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Continent is in the form of a narrow isthmus, and the downward slope from the effect attains its maximum

TROPICAL DISTURBANCE OF JUNE 12-16, 1939

By JEAN H. GALLENNE

[Marine Division, Weather Bureau, August 1939]

The first tropical disturbance of 1939 attained only moderate intensity, but moved in a rather unusual course from the Gulf of Honduras northward and north-northwestward to the east Gulf coast.

The earliest report of disturbed conditions in connection with this depression was received on the morning of

June 12, through the Mexican weather service at Chetumal, placing the center near latitude $18^{\circ}45'$ N. and longitude 87° W. During the afternoon of the same day, although no reports of strong winds were received, vessels in the area just east of the Yucatan Peninsula reported squally weather conditions, with moderate to rough seas.

The Amer. S. S. *Carrillo* at 7 a. m. (E. S. T.) of June 12, near latitude 18.7° N. and longitude 86.6° W. reported a barometer reading of 29.77 inches; east-southeast winds, force 5; slight drizzle, with rough sea. At 7 a. m. (E. S. T.) of the following day, the *Carrillo*, then in the easterly quadrant of the disturbance, encountered east and south-east winds of force 7-8 accompanied by very rough seas.

The center of the depression, by evening of June 12, was near Cozumal Island, where there had been a fall in pressure from 29.88 inches at the morning observation, to 29.61 inches at 7 p. m. (E. S. T.).

During the period from the morning of June 12 until the evening of June 14 the disturbance moved slowly northward.

The Pan American Airways Observer at San Julian, located on the extreme western tip of Cuba, reported south wind, force 7, with a rainfall of 10 inches, during the night of June 12-13. On the morning of the 13th, the S. S. *Alabama*, near latitude 25.3° N. and longitude 85.8° W., recorded a falling barometer; fresh gales from the east-southeast and southeast, with overcast skies and rain. By noon the wind had increased from force 8 to force 9; this was the highest wind reported in connection with this disturbance. The lowest barometer reading during the progress of the disturbance (29.54 inches) was observed on the evening of June 14, on the American Steamship *Kofresi*, near latitude 29.5° N. and longitude 87.6° W. This vessel reported that during that period she met with heavy rain squalls, moderate gales, and rough seas.

During the 24 hours following the evening of the 14th, the center of the disturbance described a small left-hand loop, then resumed a north-northwestward movement on the night of June 15, which carried the depression inland, over Mobile, Ala., on the morning of the 16th.

The explanation of this loop by R. A. Dyke, Forecaster in charge of our New Orleans Office, is as follows:

The westward turn at the beginning of the loop early on the night of the 14th-15th was attended by a tendency toward equalization of pressure along the coast north of the disturbance. The pressure at Pensacola rose from 29.66 at 7:30 p. m. (E. S. T.) of the 14th to 29.68 at 9 p. m., while the pressure at Mobile fell from 29.74 to 29.70 inches. However, instead of movement to the coast, as

expected, the disturbance continued to move in a small curve which brought it slightly farther south on the morning of the 15th. Until the movement of the disturbance was halted off Pensacola, the straight northward progress was evidently under the influence of upper winds in line with those over Florida, where the western portion of an upper anticyclonic circulation gave upper winds from the south. The northward drift prevailed as far west as New Orleans up to 14,000 feet on the 12th.

With northward advance the winds aloft from Florida westward to New Orleans came under the influence of the disturbance. At the same time the winds aloft from 8,000 to 14,000 feet were moving anticyclonically over Texas and the Lower Mississippi Valley. The center of this upper anticyclonic circulation moved east-north-eastward from Texas and Oklahoma to eastern Kentucky, or thereabouts, from the 14th to the 16th, and the upper winds over the Lower Mississippi Valley became easterly instead of northeasterly, except over New Orleans, where winds in the afternoon of the 15th were northeast up to 27,000 feet, with the upper winds showing velocities of 30 to 42 miles per hour. In the early morning of the 16th, the upper winds at elevations of 8,000 to 12,000 feet from Montgomery, Ala., to Memphis, Tenn., and Little Rock, Ark., had veered to southeasterly, while winds over New Orleans, under the influence of the disturbance, had backed to northerly. During the shift of the center of the upper anticyclonic circulation from the Southern Plains to a more eastern position the northward movement of the disturbance was halted by blocking winds; but when the upper circulation became central farther east the upper winds favored the resumption of northward movement. Indeed, the blocking winds apparently forced the disturbance farther southward so as to form the small loop described.

At Mobile, Ala., at 9:37 a. m. (E. S. T.) of June 16, as the center moved inland, an abrupt wind-shift from north to south was observed. The wind was of only moderate force. At 7:30 p. m. (E. S. T.) of the 16th, its center lay to the southwest of Meridian, Miss.; the disturbance thereafter advanced to the northward, and merged with an extra-tropical low pressure area.

There was no loss of life reported in connection with this disturbance, except that a boy fell into the swollen waters of the Peace River near Wauchula, Fla., and was drowned.

The first advisory in connection with this disturbance was issued from the Weather Bureau Office at Jacksonville, Fla., at 9:30 p. m. (E. S. T.) of June 12, and as the depression passed through the Gulf of Mexico, frequent timely warnings and advisories were issued from New Orleans, La.

Chart XIII, shows the situation on the morning of June 13, and the track of the disturbance.

TROPICAL DISTURBANCE OF AUGUST 1939

By I. R. TANNEHILL

[Marine Division, Weather Bureau, Washington, D. C., September 1939]

There was one well-defined tropical disturbance in August 1939. It originated in Atlantic waters northeast of Puerto Rico on the 8th, moved west-northwestward across Florida and the extreme northeastern Gulf, then progressed very slowly through Alabama, where it was nearly stationary for 3 days, and thereafter moved more rapidly northeastward to southeastern New York where it dissipated on the 20th. On the 30th and 31st, there were indications of a slight disturbance over the extreme eastern Caribbean Sea but no further evidences of it were reported after the end of the month.

August 8-20.—The first definite evidence of this disturbance was on August 8. During the day several ships in the general vicinity of 22° N., 66° W. reported easterly winds of force 6 and rough seas. The disturbance moved west-northwestward during the next 3 days, crossing the Bahamas late on the 10th and early on the 11th. The center reached the east coast of Florida in the late afternoon of the 11th. Its progressive movement had increased gradually from about 10 miles an hour on the 8th to approximately 15 miles an hour on the 10th and 11th. Ship reports do not indicate that it was of more than moderate intensity in the Atlantic. The highest wind noted on shipboard was force 10. The American steamship *Pan Amoco* reported by radio at 7 p. m., August 11, when located at 27.6° N., 79.6° W., wind E., force 10, barometer 1,005 millibars (29.68 inches).

On the east coast the lowest pressure and highest wind were recorded at Fort Pierce, 991.2 millibars (29.27 inches) and 54 miles per hour.

In crossing Florida the rate of progression increased to about 18 miles per hour, while the intensity of the disturbance did not change materially. The center passed very close to Lakeland and Tarpon Springs and moved to the extreme northeastern Gulf on the 12th. At the Tampa Airport the highest wind was 62, south-southwest at 4:30 a. m. on the 12th, the lowest pressure 998.6 millibars (29.49 inches).

Late in the afternoon of the 12th the disturbance entered western Florida near Apalachicola, the center passing over Port St. Joe, at 6 p. m., eastern standard time. At Apalachicola, lowest pressure was 990.9 millibars (29.26 inches) at 6 p. m., the highest wind 52, northeast at 4:18 p. m. A lull followed, with velocities averaging 26 miles per hour, after which the wind increased to 46 south at 6:45 p. m. The storm center also passed over Panama City and St. Andrews, the lowest reported pressure at the latter place being 988.5 millibars (29.19 inches) at 9:10 p. m.

The following comments on damage by the storm are taken from the report of Forecaster Norton at Jacksonville:

In peninsular Florida the damage by this storm was minor in character, as would be expected for a storm of only moderate

intensity. It appears that damage was confined to uprooted trees, broken power and communication lines, plate-glass windows, a few flimsy structures, roofs, signs, cornices, etc., with damage to crops negligible, although some citrus fruit was damaged and seedbeds flooded and damaged. A few small boats were beached and damaged, but small craft generally had been moved to safe anchorage well in advance of the storm. A man was drowned at Cedar Key when the rowboat in which he was attending the anchorage of fishing boats capsized in the rough sea. This was the only death attributed to the storm. In the northwestern counties from about Tallahassee to Pensacola, considerable damage to crops by flooding and wind resulted. * * *

After about 4 days in Alabama, where disastrous flooding rains fell, the remnants of the disturbance moved over the northern portion of the Jacksonville district, attended by heavy rains and some flooding along the southern and eastern slopes of the Appalachian Mountains. A tornado on the periphery of the disturbance is reported to have killed one person in North Carolina, but otherwise no very strong winds attended the disturbance in its northeastern movement in this district.

In reporting on conditions in the vicinity of Apalachicola, Forecaster Dyke at New Orleans says:

Winds of gale force occurred as far inland as De Funiak Springs, in Walton County and about 26 miles from the coast. As the stronger winds were offshore, no high tides occurred west of Apalachicola. Tides were above normal from Apalachicola northeast-

ward to St. Marks but not high enough to cause appreciable damage.

The principal damage was to electric power, telephone, and telegraph lines. There was some damage to roofs. Most of the boats were safely placed, but a few unguarded small boats were sunk at Apalachicola. Damage of \$2,000 to a dock warehouse at Port St. Joe is reported.

In Virginia, Maryland, Delaware, New Jersey, southeastern Pennsylvania, and extreme southeastern New York, heavy rains attended the remnants of the storm while it was moving northeastward during the period from the 18th to the 20th. At several places the records of rainfall in 24 hours were broken. Tuckerton, N. J., had 14.81 inches.

Timely reports, especially those received from stations in the Bahamas and from merchant ships, enabled the forecasters to chart the storm center with exceptional accuracy. Advices and warnings were issued frequently and well in advance of the storm.

Chart XIII shows the track of the disturbance and the situation on the morning of August 12 when the center was moving across the extreme northeastern Gulf of Mexico.

TROPICAL DISTURBANCE OF SEPTEMBER 24-26, 1939, IN THE GULF OF MEXICO

By WILLIS E. HURD

[Weather Bureau, Washington, October 1939]

Only one tropical disturbance was reported during September. There was unsettled weather over the extreme northwestern part of the Caribbean Sea early on September 23. It is probable that this disturbed condition moved northwestward across the British Honduras and Yucatan during the 23d and early 24th under influence of a tropical disturbance that apparently developed about 100 miles east of Vera Cruz, Mexico, between September 20 and 22.

A report received by mail from the American steamer *Aztec* states that westerly winds of force 8 during squally weather were experienced from late on the 22d to early on the 24th in the southwestern part of the Gulf of Campeche and that there were heavy northwesterly swells.

At 7 p. m. (E. S. T.) of the 24th there was a fairly definite circulation, with slightly depressed barometer, near latitude 22° N., longitude 92° W., with winds of force 3-5 reported by ships within the area 20° - 25° N., 90° - 95° W.

During the 25th the central barometer had deepened somewhat and squally winds about the center showed local increases in force. At 7 a. m. of the 25th, in $26^{\circ}05'$ N., $91^{\circ}45'$ W., the Panamanian motorship *Cubahama* experienced a north-northeast gale of force 9, which is the highest wind velocity reported by a ship in connection

with the depression. Her barometer, in a report later received by radio, was given as 1,005.8 millibars (29.70 inches). This reading, following the result of a later comparison at Mobile, was corrected to 1,003.7 millibars (29.64 inches), which is the lowest pressure reported for the disturbance.

On September 26, at 7 a. m. (E. S. T.), as the center was entering the coast, the American steamer *Roanoke*, at some distance to the southward, had a south-southwest wind of force 7, barometer 1,010.2 millibars (29.83 inches), in $27^{\circ}56'$ N., $89^{\circ}00'$ W. Quoting from the report of W. R. Stevens, forecaster on duty at the New Orleans office of the Weather Bureau:

The disturbance moved inland south of New Orleans a short distance west of Grand Isle the morning of September 26, with only fresh winds near the center. A passing squall caused a southwest wind of 49 miles per hour at Pensacola, Fla., the morning of September 26 after the disturbance had moved inland.

No report of damage or loss of life has been received.

Advisory warnings of the disturbance were issued by the Weather Bureau at New Orleans at frequent intervals from 9:30 a. m. (E. S. T.) of the 25th until 9:45 a. m. (E. S. T.) of the 26th. Chart XIII shows the path of the disturbance from the 24th to 26th, and the general situation on the morning of the 25th.

TROPICAL DISTURBANCES OF OCTOBER 1939

By WILLIS E. HURD

[Weather Bureau, Washington, November 1939]

Hurricane of October 12-18, 1939.—The fourth tropical disturbance of 1939, that of October 12-18, unlike its predecessors of June, August, and September, which were of light to moderate character, was a hurricane of fully developed intensity. It originated to the eastward of the Antilles, and its preliminary signs were evidenced by unsettled weather and somewhat depressed barometer, with light winds, over the Leeward Islands during the afternoon of the 9th. From the 9th to the 12th there was but little change in the situation, except for a slight fall in barometer over the Leewards. By the morning of the 13th, cyclonic circulation appeared to be developing northeast of Puerto Rico, with winds of force 5-6 reported by ships south and west of the center which, at 7 a. m. (E. S. T.) was in approximately 21° N., 66° W. The lowest known barometer at the time was 1,005 millibars (29.68 inches), wind west, force 5, reported by a ship near 19° N., 65° W. Thereafter development of the disturbance was much more rapid, and it moved, first in a north-northwesterly direction, then north-northeast past Bermuda on the 16th, until its identity was lost on the 18th east of northern Newfoundland.

By 7 a. m. (E. S. T.) of the 14th, although there were no ships' observations to the near eastward of the center, winds in other quadrants of the disturbance denoted the establishment of a cyclonic circulation. The American steamer *Argentina*, near 25° N., 68° W., at that time, gave a barometer of 1,001 millibars (29.56 inches), wind east-northeast, force 6. At local noon of the 14th the Panaman motorship *Permian*, in 22°43' N., 69°33' W., reported the earliest known gale, a northwest wind of force 7, barometer 1,001.7 millibars (29.58 inches), observed in connection with the cyclone. Squally weather continued over a wide area throughout the day, with highest winds reported as of force 7, lowest barometers about 999 millibars (29.50 inches).

During the night of the 14th-15th, or very early on the 15th, rapid intensification set in. A report received by mail from the American steamship *F. W. Abrams* shows that at 1:50 a. m., local time of the 15th, the barometer on ship had fallen to 988.5 millibars (29.19 inches) in 26°54' N., 66°18' W., with wind east, force 8. At 7:50 a. m., local time, in 26°36' N., 66°48' W., the wind was a hurricane from the east, with barometer down to 941.4 millibars (27.80 inches), the lowest pressure observed

during the course of the storm. The center at 7 a. m. (E. S. T.) of that date was close to 27° N., 67° W. High winds covered a wide extent of the sea during the local forenoon hours of the 15th. At 2 a. m. the southbound American steamship *Boringuen* in 28°00' N., 65°30' W., had a barometer of 969.5 millibars (28.63 inches), with northwest winds, force 10. Between about 10 a. m. and 2 p. m. the ship encountered southwesterly gales of hurricane force, with rising barometer. Considerably to the northwestward, the Dutch steamship *Telamon*, near 29° N., 69° W., had a northeasterly gale of force 10 during the midday hours, and at local noon the American steamship *Ponce* had a force-8 gale in 32°30' N., 71°45' W. During the afternoon the Dutch southbound steamship *Bacchus* experienced gales of force 10 to 12 from north to northeast, lowest barometer 993.9 millibars (29.35 inches) at 5 p. m. near 30° N., 68° W. In the same position, during the early morning hours of the 16th until about 6 a. m., the winds at the ship continued at force 11 from north-northeast. The cyclone center at that time was a short distance south of Bermuda.

From early morning on the 14th, the hurricane, which until then had been pursuing a generally north-northwesterly course, began curving into a north-northeasterly direction, under the influence of a strong anticyclone that was pressing seaward with crest over the Middle Atlantic States. It was during this recurve that the storm rapidly entered its hurricane stage.

For the 16th ship reports are lacking from near the center of the hurricane and, except for the force-11 gale experienced in the early morning by the *Bacchus*, no other vessel reported a wind higher than force 9. This was in 36°22' N., 66°55' W., lowest barometer 1,003 millibars (29.62 inches), read on the Dutch steamer *Hermes*. At greater distances north and west of the storm center, there were moderate to fresh gales.

Press reports from Bermuda show the islands to have been swept by hurricane winds for several hours during the afternoon of the 16th, with a maximum velocity of 131 miles an hour from the north at 6:40 p. m., as the center of the hurricane passed close to the eastward. Here considerable damage was done to trees, boats, houses, and public utilities.

During the greater part of the 17th the hurricane continued on a north-northeasterly course, with the center

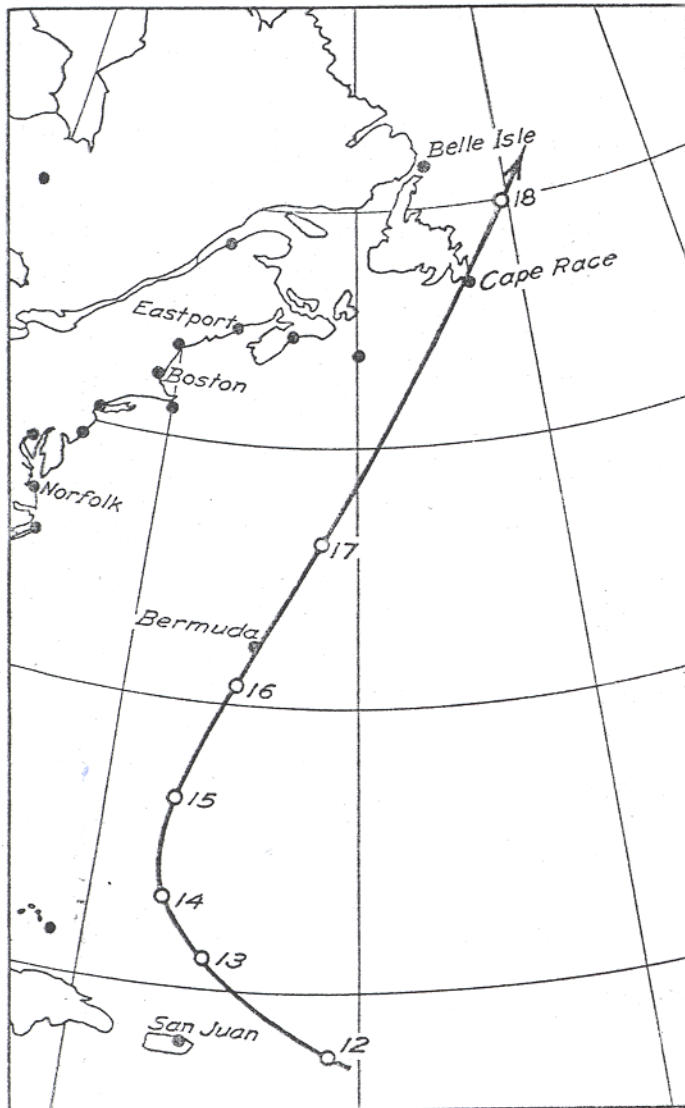


FIGURE 1.—Approximate track of the North Atlantic hurricane of October 12-18, 1939. The circles show closely the positions of the storm center at 7 a. m. (E. S. T.) on the dates given.

at 7 a. m. (E. S. T.) at approximately 36° to 37° N., 61° W. Several ships were heavily involved. The Dutch steamship *Palembang* in $35^{\circ}24'$ N., $58^{\circ}21'$ W., had lowest barometer 991.6 millibars (29.28 inches), with a south-southeast gale of force 10. About 6 hours later the wind at ship had changed to southwest, force 11. Early in the afternoon on a westerly course, she had passed to the southward of the storm center. The Dutch steamship *Ulysses*, somewhat closer to the center, had a south-southwest wind of force 11, barometer 966.8 millibars (28.55 inches), at 6 a. m., local time, in $36^{\circ}37'$ N., $60^{\circ}02'$ W. At 10 a. m., the wind had arisen to force 12 from the west, with rising pressure. A report from the Belgian steamship *Indier* noted dense fog from 9 a. m. until 3 p. m. This vessel had lowest barometer 986.8 millibars (29.14 inches), with hurricane wind from the north, at local noon of the 17th, in $41^{\circ}34'$ N., $61^{\circ}12'$ W.

To the eastward of the *Indier*, on the 17th, the American steamship *Acadia* was very close to the storm center at 4 p. m., with lowest barometer 961.7 millibars (28.40 inches), wind northwest, force 12, near 42° N., 59° W. For several hours thereafter this westbound vessel, hove to, continued in the grip of full hurricane winds.

At 7 p. m. (E. S. T.) of the 17th the hurricane center was very close to 44° N., 56° W., as indicated by the report from an unnamed ship near 42° N., $56\frac{1}{2}^{\circ}$ W., with a barometer of 954 millibars (28.17 inches), and a hurricane wind from south-southwest. Storm to hurricane winds were met by several ships within the region 40° - 45° N. 50° - 60° W.

Late on the night of the 17th the American liner *President Harding*, westbound for New York, encountered such heavy weather about 300 miles south of St. Johns, Newfoundland, according to press reports, that one of her crew was drowned and 73 of her passengers and crew received serious to minor injuries, necessitating an emergency call for medical supplies. These supplies were received from the Coast Guard Cutter *Hamilton* during the 18th. Some damage was done to the ship, as well as to other vessels, due to heavy winds and seas.

During the night of the 17th-18th the center continued in a north-northeasterly direction. In the early morning of the 18th it lay east of Newfoundland, still of great intensity, as shown by the report of the steamship *American Shipper*. At 4 a. m., local time, this vessel, in $47^{\circ}55'$ N., $50^{\circ}59'$ W., had a low barometer of 953.3 millibars (28.15 inches), with a south wind of force 11, changing, 2 hours later, to a southwest wind of force 12. The Belgian steamship *Kasongo*, at 2 a. m., had a hurricane wind from the south much farther to the eastward, in $45^{\circ}35'$ N., $47^{\circ}30'$ W., but with much higher barometer.

The storm center at 7 a. m. (E. S. T.) of the 18th was located close to 50° N., 50° W. There is no certainty as to its later movements or intensity owing to lack of reports, due to the war situation.

Figure 1 shows the approximate track of the storm, which may be subject to revision if later information warrants.

From the beginning of the disturbance as an area of unsettled weather late on the 9th in the Leeward Islands until early on the 13th when the low center lay northeast of Puerto Rico, advisories were issued frequently from the forecast center at San Juan, P. R. Thereafter until the 16th, advisories were continued from the forecast center at Jacksonville, Fla., and on the 17th, from Washington, D. C.

Disturbance of October 27-November 6.—Late in October disturbed conditions developed in the southwestern Caribbean Sea. The disturbance moved northward to the vicinity of Swan Island on the 29th. On the 30th it took an east-northeasterly direction, crossing Grand Cayman Island, where hurricane intensity was developed on the 31st, then passed between Jamaica and Cuba during November 1-3. Considerable damage was done in Jamaica due to wind and heavy rains. A complete account of the cyclone will be reserved for the November issue of the REVIEW, pending further receipts of ships' reports.

DISTURBANCE OF OCTOBER 29–NOVEMBER 8, 1939

By WILLIS E. HURD

The fifth tropical disturbance of 1939 originated from a shallow low-pressure wave in the southwestern Caribbean Sea on October 27. A slow north-to-northwest movement of the wave, with equally slow fall in barometer, occurred until 7 p. m. (E. S. T.) of the 29th, when a cyclonic circulation became more developed, with center not far to the southward of Swan Island. At the morning observation of the 30th the center was close to the westward of Swan Island, where the barometer read 1,004.7 millibars (29.67 inches), wind south-southwest, force 5. During the day of the 30th the disturbance curved into a northeasterly direction, the center passing to the north of Swan Island where, at 7 p. m. (E. S. T.), the barometer had fallen to 1,003.4 millibars (29.63 inches). Up to that time no gales had been reported in connection with this disturbance. But at midnight of the 30th–31st the American steamer *Olancho*, Santa Marta toward Barrios, experienced a gale of force 8. The ship's position at 4 p. m. of the 30th was in 16°25' N., 83°53' W., where she had lowest barometer, 1,005.1 millibars (29.68 inches).

During the 31st the disturbance increased in intensity, and was locally of hurricane force as it passed over the Cayman Islands during the afternoon. At Grand Cayman the maximum wind velocity was 92 miles an hour, and the lowest pressure, at about 3:30 p. m., was 990.5 millibars (29.25 inches). Press reports indicate considerable damage on the islands, and the loss of four schooners. The strongest wind reported by a ship on the 31st was from the northwest, force 9, experienced by the American steamer *Memphis City* near 21° N., 85° W., at about 7 a. m., ship's time. The ship was at that time considerably to the west-northwest of the storm center, then near 19° N., 82° W.

After leaving the Caymans, the cyclone took an east to east-by-south course toward Jamaica, and at 7 p. m. (E. S. T.) of the 31st, while yet moderate to strong northerly gales were blowing at Grand Cayman, strong southerly gales were battering the western extremity of Jamaica. At 7 a. m. (E. S. T.) of November 1 the center lay close off the northwest coast of Jamaica, where there was heavy property damage, particularly at Montego Bay, according to press reports. Here the high waves forced scores of families to leave their homes, and one life was lost. Heavy rains also added materially to the damage done on the island. During the day a few ships well to the westward of the storm center reported northerly gales of fresh to strong force along the eastern slope of a high pressure area central over the extreme southern Gulf States.

During the 2d and 3d of November the storm center, of lessened energy except for local manifestations, moved very slowly and capriciously, but generally eastward, between Jamaica and eastern Cuba, accompanied by strong winds and torrential rains. Floods in the southern Cuban rivers resulted in damage to crops and livestock and the loss of one life. Even as far to the eastward as Haiti some damage was done in coastal localities by the high seas. The strongest winds reported during the 2 days was encountered by the Honduran steamer *Amapala* on the 3d. At 8 a. m. this ship, in 18°37' N., 76°05' W., had an east-southeast gale of force 10, barometer 997.3 millibars (29.45 inches). This reading is the lowest reported by a ship during the course of the storm in the Caribbean Sea. Between the *Amapala* and the Cuban

coast two other ships, at 7 a. m., reported east gales of force 8 to 9, but with much higher barometers. At 7 p. m. (E. S. T.) of the 3d a ship near 19° N., 76° W., had a southeast gale of force 9, but with only moderately low barometer.

Outside of the immediate area of the disturbance, in the eastern Gulf of Mexico, the Florida Strait, and off the southern Atlantic coast, there were strong northeasterly winds, but these were more related to the anticyclone over the United States than to the Caribbean disturbance.

During the 4th the low center moved slowly northward across eastern Cuba. At 7 p. m. (E. S. T.) of that day the barometer at Guantanamo read 1,003 millibars (29.62 inches.) In the neighboring sea area the highest wind noted for the day was of force 8, from the southeast, at 4 p. m., lowest barometer 998.6 millibars (29.49 inches), reported by the American steamer *Margaret Lykes*, in 21°00' N., 75°15' W. The wind on ship changed to northeast, force 8, at 6 p. m.

Farther northward the high pressure was giving way, and by the morning of the 5th the disturbance was central over the southeastern Bahamas, with a shallow trough of low pressure extending northward to the New Jersey coast, where another low center had formed since the preceding night.

The tropical center at 7 p. m. (E. S. T.) of the 5th lay near 25° N., 72° W., now moving north-northeastward with greatly increased rapidity. The American steamer *Delfina* reported the heaviest wind, force 9 from southwest, in connection with it, in 27° N., 71° W., at 11 p. m. The ship's barometer at that hour was 993.2 millibars, 29.33 inches. The more northerly center then lay off the southern New England coast. During the afternoon hours it caused gales of force 9–10, as reported by ships, within the region 37° to 40° N., 69° to 74° W.

During November 6 ship reports were few from along all but the northernmost part of the trough of low pressure extending from the eastern West Indies to New England, but the center of the southern disturbance at 7 a. m. (E. S. T.) could be located at approximately 29° N., 70° W., from which point it continued to move north-northeastward, to the westward of Bermuda. By evening of the 6th, continuing at great speed, the storm center, so far as can be estimated from the few ships' reports, was in 39° N., 64° or 65° W. During the night it traveled toward Newfoundland, and the center was close to the island at 7 a. m. (E. S. T.) of the 7th. The cyclone was now displaying considerable energy. The Dutch steamer *Veendam*, at 6 a. m. of the 7th, near 44° N., 55° W., had a south gale of force 9 and lowest barometer 995.5 millibars (29.40 inches). An hour later, a little to the westward, she met a westerly gale of force 11. Thereafter the storm, of considerable depth and intensity, continued its northward movement, crossed the Gulf of St. Lawrence and Newfoundland, and on the morning of the 8th was central to the eastward of Labrador.

Quoting from the report of Grady Norton, forecaster on duty at our Jacksonville office, regarding the disturbance in its tropical stages:

An interesting and somewhat disconcerting aspect of this disturbance was the occasional breaking away of large blocks of tropical air, with attendant waves of falling pressure, which formed secondary disturbances off the South Atlantic coast, which in turn

moved northward and formed vigorous storms. It is believed that the energy thus released was a factor in preventing a more severe development of the original tropical center.

The first bulletin relative to this disturbance was issued from the Weather Bureau office, Jacksonville, Fla., on

October 30, and was followed at frequent intervals by timely bulletins and advisory warnings until November 6.

The track of this disturbance, together with the tracks of preceding tropical disturbances of the year, will appear in the December issue of the REVIEW.