

TROPICAL DISTURBANCES DURING THE HURRICANE SEASON OF 1924

By W. P. DAY

During the hurricane season of 1924, there were eight disturbances near or within the Tropics, which were potentially dangerous or actually reached hurricane intensity. Three of these caused full hurricane velocities over some portions of their paths, two gave strong gales to near hurricane winds, and the remaining three failed to develop more than moderate intensity.

The first disturbance, which was followed from the 18th to the 20th of June from the northwestern Caribbean to the southwestern Gulf of Mexico, caused heavy rains but apparently no high winds.

Following this disturbance, nothing of importance was noted until August 17, when a disturbance of slight intensity appeared over the Lesser Antilles. It moved northwest, reaching the Virgin Islands on the 19th without any increase in intensity. It was accompanied by heavy rain but no damaging winds. It was next noted as it turned the winds around at Turks Island, the storm passing to the north of the station. By the 21st, however, there had been considerable development, one vessel reporting a wind force of 11 (Beaufort) and 29.52 inches on the barometer. Up to this time the course of the storm had been toward the northwest, but an obstructing high-pressure area now deflected it toward the west-southwest and it did not start north again until the night of the 24th, meanwhile developing the greatest intensity just north of the Bahamas with hurricane velocities and barometer readings as low as 28.70 inches. On the 25th the storm began to move very rapidly north-northeast and at noon was very accurately located by three vessels near latitude 32° N. and longitude 76° 30' W., the ships reporting barometer readings of from 28.76 to 28.80 inches. At 8 p. m. it was just southeast of Hatteras, a vessel reporting 28.67 inches. It reached Nantucket shortly after noon of the 26th and was last noted near Port Aux Basques, Newfoundland, the next morning. The path of this storm was quite unusual and shows the effect of the extratropical circulation upon the movement of these storms. After the storm was well out of the Tropics the heaviest winds were experienced on the southeast quadrant (on the side toward the HIGH), and little damage resulted to the west, except near the storm center.

This hurricane had barely receded from the limits of observation before a new one, already of maximum intensity though small diameter, made its appearance between Antigua and Guadeloupe of the Lesser Antilles on the night of the 27th of August. The center passed over Cudjoe Head, Montserrat at 3.30 a. m. of the 28th with readings on nearby barometers as low as 28.50 inches. The center was again exactly located as it passed over the western end of Tortola of the Virgin group. The lowest reading at this point was 28.56 inches at 1.30 a. m. of the 29th. From this time until the storm reached Newfoundland on the 4th of September it was encountered by various vessels, but none reported the extreme conditions of wind and low barometer which were recorded over the Lesser Antilles.

The islands in the direct path of the center of the hurricane were almost completely devastated by wind and by flood waters from the extremely heavy rainfall.

On the morning of the 13th of September a disturbance was noted in the central portion of the Gulf of Mexico. This developed and moved, at first, slowly northwest, but was caught in a passing trough of low pressure and turned sharply toward the northeast, striking the northwest Florida coast near Appalachicola on the 15th and moved thence up the Atlantic coast with diminished intensity. Near hurricane velocities were recorded here and reported from the vicinity, but little damage resulted. Like the preceding storm the area covered was quite small but the intensity was much less on account of the higher minimum reading of the barometer near the center (29.12).

The next disturbance was noted on the morning of the 27th of September in the vicinity of the Swan Islands. It had a well-defined circulation, but did not develop the central core of low barometer which was so well shown in the two preceding storms. Consequently dangerous winds were absent. It reached the Florida coast near Cedar Keys during the afternoon of the 29th and continued up the Atlantic coast as a storm of only moderate intensity.

On the 12th of October a well-defined disturbance developed over the north-central Gulf of Mexico, but was forced southwestward and apparently dissipated over the southwestern Gulf on the 14th.

At the same time the air pressure began to fall in the vicinity of the Swan Islands. This new disturbance remained nearly stationary until about the 18th by unfavorable pressure distribution to the northward, but meanwhile it had developed greatly in intensity with a central pressure below 28 inches and hurricane winds. It began to move northward on the 18th and passed over the extreme western end of Cuba on the 19th, Los Arroyos reporting a pressure of 27.52 inches and the S. S. *Toledo* near Jutias Cay (northwest coast) 27.22 inches. The storm struck the Florida coast in the unsettled region south of Punta Rasa and quickly diminished in intensity, passing off into the Atlantic just north of Miami. The southward movement of a great HIGH caused the path of the storm to be deflected quite sharply to the eastward and apparently aided in its disintegration. Almost complete destruction was wrought over extreme western Cuba in the path of minimum barometer.

On the 8th of November a definite cyclonic circulation was noted over Jamaica, which moved slowly north across eastern Cuba on the 9th accompanied by gales. It then turned toward the northeast and was encountered by the U. S. S. *Concord* in the southeastern Bahamas as a storm of considerable intensity. It continued in a northeasterly direction, passing just southeast of Bermuda on the 13th and was last noted south of the Grand Banks on the 15th. (See Chart XV at end of this REVIEW.)

STORMS AND WEATHER WARNINGS

WASHINGTON FORECAST DISTRICT

Few disturbances crossed the country during June and those that did were of slight or moderate intensity. Consequently no storm or small-craft warnings were issued for the Atlantic and east Gulf coasts.

Advisory warnings were issued, however, during the 20th-22d in connection with a tropical disturbance of slight intensity that moved inland over Mexico in the vicinity of Tampico. Pressure fell gradually over the northwestern Caribbean Sea during the 15th-17th, the decrease in that time amounting to 0.14 inch at Tela, Spanish Honduras, and Belize, British Honduras, and 0.04 inch at Swan Island. A further slight decrease took place at these stations on the 18th. By the 19th this decrease in pressure had reached the southwestern portion of the Gulf of Mexico and on the morning of the 20th Tampico, Mexico, reported a barometer reading of 29.68 inches and Brownsville, Tex., 29.74 inches. Rain set in along the Texas coast during the night of the 19th-20th, and excessive rainfall occurred at Brownsville and Corpus Christi on the 21st. The disturbance was moving slowly west-northwestward across the Bay of Campeche during this period and it moved inland during the 21st-22d. Heavy rains occurred at several Mexican stations. No strong winds were reported in connection with the disturbance.

No frost warnings were issued, except for the interior of northern New England on the 9th, and for the cranberry bogs of New Jersey on the 4th, 5th, 7th, and 9th.—*Charles L. Mitchell.*

NEW ORLEANS FORECAST DISTRICT

On the 20th-21st, during the moderate disturbance in the Gulf east of Tampico, Mexico, described under Washington Forecast District, winds on the Texas coast blew rather persistently from the southeast and were stronger than at other times during the month, partaking somewhat of the character of moderate thundersqualls. Small-craft warnings were displayed on the 21st in the Corpus Christi district by the Weather Bureau official at that place and were justified.—*R. A. Dyke.*

STORMS AND WEATHER WARNINGS

WASHINGTON FORECAST DISTRICT

During the latter half of the month two tropical disturbances reached the Lesser Antilles from the region to the eastward. The first of these was centered between Dominica and St. Lucia the morning of the 17th and the second a short distance northeast of Dominica the evening of the 27th. The tracks of these two disturbances were almost parallel for about 800 miles, both moving almost directly northwestward from the Lesser Antilles, the first at the rate of approximately 270 miles and the other 200 miles a day. The former continued to move in a northwesterly direction until it reached latitude 28° N. and longitude 75° W. It then moved slowly in a westerly direction for 48 hours, after which it turned abruptly and moved north-northeastward with rapidly increasing speed and its course gradually changed toward the northeast. (See Chart II.) Ten and one-half days after this tropical disturbance had appeared over the Lesser Antilles, its center was between Belle Isle and

Fogo, Newfoundland, while eight and one-half days after the second disturbance was first noted its center was in the same location. However, after reaching latitude 25° N. the course of the latter was almost due north for 36 hours, then north-northeast to western Newfoundland, the paths of the two storms gradually converging.

The first tropical disturbance was of only slight intensity in the region of the Lesser Antilles and of moderate intensity when its center passed between Porto Rico and the Virgin Islands during the evening of the 18th. It increased gradually, however, both in intensity and size after passing to the north of Porto Rico and within three days, when its center was in about latitude $27^{\circ} 30'$ N. and longitude $74^{\circ} 30'$ W., the winds near the center had increased to hurricane force. At this time the storm was beginning to recurve to the northward into a shallow trough of low pressure that was moving eastward from the middle and north Atlantic coast, but its path to the northward was blocked by an anticyclone that moved eastward from the Upper Lake region to the North Atlantic States during the 20th-22d. The influence of

this anticyclone extended southward to the vicinity of the hurricane and changed the direction of movement of the air in the intermediate and higher levels toward the west. However, the air movement was slight in the levels that control the direction of movement of tropical cyclones, and the westward progress was quite slow. This condition continued for about two days, although pressure gradually decreased over the Middle Atlantic and North Atlantic States. By the evening of the 24th a trough of low pressure, moving eastward, extended from western Quebec southwestward to the east Gulf States, and as is always the case with such troughs, the wind aloft changed to southerly some distance to the eastward with the result that the tropical storm began to move northward, and a little later to the north-northeastward. Hurricane winds and mountainous seas were reported from vessels within the storm area, especially during the 23d-25th, with barometer readings below 29 inches, the lowest reported being 28.67 inches.

The rate of movement of this storm was very rapid after the morning of the 25th, at which time its center was in latitude 26° N. and longitude 76° W. The center passed a short distance east of Cape Hatteras about 9 p. m. of the 25th and immediately east of Nantucket, Mass., about 1 p. m. the following day. The highest wind velocity reported from a land station was 72 miles an hour from the northwest at Cape Hatteras. A number of vessels were somewhat damaged by the hurricane winds and mountainous waves off the south Atlantic and middle Atlantic coasts and along the trans-Atlantic steamer lanes, especially between longitudes 65° and 70° W. The S. S. *Arabic* was hard hit by the hurricane and several passengers were injured. No reports have been received of material damage along the Atlantic coast.

Advisory warnings of the location, intensity, and progress of this, one of the greatest hurricanes in both intensity and extent ever experienced off the Atlantic coast, were issued twice daily from the time the disturbance was first noted. Timely warnings were broadcast by radio of the probable increase in intensity of this storm after it passed Porto Rico and vessels bound for the regions traversed by the hurricane were advised to exercise caution. The first storm warnings in connection with this storm were displayed on the 22d from Cape Hatteras to Jupiter Inlet, and when it became evident that the storm was moving westward the warnings were extended southward to Miami. On the morning of the 25th, shortly after the hurricane had recurved to the northward, storm warnings were extended north of Cape Hatteras to the Virginia Capes, and at 6 p. m. to Atlantic City. Hurricane warnings were ordered displayed at 4 p. m. from Beaufort, N. C., to Cape Henry. Northeast storm warnings were displayed as far north as Boston at 9:30 p. m. of the 25th and were extended to Eastport, Me., on the following morning.

The second tropical disturbance evidently developed much farther east than the first, inasmuch as it was already a storm of considerable intensity when it appeared near Dominica on the 27th. By the time it reached the Virgin Islands it had attained hurricane intensity. The barometer fell to 29 inches at St. Thomas at 3 a. m. of the 29th and great damage was done by the storm in these islands. A number of lives were lost, hundreds of houses were destroyed and thousands damaged, and much damage was done to crops. So great were the losses in the Virgin Islands that appeal was made to the American Red Cross for substantial aid.

After this storm passed over the Virgin Islands few vessel reports were received from its vicinity and as its

center passed about 150 miles east of Turks Island and the same distance west of Bermuda the barometer did not fall below 29.78 inches at either place; but Bermuda reported a wind velocity of 36 miles an hour from the southwest the morning of September 3. The S. S. *Ponce* reported a barometer reading of 29.16 inches and a southwest wind of force 9 (Beaufort scale) on the 2d in latitude 28° N. and longitude $68^{\circ} 40'$ W. This storm was of much smaller diameter and less intensity than the previous hurricane and since the number of vessels in the part of the ocean over which it passed is usually quite small, it is not surprising that few reports were received by radio from vessels near the hurricane center. Advisory warnings regarding the approximate location, direction of movement, and intensity of this storm were issued twice daily, and vessels bound for the regions affected were advised to exercise caution.

No storm warnings were issued during the month, except those previously referred to in connection with the first tropical storm.—*C. L. Mitchell.*

STORMS AND WEATHER WARNINGS

WASHINGTON FORECAST DISTRICT

The month was characterized by considerable activity in the Tropics, in that three disturbances occurred. The first, which appeared on August 28 in the vicinity of Dominica and continued into September, was of major importance. The other two, which developed over the southeastern Gulf of Mexico on the 13th and 28th, were of lesser intensity.

A tropical disturbance at the beginning of the month was central about latitude 25° N. and longitude 70° W. The history and subsequent movement of this disturbance is discussed in the MONTHLY WEATHER REVIEW for August.

Later information which has just come to hand indicates that the center of this storm passed between Antigua and Montserrat (Lesser Antilles) at 3:30 a. m. of the 28th. At 2 a. m. of the 29th the center with a reading of 28.56 inches passed over the eastern end of the island of St. John. The western end of the island of Tortola experienced hurricane winds from 6 p. m. of the 28th to 6 a. m. of the 29th. The storm was accompanied by torrential rains and by winds estimated about 100 to 110 miles an hour. The rains of the 28th and 29th at St. Kitts, 17 inches, and Nevis, 20 inches, are reported to be the heaviest recorded in 40 years. More than 100 lives were reported lost and more than 1,000 houses destroyed, while serious damage resulted to crops along the path of the storm from Montserrat to St. Thomas. The observer at St. Thomas estimated the wind at 110 miles per hour from the north-northeast between midnight and 2 a. m. of the 29th. Estimates of 100 to 110 miles per hour were also made at Montserrat and Antigua between 3 a. m. and 4 a. m. of the 28th.

In connection with a disturbance over eastern Quebec on the 5th, northwest storm warnings were ordered for the Atlantic coast from Sandy Hook to Eastport. Winds of moderate gale force occurred south of Nantucket, but to the northward winds were only fresh to strong.

On the 9th a disturbance of moderate intensity was central over the upper St. Lawrence Valley, and southwest storm warnings were displayed on the Atlantic coast from Delaware Breakwater to Eastport. A secondary storm developed off the southern Massachusetts coast on the morning of the 10th and warnings were changed to southeast from Nantucket to Eastport. Strong winds and gales occurred generally over the region indicated.

On the morning of the 13th there were indications of the development of a tropical disturbance over the southeastern Gulf of Mexico. This disturbance moved northwestward during the following 12 hours. It thence recurved rather sharply and moved slowly east-northeastward during the next two days, striking the north-west Florida coast near and east of Port St. Joe about 11 a. m. of the 15th. The highest winds at Port St. Joe have been estimated at 75 to 80 miles per hour from the northwest. At St. Andrews the winds at their highest were estimated at from 60 to 75 miles per hour and at Carrabelle from 40 to 50 miles with lowest barometer reading at the latter 29.10 inches at about 2:30 p. m. of the 15th. The lowest pressure reading at Apalachicola was 29.12 inches at 12:40 p. m. of the 15th, and the highest wind velocity was 68 miles per hour from the southeast.

In commenting on this disturbance the official in charge at Pensacola, Fla., writes as follows:

No report of damage at sea has been received with the exception of the three-masted schooner which was blown ashore near Carra-

belle, and the blowing ashore of two fishing boats near Port St. Joe. The harbor damages were relatively small considering the force and duration of the storm, which is probably explained by the timely warnings which were evidently heeded, as is indicated by the St. Andrews storm warning display man, who states that all boats in the bay were placed in safe harbors upon receipt of the warnings.

From the time of the inception of this storm full information was disseminated by every available means to coast interests and to vessels at sea. While the storm did not attain hurricane intensity, winds of gale force occurred along its immediate path, and some damage to property between Carrabelle and St. Andrews is reported. The disturbance passed east-northeast across northern Florida and was central on the evening of the 16th on the South Carolina coast. It then continued its north-eastward course and by the evening of the 18th was over the steamship routes south of Newfoundland. Strong winds and gales were general along the Atlantic seaboard, warnings of which were issued well in advance.

Pressure was low over the northwestern Caribbean from the 23d to the 27th, but vessel reports indicated no cyclonic circulation. On the 28th information was broadcast by radio announcing the presence of an incipient disturbance over the southeastern Gulf. Radio reports on the morning of the 29th showed a disturbance of slight but apparently increasing intensity moving northward, and storm warnings were hoisted on the east Gulf coast. Information was disseminated that the disturbance would move northeastward and cause dangerous gales along its path. The disturbance advanced rapidly north and northeastward and crossed the north-west Florida coast near Cedar Keys during the late afternoon of the 29th. During the afternoon of the 29th storm warnings were ordered for the south Atlantic coast from Jacksonville to Fort Monroe, Va., in anticipation of the northward movement of the tropical disturbance. By the following morning the storm was over the North Carolina coast with increased intensity. Storm warnings, which were displayed on the middle Atlantic coast in connection with a development over Virginia, were continued. Storm warnings were also ordered for the north Atlantic coast. The disturbance moved rapidly northward and easterly gales were experienced along the entire Atlantic seaboard.

Frost warnings were issued on the 10th for New York, Pennsylvania, New Jersey, West Virginia, and the eastern portions of Kentucky, Tennessee, and Ohio; and frosts occurred over portions of the States mentioned, but in other portions frost was prevented by cloudiness.

On the 23d, 24th, and 25th frost warnings were disseminated for portions of New England and the northern portion of the Middle Atlantic States, and frosts occurred substantially as indicated in the warnings. On the 30th frost warnings were issued for Tennessee and Kentucky and were verified. In addition, frosts occurred in the extreme north portion of the east Gulf States and in the southern Appalachian region.

During the early days of the month the special advices and bulletins furnished to the world fliers twice daily and at other times when required, materially assisted in the successful carrying out of their flying program.—
R. H. Weightman.

in the town sustained heavy damage, besides the severe damage done to the tobacco crop. A maximum wind velocity of 72 miles an hour from the south was registered at Habana at 10 p. m. of the 19th, although the barometer fell little, if any, below 29.50 inches. The lowest pressures observed at a number of stations in western Cuba and also very complete barometric data from the S. S. *Toledo*, all kindly furnished by Dr. Millas, are given below:

CUBAN STATIONS, OCTOBER 19, 1924

	Inches
Guane.....	28.97
Dimas.....	28.54
La Fe.....	28.35
Pinar del Rio.....	29.28
Mantua.....	28.15
Los Arroyos.....	27.52

S. S. "TOLEDO" NEAR JUTIAS CAY (OFF THE NORTHWESTERN COAST)

Time, Oct. 19	Wind direction	Wind force	Pressure
			<i>Inches</i>
Noon.....	E. by N.....	11	29.18
1:00 p. m.....	E. by N.....	12	28.78
2:00 p. m.....	East.....		-----
	ESE.....	12	28.06
2:10 p. m.....	ESE.....	12	27.87
2:15 p. m.....	ESE.....	12	27.72
2:25 p. m.....	ESE.....	12	27.59
2:33 p. m.....	ESE.....	12	27.48
2:40 p. m.....	SE.....	12	27.44
2:50 p. m.....	SE.....	12	27.36
3:00 p. m.....	SE.....	12	27.28
3:15 p. m.....	SE.....	12	27.26
3:30 p. m.....	SSW.....	6	27.22
	WSW.....	8	-----
3:55 p. m.....	SSW.....	12	27.26
4:10 p. m.....	WSW.....	12	27.28
4:20 p. m.....	West.....	12	27.40
4:30 p. m.....	WNW.....	12	27.52
4:50 p. m.....	WNW.....	12	27.87
5:00 p. m.....	WNW.....	12	28.11
5:20 p. m.....	WNW.....	12	28.39
5:30 p. m.....	WNW.....	12	28.54
6:00 p. m.....	WNW.....	12	28.80
7:00 p. m.....	WNW.....	12	29.11
7:30 p. m.....	WNW.....	11	29.19
8:00 p. m.....	WNW.....	11	29.25
9:00 p. m.....	WNW.....	11	29.33

The following extracts are from a report of an interview that the meteorologist of the Panama Canal Zone had with Captain Burmeister, master of the United Fruit Steam Ship *Heredia*:

* * * At about 7 p. m. (October 18) all three ships (the *San Bruno*, *Turrialba*, and *Heredia*) left Havana Harbor and preceded toward Cape San Antonio. At first there was practically no wind, but as they steamed west the wind went around to east and northeast and gradually freshened up. There was a fairly heavy following sea. The wind gradually became heavier and the sea higher. At about 3 a. m. (October 19) the master of the *San Bruno* * * * decided that the center (of the storm) was to the westward and he radioed the other ships that he was going to turn around and steam toward the northeast. After debating at some length, Captain Burmeister also decided to turn around. At this time the ships position was about 23° 50' N. and 84° 10' W. The ship was headed north-northeast for a while and then north. The pressure dropped steadily. At 4 a. m. the barometer read 29.56 inches and the wind northeast force 4. At 6 a. m. the sea was so high that the captain decided to heave to. A message to that effect was sent to the two other ships. At 8 a. m. the pressure was 29.44 and the wind had risen to northeast 8. The ship was empty and it bobbed around like a cork. At 11 a. m. the pressure was 29.15 and the wind northeast 11. * * * At noon the barometer read 28.10 inches. This was a drop of 1.05 inches in one hour. At that hour the wind was blowing from the northeast force 12. The following is a vivid description of the storm at its height by Captain Burmeister:

"The whole sea was a boiling, seething mass. It was impossible to see any distance. It appeared as if the surface were covered with a mass of turbulent steam. The sea was breaking in such manner that it was impossible to tell whether the water in the air was rain or sea water. I estimated the wind to be blowing 120 m. p. h. I ordered every pound of steam to be used in keeping her under control."

NOTES ON THE WEST INDIAN HURRICANE OF OCTOBER 14-23, 1924

By CHARLES L. MITCHELL

[United States Weather Bureau, Washington, D. C.]

Recent reports indicate that the hurricane of October 14-23, 1924, was one of great intensity. Dr. José C. Millas, director, Observatorio Nacional, Habana, Cuba, writes: "I believe that this hurricane is one of the most severe ever experienced in our latitudes." Doctor Millas has forwarded a number of photographs clipped from *El Mundo*, Habana, taken in Los Arroyos and Arroyos de Mantua, Pinar del Rio Province, which suggest that the force of the wind was almost comparable to that in a tornado. The steel wireless tower at La Fe was blown down.

It is, indeed, fortunate that this hurricane passed over no land areas other than the extreme western end of Cuba and a very sparsely settled region in southern Florida. Full details of damage done by it have not been received from western Cuba. Press reports indicate that in Arroyos de Mantua about a dozen persons were killed and 50 injured and that almost every building

There was water in the staterooms and even in the captain's room on the bridge. The following note was written in the log at about this time:

"Hurricane winds with high seas. Ship laboring heavily. Taking heavy seas over forward and after decks."

The pressure dropped to its lowest point at 1 p. m., 28.05 inches (a test of this barometer at 28 inches showed that it was reading too high by 0.20 inch, making the corrected reading 27.85 inches). From 11 a. m. to 2 p. m. the wind blew with hurricane force, and waves were mountainous. After 1 p. m. the pressure rose quickly and by 4 p. m. it was 29.20. At 5 p. m. there was noted a backing of the wind, although the velocity was still high, north-northeast 10. As the wind continued to back the velocity decreased. By midnight the pressure had risen to 29.55 and the wind blew from the northwest with a force of 6.

The following is quoted from the report of the official in charge of the Weather Bureau office at Key West:

The storm's center at its nearest approach to Key West was 90 miles distant. This was about noon of the 20th, when the center bore northwest.

Notwithstanding the strong and consistently increasing winds which began during the night of the 19th and which culminated at 2 p. m. of the 20th with a maximum velocity of 66 miles an hour from the southwest, this storm caused no damage in Key West aside from some little damage to trees and shrubbery. There was no damage to shipping whatsoever. This was unusual in the face of a wind that for 17 hours maintained a velocity averaging 51 miles an hour, with gusts ranging from 54 to 74 miles an hour, and can be ascribed only to timely and persistent warnings issued by the Weather Bureau. Taking advantage of these warnings, all vessels, large and small, were made secure, windows and doors battened, and in a number of cases trees trimmed in order to lessen the wind effect and possibly save them.

As a result of warnings broadcast by radio, several vessels sought refuge in port. All P. & O. steamers were held on advice from this office. The following vessels were held in port pending the passage of the storm: Steamers *W. F. Burdell*, *J. R. Gordon*, *Roanoke*, *Estrada Palma*, *Henry M. Flagler*, *Joseph R. Parrott*, *Miami*, *William Islam*, and *Governor Cobb*, and the schooner *Mary Thompson*.

The bureau's work on this hurricane has called forth much praise from outside sources.

[The table herewith contains no data.]

STORMS AND WEATHER WARNINGS

WASHINGTON FORECAST DISTRICT

On the morning of the 2d a disturbance of moderate intensity was over the St. Lawrence Valley and fresh to strong west and northwest winds were forecast for the New England coast and strong winds attaining moderate gale force at times occurred during the ensuing 24 hours.

On the evening of the 7th, with a disturbance over the upper St. Lawrence Valley, southwest storm warnings were ordered for the New England coast and strong winds and moderate gales occurred substantially as indicated.

On the evening of the 8th a tropical disturbance of slight intensity was near Santiago, Cuba. After moving slowly northward to about latitude 22° and longitude 76° by the evening of the 9th, its progress was checked by a high-pressure area that covered the Atlantic States. During the next 36 hours it advanced eastward to a position just west of Turks Island. Thus far its progress had been slow, but beginning with the morning of the 11th its rate of movement increased as it passed north-northeastward to a position about 200 miles southeast of Bermuda by the evening of the 13th. Its subsequent course was apparently northeastward. The disturbance was of small diameter and considerable intensity near the center. On the evening of the 10th the U. S. S. *Concord* in latitude $21^{\circ} 35' N.$, and longitude $74^{\circ} 15' W.$ passed near the storm center, reporting a pressure reading of 29.40 inches and a wind velocity of 82 miles per hour.

Beginning with the evening of the 8th advices concerning the location, probable intensity and direction of movement of this disturbance were issued twice daily.

In connection with a disturbance of increasing intensity which was over Nova Scotia on the evening of the 16th, storm warnings were ordered from Nantucket to Eastport and warnings of strong northwest winds off the coast were disseminated by radio. This offshore blow continued into the night of the 17th.

In the trough of the disturbance that was over Lake Michigan on the morning of the 21st, a secondary depression developed over the east Gulf States. During the next 24 hours it had advanced to the North Carolina coast with greatly increased intensity and by the morning

of the 24th it was over the lower St. Lawrence, having caused gales along the entire Atlantic seaboard, warnings of which were ordered well in advance.

On the morning of the 27th storm warnings were ordered for the Atlantic coast from Delaware Breakwater to Nantucket, but due to the decrease in intensity of the low-pressure area, which had moved from Ontario to western Quebec during the day, storm warnings were ordered down at 9.30 p. m.

On the morning of the 29th small-craft warnings were ordered from Norfolk to Nantucket in connection with a disturbance that was over New Jersey and moving northward. On the evening of that date, when the disturbance was over Massachusetts with increased intensity, north-west storm warnings were ordered from Block Island to Eastport. Strong winds occurred from Hatteras northward.

On the 16th warnings for light to heavy frosts were disseminated for portions of the South Atlantic and east Gulf States and were justified. On the 19th frosts occurred quite generally in the interior of the South Atlantic and east Gulf States and in Tennessee. Warnings were issued on that date for heavy to killing frosts on the following morning in the interior of North and South Carolina and for north and central Georgia, and these frosts occurred as indicated. Frost warnings were again distributed on the 24th and 25th for portions of the Atlantic and east Gulf States. On the 29th warnings of light to heavy frost were issued for extreme northern Florida and occurred as forecast.—*R. H. Weightman.*