possibilities of the case, as near as I can compute them, are as follows, taking the flood of 1897 as the maximum condition, and the danger line of 45 feet at Vicksburg as the line above which the water would begin to run off into the canal. At the time of the maximum stage of 52.3 feet the discharge in cubic feet per second was about 1,600,000, while at the 45-foot stage it was about 1,300,000. The difference of 300,000 feet is the quantity which it is desired to dispose of through the proposed canal. Assuming the velocity of the current to be 4 miles per hour, which is equivalent to 5.87 feet per second, the cross section of the canal would have to be $300,000 \div 5.87 = 51,107$ square feet. Therefore, if the depth were to be 30 feet, the width would have to be $51,107 \div 30 = 1,703.6$ feet, and its length would be about 12 miles. Both banks would need protection by revetments to secure permanency. I can give no close estimate of the cost of such a work, but I think it could be done for $20,000,000 or less. On paper it certainly appears feasible. Opponents of the canal argue that it would gradually fill up by deposits of sand, but this objection is met by the reply that it applies equally to any portion of the river, and the canal, owing to its comparatively limited extent, could be effectually dredged to the required depth whenever necessary.

Above the mouth of the Missouri attempt has been made to lessen the flood heights by building storage reservoirs at the head waters. Five of these reservoirs were built, with a view to store surplus waters, which should be available for purposes of navigation when the low-water season set in. These anticipations were not realized, however. The floods were repressed to some extent as far as Lake Pepin, but not below, and as much as 1 foot of additional water was available at the low-water season at St. Paul, disappearing by the time Redwing, Minn., 52 miles below, was reached. In any event, with or without reservoirs, no floods north of Lake Pepin are felt to the southward to any considerable extent.

The effect in the lower river of an all levee system upon navigation would be to narrow the channel and, consequently, increase the velocity of flow during high water, thereby retarding somewhat the upstream movement of boats. Relief would come quicker, however, owing to the greater velocity of the water, as it would, of course, run off sooner. In times of low water it is probable that, there being no overflow or back water to run into the main stream and the levees causing a greater velocity in the flow of the water already there, the low-water season would be prolonged and still lower stages prevail than had obtained in the past. This would be impossible with the storage reservoir, as the surplus water could be let into the river just as needed.

This completes about all I have to say upon this subject, and I beg of you to bear in mind that I do not come here as an expert in these matters; I simply present to you the facts as I have gathered them in various ways. The subject is certainly one of deepest importance, and justifies almost any expenditure of time and money to produce satisfactory results. The proper improvement of the Mississippi River may require thirty or forty years of time and may cost $300,000,000. It could probably be done in one-half the time and for one-half the money or less. But no matter what the cost, the moral, social, and economic development of many millions of people is directly concerned, and it is not always wise to too closely reckon the cost in mere dollars and cents.

SMALL WHIRLING COLUMNS OF MIST.

By RALPH B. MAREAN, Weather Bureau, dated October 25, 1899.

On Sunday, October 22, a very interesting meteorological phenomenon was observed by me at the upper or receiving reservoir on the Conduit road a few miles above Washington. It was about 7:30 of a perfectly clear, calm, frosty morning. Over the mirror-like surface of the pond hung a ragged mist from 5 to 10 feet deep and so thin that it did not obscure objects on the opposite shore, some three hundred yards distant. When first seen there was no perceptible movement in this veil of mist; it rested almost motionless on the surface of the lake. Soon, however, it was noticed that it had begun to drift hither and thither in all directions. In two places within 50 or 100 feet of each other the movement would be in opposite directions. Almost simultaneously with the beginning of this movement of the fog there appeared whirls or spouts in the mist, seeming to form where two nearly opposite currents of air met, as shown by the drifting mist. Some of the columns were evidently formed as rolls between two parallel opposed currents. When first formed these spouts were from 2 to 4 feet in diameter, extending but 2 or 3 feet above the surface of the water and rotated (counter clockwise) but five or six times per minute. The speed of rotation rapidly increased, however, until at the end of half a minute or so it would be about thirty or forty per minute, the diameter decreasing at the same time to from 6 to 18 inches, while the column grew until about 20 feet in height. The column appeared hollow, the denser mist being in the outer ring. In the fully developed whirls there was a well defined upward spiral motion, the angle of ascent being, as nearly as could be judged, between 45° and 60° with the horizontal. Although some of these spouts lasted probably as long as five or six minutes, their average life was about two minutes, but within the twenty or twenty-five minutes during which the phenomenon was observed a great many, probably over a hundred, of these little whirling columns of mist were seen. Generally they had no progressive motion, although a few wandered aimlessly here and there. Gradually the number of the spouts diminished and finally in about half an hour no more were formed, the mist in the mean time having become almost entirely dissipated, partly by the rising sun and partly by the mixture of dry air.

Of course one could not witness a phenomenon of this kind without trying to discover its cause. It seems to the writer that the lower stratum of air had become heated by radiation from the comparatively warm water, but as no disturbing incident occurred it lay in the hollow over the lake in a state of unstable equilibrium. As soon as something happened, however, to disturb this equilibrium the cold overlying air began to fall and crowded up the warm, light stratum beneath.

The scene was one of great beauty. In the eight or ten acres of the lake in view there would be a great number of these minature columns of mist standing in relief against the dark pines in the background and as erect as they.

ADDITIONAL OBSERVATIONS OF THE ST. KITTS, W. I., HURRICANE.[1]

By W. H. ALEXANDER, Observer.

About noon of Thursday, September 7, the wind changed from the northeast to the north, from which direction it blew steadily with an average velocity of 17 miles per hour until 2 a. m. of the 8th, when it began varying between north and northwest and increasing in force. About 5 a. m. it set in steadily from the northwest and continued from that direction until 1 p. m., when it began shifting to the west and increasing rapidly in force. From 1:45 to 3:40 p. m. the wind came from the west with an average velocity of about 36 miles per hour. At 3:40 p. m. it shifted to the southwest and soon reached verifying velocity. About 3:15 a. m. of the 9th, the wind began blowing from the south, and by noon it was coming steadily from that direction.

[1] From a second report by Mr. Alexander, we copy the following additional details, received too late to be inserted in the chapter on Forecasts and Warnings.

The hurricane began at 3:40 p. m. and ended at 2:25 a. m. of the 9th, lasting, therefore, ten hours and forty-five minutes, during which time there was a total wind movement of 514 miles, giving an average of 48 miles per hour. The maximum, 62 miles per hour, occurred between 8:18 p. m. and 8:23 p. m. The extreme, 120 miles per hour, occurred at 5:51 p. m. The wind was from the southwest during the entire storm.

The following special barometer readings were made, viz:

September 8	5:30 a. m.	29.743
	7:00 a. m.	29.742
	8:00 a. m.	29.724
	9:00 a. m.	29.703
	10:00 a. m.	29.675
	12:00 noon	29.598
	1:00 p. m.	29.578
	2:00 p. m.	29.536
	3:00 p. m.	29.532
	4:00 p. m.	29.517
	5:00 p. m.	29.506
	6:00 p. m.	29.518
	7:00 p. m.	29.536
	8:00 p. m.	29.617
	9:00 p. m.	29.644
	11:30 p. m.	29.689
September 9	1:00 a. m.	29.678
	2:00 a. m.	29.685

PROCEEDINGS OF THE MEETING OF THE INTERNATIONAL METEOROLOGICAL COMMITTEE, AT ST. PETERSBURG, SEPTEMBER 2-7, 1899.

By A. Lancaster, from notes by St. Hepites. Director of the Meteorological Institute of Roumania.

[Translated by the Editor from Ciel et Terre, September 1899, p. 339.]

The International Meteorological Committee held its annual meeting at St. Petersburg from the 2d to the 7th of September. The attendance was not very numerous; only eight members of the Committee were able to accept the invitation of General Rykatcheff, Director of the Central Physical Observatory of Russia.

The opening session was presided over by His Imperial Highness the Grand Duke Constantine, who delivered a very interesting address which elicited great applause. He referred to the service rendered to meteorology by Kupffer, the founder of Russian climatology. After this address the various reports submitted to the committee for discussion were read as follows:

1. Report by Rücker on terrestrial magnetism and atmospheric electricity.

It was decided to maintain the Committee on magnetism as a distinct organization, but under the immediate control of the International Committee.

2. Report by Hildebrandsson on the observations of clouds.
3. Report by Hergesell on balloon ascensions.
4. Report by Violle on solar radiation and insolation.

In the session of September 3, the question proposed by General Rykatcheff was considered: "Is it desirable that the International Committee should consider earthquake observations?" The response was as follows:

"The Committee recommends that meteorological institutions contribute to seismic observations."

The question of antarctic exploration was also discussed at this session.

The Committee expressed the opinion that it is highly desirable: (1) That the results of such explorations should be supplemented by the data from the observatories already existing in the Southern Hemisphere and by that obtained from vessels navigating the seas of that hemisphere; (2) that new meteorological stations be established in the southern portion of the Southern Hemisphere, and especially that magnetic observatories be organized there; (3) that magnetic determinations over the whole globe be made in conjunction with those of exploring expeditions.

The interesting investigations of Hildebrandsson on the great centers of atmospheric action gave rise to the following resolution:

"The Committee appreciates the great interest attached to systematic observations made in those regions of the globe which seem to have a special importance in relation to our knowledge of the general circulation of the atmosphere."

The Committee is very happy to be informed by von Bezold and Mascart of the plans of His Serene Highness the Prince of Monaco as to the establishment of a complete meteorological and magnetic observatory in the Azores. His Highness, as we know, is aided in the execution of this project by Captain Chaves of the Portuguese Navy who has been devoting himself to this work for several years.

On the subject of the "Definition of the meteorological day," it was decided that:

"If the computation of the daily mean be not made according to the exact formula:

$$\left(\frac{0^h+24^h}{2}+1^h+2^h+3^h\ldots\ldots+23^h\right)\div 24,$$

it will be proper to consider the observation at midnight as belonging to the end of the day, as is done at most stations, and to adopt the formula:

$$(1^h+2^h+3^h\ldots\ldots+24^h)\div 24."$$

On the subject of the proposition of Hann to publish in a special form and definite manner the tables of the diurnal variation of the temperature for each country, the Committee, while fully appreciating the interest and importance of this proposition, is of opinion that, as this question is one of general interest, it should be considered by a special commission [subcommittee] which could decide upon a form of table to be used by all countries. While awaiting the final decision as to this form, the directors of the various meteorological institutions will certainly be glad to furnish the data in manuscript for their first order stations whenever requested.

As to the importance of actinometric observations (a question also introduced by Hann) the Committee can not do otherwise than concur in the wish expressed by this eminent Austrian meteorologist. It hopes that the commission on radiation and insolation will kindly examine the subject and make a report on it to the next International Congress. Violle has already presented a note on the various methods of making actinometric measurements; this note will be published in the Proceedings of the Committee.)

On the following proposition by Pernter that: "It is desirable that observations with the psychrometer be restricted and that observations with the hair hygrometer be increased," the Committee made no decision. A complete review of the subject must first be furnished.

In a letter sent to the Committee, Paulsen, Director of the Meteorological Institute of Denmark asks for the establishment of a cable between Iceland and Europe in the interest of weather predictions. It is well known that for a long time meteorologists have insisted upon the great importance of receiving, daily, information as to the current atmospheric conditions in Iceland, in order to improve the predictions of the weather for England and the states of western and northern Europe. But as the limited commercial intercourse between Iceland and Europe does not promise a sufficient income to compensate for the expense of laying a cable, therefore, the idea of the establishment of telegraphic communication between that island and the coast of Scotland has never been carried out.

The solution of the question has, however, been greatly advanced, thanks to the intelligent initiative of the Danish