas concerning the application of the data. He says, finally, that a properly-put question should contain (1) the date, accurately stated to as small time units as possible; (2) the place, as specifically as possible; (3) the weather element involved, clearly stated, as, for example, rain, snow, or hail rather than precipitation; (4) the circumstance involving the data, such as spoiled meat, heat stroke, or accident due to glaze; and (5) the willingness to pay for the information.

The third section of the book is of greatest popular interest and perhaps of greatest value, for it contains running comment, queries, and replies for 438 examples, selected from actual experience, dealing with the various meteorological elements. Some of these possess a touch of humor, some illustrate how a trivial meteorological circumstance may be the turning point of an important case, and all show the manifold ramifications of weather influences in the daily life of man. Some examples follow:

1. An automobile collided with a milk wagon which carried no lights at 9.45 p. m. The driver of the wagon maintained that it was still so light that no lights were necessary.

Reply: Twilight ended at 9 o'clock; the moon was not shining; there were a few clouds. A burning lantern was, therefore, quite necessary.

2. A woman was arrested by the police in a market for having sold spoiled goose meat. She maintained that excessive heat was responsible.

Reply: Highest temperature was only 20° C. (68° F.).

3. In a railroad shipment of filled flasks a part of the flasks were found cracked and empty. The railroad company maintained that it was the result of severe frost.

Reply: No; for on only one day was light frost (-2° C.) (28° F.).

4. A man in running from a large dog fell and broke his leg. The owner of the dog maintained that rain had made the sidewalk so smooth that the man had slipped and thus injured himself.

Reply: No rain, but clear sky instead.

5. Lightning struck a tavern and it burned. In opposition to the guests, whose effects were destroyed, the landlord maintained the misfortune was an "act of God."

Reply: There was a thunderstorm.<sup>2</sup>

These cases have been selected at random and can presume to do no more than suggest the field covered by the 438 examples. Nor can any idea of the running discussion offered by the author be given, for he constantly points out the best statements and the outcome of the trials. He shows throughout how the reply is limited by the query and how the meteorologist must confine himself strictly to the meteorological aspects of the question, even when there are ramifications closely allied to the meteorological phase, as in the last example given above. A large section is devoted to cases, always frequent where meteorological forces are concerned, involving the "act of God" (*Höhere Gewalt*).

<sup>1</sup> *Gerichtliche und Verwaltungs-Meteorologie, Das Wetter in der Rechtsprechung für Gerichte und Rechtsanwältinnen, Verwaltungen, Magistrate und Hausbesitzer, Berufsgenossenschaften und Versicherungsgesellschaften, für Gewerbe, Handel und Technik. Mit 158 Beispielen aus der Praxis.* Berlin and Leipzig, Vereinig. wiss. Verleger, 1921. 8°; 208 pages.

<sup>2</sup> It was maintained in the trial, however, that such defense was not valid since the inn was not protected by lightning rods. Had the inn been so protected, it was held, the owner could properly have defended himself upon the grounds of an "act of God."