

*Tropical disturbance.*—Below is an account of a tropical disturbance which was traced from the 18th to the 27th, originating near Turks Island and disappearing near Newfoundland. It caused no very intense winds; its movement was northward near the 72d meridian till about in the latitude of the Chesapeake Capes, then eastward or northeastward at a comparatively low speed.

*Fog.*—There was considerable fog during the period 21st to 25th within the 5°-square, 30° to 35° N., 70° to 75° W. This square lies about midway between Bermuda and the coasts of Georgia and South Carolina, and during part of this time the weather was greatly affected by the low already referred to as moving northward from the tropics.

Farther northward the region near the coast, as far as Cape Cod, had almost daily fog from the 20th onward, though there had been comparatively little before the 20th. The square 40° to 45° N., 70° to 75° W., reported fog on 14 days, and the square adjoining this to southward, on 13 days; these two squares are indicated as having much more fog than any others in North Atlantic waters. For localities to eastward and northeastward of Cape Cod, as far as the 55th meridian, a moderate number of fog reports are at hand, the majority of these being for days after the 20th.

From the Grand Banks region reports are not plentiful, but some fog is shown to have occurred, mainly about the 7th or the 20th.

#### TROPICAL DISTURBANCE OF MAY 18-27, 1940

By JEAN H. GALLENNE

The first tropical disturbance of the 1940 season was of minor intensity throughout its entire existence. The depression originated a short distance to the southeast of Turks Island during the evening of May 18 and moved in a general northerly direction for a period of about 4 days; thereafter its progressive motion was toward the east and northeast, where its identity was lost in the area between Nova Scotia and Newfoundland on the morning of May 27.

A slight fall of barometric pressure was charted in the region near Puerto Plata and Turks Island on the evening of May 18. At that time cloudy weather, gentle east winds, and a barometer reading of 1,007.8 millibars (29.76 inches) were observed at Turks Island. However, during the next 12 hours the wind at that station shifted to the southwest, increasing to force 5, while the barometer continued to fall gradually to 1,007.1 millibars (29.74 inches).

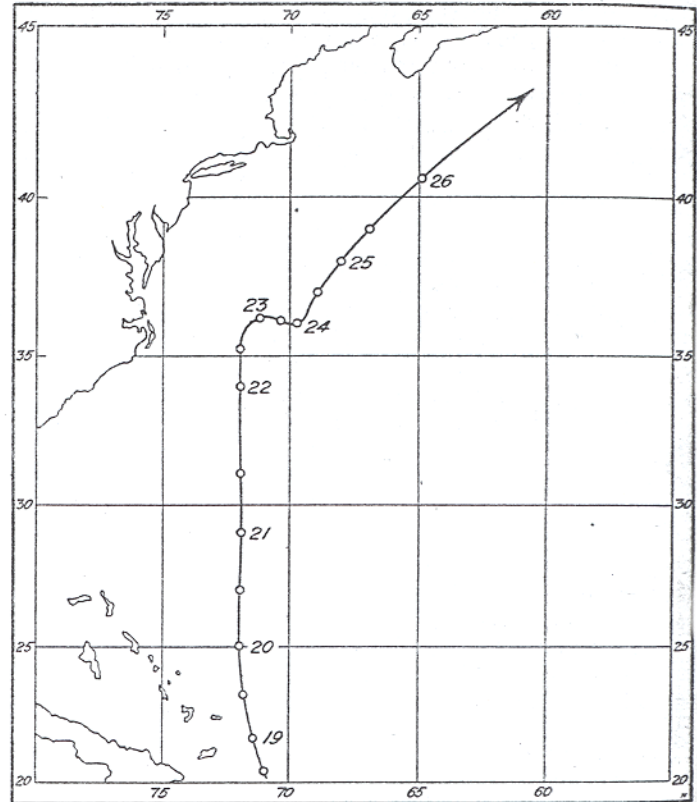
On the morning of May 19, a rather well-defined cyclonic circulation was observed, with the center of low pressure near latitude 22°45' N., and longitude 71°30' W. Winds of force 5-6 were noted in the northerly quadrant of the disturbance at this stage. (See figure.)

During the next 36 hours the disturbance moved in a general northerly direction, and reports from ships during that period indicate that strong to high winds were experienced over a considerable area.

Between 5 a. m. and 6 a. m. on May 21, the Belgian M. S. *Good Gulf* near latitude 30°12' N., and longitude 71° W. reported a barometer reading of 1,002.7 millibars (29.61

inches); wind southeast, force 8; heavy rain and very rough seas. The Belgian M. S. *Lubrafol* at midnight of the same day reported an easterly gale with a barometer reading of 995.6 millibars (29.40 inches) when near latitude 32°21' N., and longitude 71°52' W. This is the lowest barometer reading of record in connection with the disturbance. Several other vessels reported strong shifting winds and disturbed conditions on May 21.

The center was located near latitude 34° N., and 72° W. on the morning of the 22d; and from reports at hand, indications are that the barometric pressure had risen



somewhat as compared to that of the previous day and that the disturbance had become less violent.

At the morning observation of May 23, the disturbance was centered near latitude 36°15' N., and longitude 71°15' W. The progressive motion was then toward the east or slightly east-southeast, and on the following morning the center was at approximately 36° N., and 69°45' W. From that point it moved toward the northeast for the next 3 days and apparently merged with an area of low barometric pressure to the southwest of Newfoundland.

Gale winds of force 8 were the highest recorded in connection with this disturbance and no unusually low pressure was observed. No loss of life nor property damage has been reported.

Advisory warnings of the disturbance were issued by the Forecast Center at Jacksonville, Fla., on May 19 to 21.

This disturbance was unusual, in that from 1887 to date only four other occurrences of tropical cyclones have been recorded in the month of May; none was of hurricane intensity.

## TROPICAL DISTURBANCES OF AUGUST 1940

By JEAN H. GALLENNE

There were three tropical disturbances in the North Atlantic and the Gulf of Mexico during the month of August. The earliest, that of the 2d-10th, was confined to the Gulf of Mexico. The second, that of the 5th-17th, was of the West Indian type and its course lay over the North Atlantic ocean. The third originated over the North Atlantic Ocean rather late in the month and will be described in the September REVIEW.

## DISTURBANCE OF AUGUST 2-10

This disturbance had its inception in the southern end of an extra-tropical low-pressure trough which moved off the coast of South Carolina and Georgia. A wave developed on August 2, off Jacksonville, Fla., and moved southwestward across Florida into the northeast portion of the Gulf of Mexico by the 3d, where a rather shallow low 1,012.5 millibars (29.90 inches), with definite cyclonic wind circulation was charted. The disturbance moved steadily west-southwestward with increased intensity during the next 24 hours and ships' reports indicate that it was centered on the morning of August 4 near latitude 28° N., and longitude 87° W., from where it progressed in a slight curve to the right during the 4-5th.

Heavy rain squalls and fresh to strong shifting gales were encountered by vessels in the central and north-central portions of the Gulf of Mexico on August 5, 1940. At 12:50 a. m., of the 5th, the American S. S. *Connecticut*, near latitude 26°45' N., and longitude 88°06' W., reported a barometer reading 1,004 millibars (29.64 inches), strong gales and rough sea; the wind increased to force 11 (Beaufort scale) shortly after 2 a. m. This is the highest wind of record reported from any vessel in connection with this disturbance. At 7 a. m., on August 5, the center of the storm was charted about 110 miles southeast of Port Eads, La. The American motor vessel *Rhode Island* at 6:07 p. m., of the same day met south-southwest winds of force 9, with rough sea and very heavy rain.

The disturbance continued in a west-northwest direction during the 6th which carried the center south of the Louisiana coast toward Texas, where it passed inland on August 7, just east of Sabine. The storm at this point was of small diameter, with the path of hurricane winds about 20 miles wide in the Port Arthur-Sabine area.

The following table gives the recorded maximum wind velocities and the lowest pressures at stations on and near the Gulf coast, during the passage of the disturbance.

Station	Wind	Time	Lowest pressure, inches	Time
Apalachicola, Fla. ....	32-NE.....	5th-3:43 a. m. ....	29.82	4th-5:30 p. m.
Pensacola, Fla. ....	34-SE.....	5th-7:38 a. m. ....	29.82	4th-6:00 p. m.
Mobile, Ala. ....	29-NE.....	6th-6:01 a. m. ....	29.84	5th-2:00 a. m.
New Orleans, La. ....	32-E.....	6th-4:55 a. m. ....	29.71	6th-6:15 a. m.
Burrwood, La. ....	51.....	6th-7:00 a. m. ....	29.40	6th-3:00 a. m.
Lake Charles, La. ....	50-E.....	7th-9:30 a. m. ....	29.50	7th-7:30 a. m.
Port Arthur, Tex. ....	32-NE.....	7th-12:47 p. m. ....	28.87	7th-1:15 p. m.
Galveston, Tex. ....	34-NW.....	7th-4:10 p. m. ....	29.50	7th-7:00 p. m.
Houston, Tex. ....	30-NW.....	7th.....	29.55	7th-7:00 p. m.

An extract from the report of E. W. Torrence, meteorologist in charge at Port Arthur, Tex., follows:

The barometer began a definite downward movement as early as 10 a. m. of the 6th. The fall was rapid from 8 a. m. to the low point at 12:15 p. m. Recovery immediately after the minimum

pressure was even more rapid than the fall. At Port Arthur the lowest pressure for this station was 977.7 millibars (28.87 inches), considerably lower than the previous low barometric pressure reading of 994.5 millibars (29.37 inches) recorded on October 16, 1923. The 5-minute maximum was 82 miles an hour from the northeast at 11:47 a. m., and the 1-mile extreme was 91 miles per hour. The total rainfall from midnight of August 6-7 to noon of the 8th was 5.87 inches.

During the evening of August 7, the storm recurved to the right with accompanying marked increase in rainfall over southwest Louisiana. At 7 a. m. of the 8th, it was centered a short distance northeast of Houston, Tex., with decreased intensity. For the next 48 hours the disturbance moved rather slowly in a north-northeasterly direction, dissipating on the evening of August 10 in north-central Arkansas.

From reports at hand, indications are that only one death resulted from the storm. A Chinese fisherman was drowned in Baratavia Bay, north of Grand Isle. Losses in crops, roads, and property damage due to wind and heavy rainfall, are estimated at more than \$1,743,550.

Passage of this hurricane from the eastern Gulf of Mexico was completely covered by warnings and advisories by the Weather Bureau forecast center at New Orleans, La.

## DISTURBANCE OF AUGUST 5-17

The morning charts of August 5 showed some indications of a slight disturbance centered between St. Martin and St. Thomas Islands. Severe squalls of 44 miles an hour were recorded at 10:04 a. m. at San Juan. By 6 p. m. of the 5th, the depression was located a short distance north of Mona Passage, having moved very rapidly in a west-northwestward direction during the preceding 10 hours. The Dutch motor vessel *Pygmalion*, near latitude 19°36' N. and longitude 65°48' W., at 5 p. m. of August 5, reported fresh easterly gales with barometric pressure 1,012.5 millibars (29.90 inches).

Cloudy weather with high winds and moderate to rough seas was encountered by ships in the vicinity of the path of the disturbance as it continued to move in a west-by-north direction during the 6th. The center passed a short distance to the south of Turks Island at noon of August 6, with deepening pressure, 1,003 millibars (29.63 inches) accompanied by winds of 30 miles an hour.

During the next 3 days the disturbance showed little tendency to increase in intensity as it moved to the northward. It was located near latitude 29°41' N., and longitude 74°15' W., on the morning of August 9. At 4 a. m. of August 10, the American tanker *Meton*, near latitude 32°12' N., and longitude 77°42' W., recorded a barometer pressure reading of 1,008.5 millibars (29.81 inches), with overcast squally weather, east winds of force 8, and high seas.

The first indications that this storm had developed to hurricane intensity were received from the American S. S. *Maine*, giving her noon position as approximately 32°03' N., and longitude 77°18' W. The ship's daily journal of August 10th shows that the vessel met east-southeast wind, force 10 increasing to full hurricane strength at 4 p. m. (local ship's time), with very high and rough east-southeasterly sea, large heavy swell and poor visibility. The barometer fell very rapidly until about 8 p. m., when it became steady and began to rise slowly.

The hurricane crossed the coast at about 4 p. m. of August 11, near Beaufort, S. C., where moving inland,

its course curved to the westward, passing just north of Savannah, Ga., between 5 and 6 p. m. on the same day. A report of the storm by the forecaster at Jacksonville Fla., Grady Norton, includes the following:

The lowest pressure at Savannah was 28.78 inches (974.7 mb.) and highest wind 73 miles per hour from north, just before passage of center. A lull occurred from 5 to 6 p. m., during which the wind dropped to 9 miles per hour, then shifted to south and increased to whole gale. Winds of hurricane force were experienced from the Savannah area nearly to Charleston, (Charleston maximum velocity 66 miles per hour for 5 minutes) a distance of about 90 miles. Damaging gales extended north of Charleston to Georgetown and south of Savannah to Brunswick. Tides were very high north of the center, Charleston reported 10.7 feet above mean low tide.

Property damage amounted to about \$1,500,000 at Charleston and nearby beach resorts, nearly \$1,000,000 in the Savannah area; and about \$500,000 elsewhere between these places, much of which was at Beaufort, S. C. The total damage to property along the coast was, therefore, about \$3,000,000. Reports are somewhat confused as to loss of life. The larger communities (Savannah, Beaufort, and Charleston) had very few casualties; none occurred at Charleston and Beaufort and only two at Savannah, and one of these was by heart failure due to fright, rather than injury. In the coastal area between Savannah and Charleston a considerable number lost their lives. Early press reports indicated 35 dead but some at first thought dead were later found safe and the exact number may never be known, but it is believed to be not more than 20 for the entire coastal area.

The coast is indented by many inlets, islands, marshes, etc. Some of these islands are inhabited by Negroes living in flimsy shanties or houseboats, without communication facilities and hard of access. The small number of deaths under these conditions is considered remarkable, and indicates the effectiveness of the Coast Guard and other agencies in reaching these remote people with the warnings and getting most of them to places of safety in advance of the storm. In addition to these rather inaccessible places, there are a number of popular beach resorts ordinarily visited by thousands of people over week-ends. A particular attraction this Sunday was to be a yacht race at Charleston. The

small crafts were moved to safe anchorage and the beaches cleared of people. It will be seen, therefore, but for the effectiveness of the warnings, the loss of life and property would have been much greater.

Aside from the doubtless saving of many lives, the money value of property saved was several hundred thousand dollars, probably \$500,000 in small craft and automobiles alone. It will be seen, therefore, that the value of property saved in this one storm would be sufficient to maintain the entire hurricane warning service for many years.

After leaving the coast the storm moved slowly to the southern Appalachian Mountain region attended by torrential rains and disastrous floods in many sections of Georgia, Tennessee and the Carolinas. Press reports indicate more than 30 deaths and property damage of many millions of dollars in these flood areas, as well as tremendous crop damage. This indicates that the storm caused far more damage and destruction by the floods than by the hurricane winds it gave in the coastal sections.

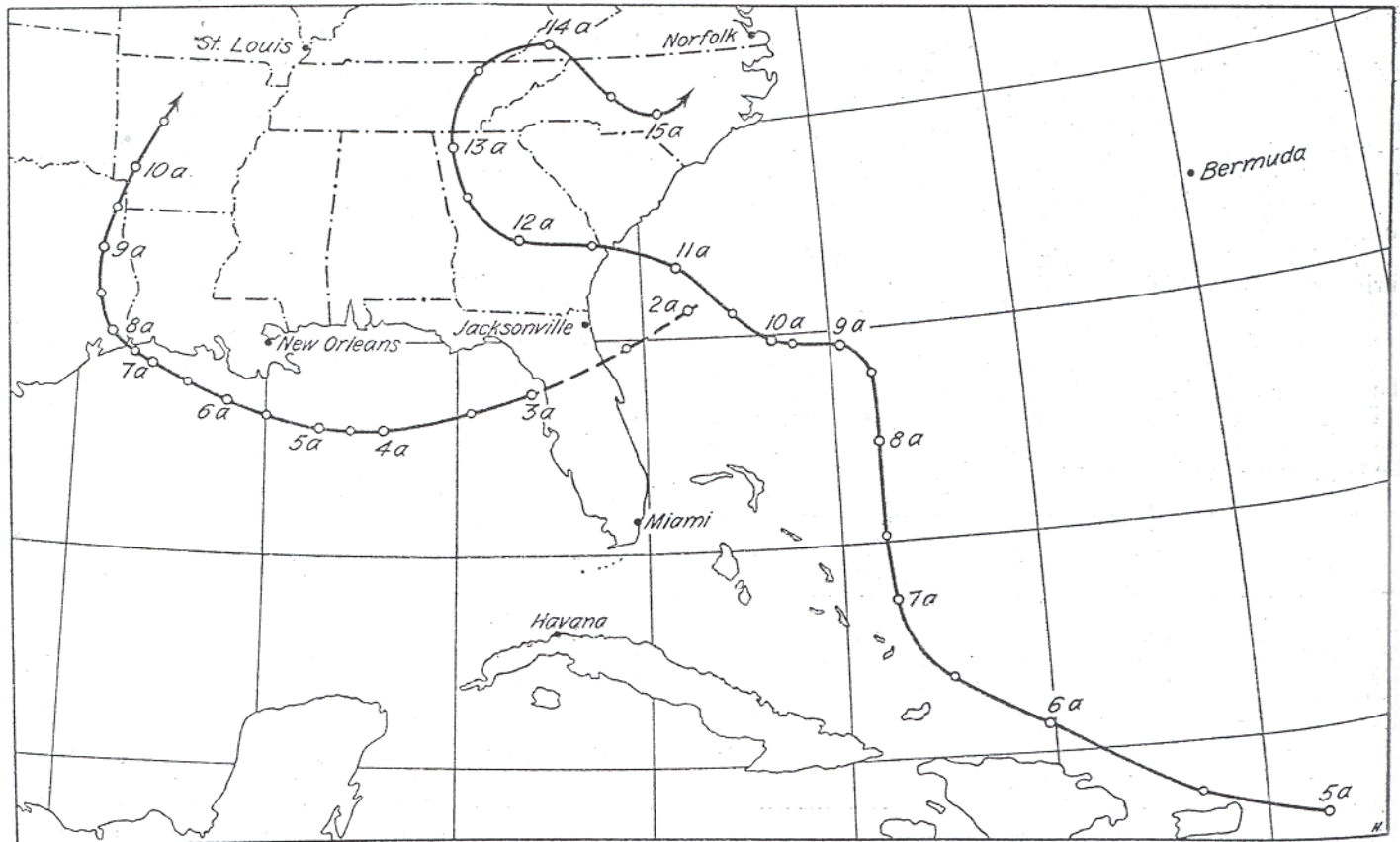
A preliminary report of river and flood conditions associated with this disturbance will be found elsewhere in this REVIEW.

During the afternoon of August 11, a sea-level pressure reading of 974.7 millibars (28.78 inches) was recorded at Savannah, Ga. This is the lowest ever recorded at the Weather Bureau Office at that place.

During the next 4 or 5 days, as the storm moved overland, it diminished rapidly in intensity and its progressive motion was rather erratic. Its positive identity was lost on August 15:

Timely and accurate warnings were issued from the Weather Bureau Offices at San Juan, Jacksonville, and Washington, D. C., covering the movements of this hurricane.

Approximate tracks of both the disturbances described in this article are shown on the accompanying chart:



## TROPICAL DISTURBANCES OF SEPTEMBER 1940

By J. H. GALLENNE

[Weather Bureau, Washington, Nov. 2, 1940]

*August 30–September 3.*—The first indications of probable origin of this hurricane appeared on the morning of August 30, as a mild depression central about 225 miles off the Florida east coast. A slow progressive movement toward the north-northwest with rapid development, was indicated by the report of an unidentified vessel near  $32^{\circ}12' N.$ , and  $72^{\circ}24' W.$ , at 5 p. m. of that day, which recorded an east-southeast wind, force 10, with barometer reading of 978.7 millibars (28.90 inches). During the next day the disturbance was attended by severe squalls and strong shifting gales over a large area and by winds of hurricane strength near its center. Shortly after the morning observation of September 1, the course of the disturbance seems to have changed from north-northwest to north-northeast.

The American S. S. *Dungannon* reported that she encountered north-northeast winds, force 10, at 8 a. m. of September 1, near  $35^{\circ}50' N.$ , and  $73^{\circ}45' W.$ , with pressure reading 993 millibars (29.32 inches), and that the wind shifted to northwest and increased to force 12 shortly thereafter. During the evening of the same day, the tanker *Franklin K. Lane*, on a voyage from New York to Corpus Christi, reported that she met an east-southeast hurricane which shifted to west-northwest near  $38^{\circ}17' N.$ , and  $70^{\circ}32' W.$  She also reported that a pressure reading of 965.1 millibars (28.50 inches) was noted during the passage of the hurricane. This is the lowest barometer reading of record in connection with the disturbance. Several other vessels reported winds of force 8 or higher, on the 1st. (See Table of Ocean Gales and Storms on page 255 in this REVIEW.)

The disturbance was centered at 7:30 a. m., September 2, about 75 miles east-northeast of Nantucket, Mass., moving rapidly north-northeastward. The Weather Bureau office, Nantucket, Mass., recorded a maximum velocity, for a 5-minute period, of 57 miles an hour, from the northeast and an extreme velocity of 65 miles an hour on September 2. This exceeds all previous September wind records at that station.

The storm moved inland a short distance to the northwest of Yarmouth, Nova Scotia, with rapidly diminishing intensity, during the evening of the 2d, and apparently dissipated in the region north of Anticosti Island, Quebec, on September 3.

Timely warnings and advisories were issued from the

forecast center at Washington, D. C., covering the movement of this hurricane.

*September 11–18.*—On the 7:30 a. m. chart of September 11, 1940, there were some indications of a disturbance of slight intensity about 250 miles northeast of St. Thomas, V. I., moving in a west-northwesterly direction. During that afternoon, an unidentified vessel near latitude  $20^{\circ} N.$ , and longitude  $64^{\circ}30' W.$ , reported cloudy weather, northwest wind, force 6, with a barometric pressure reading 1,007 millibars (29.74 inches).

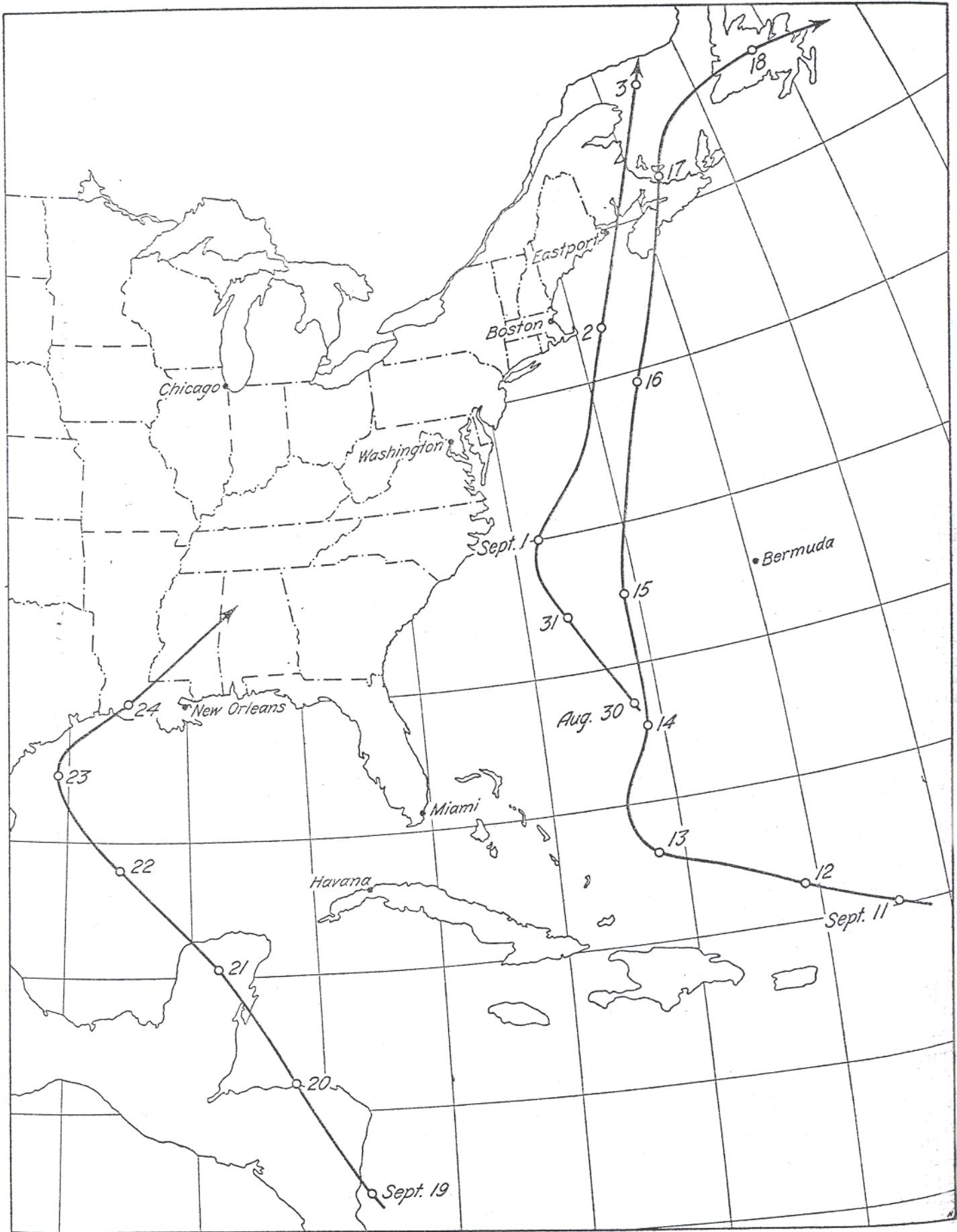
The depression developed very rapidly during the 12th, causing moderate gales over a large area to the right of its path. At 7:30 p. m. the center was near  $22^{\circ}30' N.$ , and  $68^{\circ} W.$ , from which point it continued to move in a west-northwesterly direction until the following morning. During the 13th it curved to the north and northeast attended by strong gales and continued falling pressure.

At the morning observation of September 14 the storm was central about 475 miles east-northeast of Nassau, moving at a rate of about 12 to 14 miles an hour. An observation from the S. S. *Borinquen* indicated that the disturbance developed to full hurricane strength during that day. The vessel met a north-northeast wind, force 12, at 5 p. m., near latitude  $30^{\circ}24' N.$ , and longitude  $71^{\circ} W.$ , with barometer reading 988.3 millibars (29.19 inches). Her daily journal from local noon to midnight of September 14 reads: "Overcast, heavy rain, ship hove to; vessel laboring and shipping water." The S. S. *Coamo* also became involved in the hurricane on the 14th, reporting that she encountered an east-northeast wind, force 11, at 11 p. m., near  $30^{\circ}14' N.$ , and  $72^{\circ} W.$

For the next 48 hours the storm moved rapidly in a north-by-east direction and was centered near  $39^{\circ}30' N.$ , and  $68^{\circ} W.$ , at 7:30 a. m. of September 16, attended by moderate to heavy rain, in the vicinity of Nantucket, Mass., and by gales over a very wide ocean area.

Scattered ship reports indicate that thick weather, with rough seas, and heavy rain squalls were associated with the disturbance as it moved inland during the evening of September 18, a short distance north of Cape Race, Newfoundland.

Although this storm developed full hurricane force, no reports have been received of loss of life or property damage, probably due to the fact that it remained well at sea during practically its entire passage.



Tracks of tropical disturbances in September 1940.

The movements of this hurricane were amply covered by advisories and warnings issued by the Weather Bureau.

*September 19-24.*—A rather weak tropical disturbance, 1,006 millibars (29.71 inches), formed on the morning of September 19, 1940, in the vicinity of Bluefields, Nicaragua. It progressed in a northwestward direction over the Gulf of Honduras during the next 24 hours and moved inland over Quintana Roo during the night of September 20. By the afternoon of September 21 the depression had entered the Gulf of Mexico, northwest of Progreso, Yucatan, attended by winds of force 4-5 (Beaufort Scale).

The disturbance continued to move northwestward increasing slowly in intensity after passing into the Gulf of Mexico. On the morning of September 23, it was centered near latitude  $27^{\circ}45'$  N., and longitude  $95^{\circ}30'$  W. An unidentified vessel in the western portion of the Gulf of Mexico at 5 a. m. of the 23d, encountered a fresh gale from the northwest. That afternoon, the depression moved very slowly and curved rather sharply to the northeast. The tanker *Dannedaike* met a fresh south-

west gale near  $28^{\circ}$  N., and  $95^{\circ}$  W., at 7 p. m. of the 23d, with the lowest pressure reading of the storm, 1,004 millibars (29.65 inches).

During the early morning of September 24 the disturbance passed inland over southwestern Louisiana, a short distance to the west of Lafayette. Heavy rains were associated with this storm over southern Louisiana and along the upper coast to Texas, the heaviest amount reported being 7.10 inches at Cheneyville, La.

The depression, decreasing in intensity after passing inland, continued to move northeastward and merged with a low-pressure trough which dominated the south-central and eastern portions of the United States, during the evening of September 24.

Advisories and warnings were issued by the forecast center at New Orleans, La., from September 21, when the disturbance entered the Gulf of Mexico, until it moved inland and diminished rapidly on the 24th.

A diagram showing the tracks of these disturbances appears herewith.

## TROPICAL DISTURBANCES OF OCTOBER 1940

By JEAN H. GALLENNE

[Weather Bureau, Washington, November 1940]

October 20-23.—The earliest indications of this disturbance were contained in an observation from the S. S. *Cristobal* during the evening of October 20. The vessel, which was a short distance north of the Canal Zone at that time, reported that she experienced cloudy weather with southwest wind, force 5 (Beaufort Scale) and a barometer reading of 1,008 millibars (29.77 inches).

The depression progressed in a northwesterly direction and was centered near latitude  $11^{\circ}30'$  N., longitude  $79^{\circ}30'$  W., on the morning of the 21st. Later that day reports of high winds and gales, accompanied by moderate to heavy rains, were received from several vessels in the central Caribbean. The Honduran S. S. *Contessa* reported a barometer reading of 995.3 millibars (29.39 inches) and northeast gales, force 9, with very rough seas, near latitude  $12^{\circ}35'$  N., longitude  $80^{\circ}25'$  W., during the afternoon of October 21. The lowest barometer, 982.7 millibars (29.02 inches) was read on the Hawaiian S. S. *Contessa* during the morning of the 22d in lat.  $12^{\circ}50'$  N., longitude  $81^{\circ}45'$  W.

The disturbance continued to move in a northwesterly direction during the next 36 hours, attended by fresh to strong gales.

At 7:30 a. m. of October 23, the center of the disturbance was located near  $14^{\circ}15'$  N.,  $82^{\circ}45'$  W., from which point it curved to the west and southwest, passing inland a short distance to the south of Puerto Cabezas. A report received by the Standard Fruit Co. indicates that considerable damage occurred on the northern coast of Nicaragua.

October 24-26.—On the morning charts of October 24, an area of low barometric pressure was general in the vicinity of the Greater Antilles. Subsequent ships' reports of that day indicated that a slight disturbance, 1,008 millibars (29.77 inches), with definite cyclonic wind circulation, had formed southeast of Inagua. The depression moved toward the north and north-northeast for a period of about 12 hours, then recurved sharply to the northeast and was centered near latitude  $25^{\circ}$  N., longitude  $70^{\circ}30'$  W., on the morning of the 25th. During the following day it moved very rapidly over the extra-tropical waters of the North Atlantic Ocean, where, due to a lack of vessel reports, its identity was lost near  $35^{\circ}$  N.,  $55^{\circ}$  W.

From reports at hand, indications are that no unusually low barometer readings were noted.

No reports of loss of life were received in connection with these disturbances, and it is very doubtful if either developed to hurricane strength.

Timely warnings and advisories were issued by the forecast center at Jacksonville, Fla., covering the movements of both disturbances.

A chart showing their tracks is herewith.



Tracks of tropical storms of October 1940.