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THE NORTH ATLANTIC HURRICANE OF SEPTEMBER 8–16, 1944

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DURING September 14 and the morning of the 15th an intense hurricane, similar in many respects to the destructive storm of 1938, lashed 900 miles of the east coast of the United States from Hatteras northward. The tracks of these two storms are reproduced in chart I. As they occurred in an interval of less than 6 years, and were the first intense tropical storms to reach the New England area in over 50 years, they will probably come to be known as the First and Second New England Hurricanes. Earlier storms, apparently of tropical origin, have ravaged the same section, and a listing of these storms is given later in this report. Tracks for those of 1815 and 1821, which by coincidence also occurred within a period of 6 years, are traced in chart II.*

The hurricane of September 17–21, 1938, is recognized not only as the most destructive storm to reach the coasts of this country but also, from the standpoint of damage inflicted, as one of the two greatest disasters in the history of the continent. Reliable estimates have placed property damage in the San Francisco Earthquake and in the Hurricane of 1938 at about the same figure—$350,000,000.

Several hurricanes have resulted in a greater number of fatalities, notably: The South Atlantic Coast storm of late August 1893, with a loss of about 2,000 lives; the Louisiana-Mississippi hurricane of early October 1893, with an estimated 1,800 fatalities; the Palm Beach hurricane of September 1928, which resulted in 1,836 deaths; and the Galveston hurricane and tidal wave, September 8, 1900, which took a toll of about 6,000 lives.

Although the hurricane of 1944 was probably of as great intensity as that of 1938 while it swept over the Atlantic east of Florida, several circumstances combined to militate against the heavy casualties and property damage that occurred in the 1938 storm. First among them was a gradual filling of the depression, and a resultant drop in wind velocity after the center passed Hatteras. This decrease in the pressure gradient, coupled with a slower progressive movement than accompanied the earlier storm, brought the center to the heavily populated coastal regions of New England in a less vigorous form than was evidenced in the hurricane of 1938.

*Track of the 1815 hurricane constructed by Tannehill, from newspaper clippings collected and abstracted by Noyes Darling and published in The American Journal of Science and Arts, Vol. XLII, pp. 243–252 New Haven 1842. Track of the 1821 hurricane, according to Redfield.

HISTORY OF THE HURRICANE

The existence of the 1944 hurricane was first suspected on the 8th of September when a pressure fall, accompanied by erratic winds, was noted moving into the Windward Islands. This disturbed condition later showed a circulation pattern. At 4 p. m. (E. W. T.) on the 8th, the presence of a tropical disturbance was announced in a preliminary advisory radioed from San Juan, P. R.

Since this light circulation did not account for other indications that a strong disturbance existed in the vicinity, a reconnaissance plane was dispatched on the 9th to search for a storm farther north. This flight located an intense storm in the vicinity of latitude 21° N., longitude 60° W., and later reconnaissance proved it to be a fully developed hurricane moving in a west-northwesterly direction.

From this point to the northeast of the Leeward Islands the hurricane drifted west-northwestward, in the prevailing air stream, until further reconnaissance located the center off the northern Bahama Islands near latitude 27° N., longitude 74° W. on the evening of the 12th. At this stage of its progress the hurricane was so large and violent that the term "Great Atlantic Hurricane" was adopted in advisory messages from Miami in order to convey a proper description.

A weather officer aboard an army reconnaissance plane which became involved in the storm estimated the wind at about 140 miles per hour. He reported turbulence so great that with the pilot and copilot both at the controls the plane could not be kept under control, and several times it was feared it would be torn apart or crash out of control. When they returned to base it was found that 150 rivets had been sheared off on one wing alone.

At about 9 p. m. of the 12th, the storm was centered near the 75th meridian and the expected recurve to the northward became apparent. Moving almost due north, at a rate of 25–30 miles per hour, the center passed just east of Hatteras at about 9:20 a. m. (E. W. T.) on the 14th. Then turning slightly to the northeastward it moved up the coast, at an accelerated speed of about 40 miles per hour, and crossed over eastern Long Island at about 10 p. m. of the same date. Moving inland about an hour later near Point Judith, R. I., the center crossed

the States of Rhode Island and Massachusetts, passing a short distance southeast of Boston, and moved into Massachusetts Bay shortly after 1 a. m.

The center again passed inland, on the Maine coast, and later crossed southeastern New Brunswick near the head of the Bay of Fundy. Late on the 15th it passed over Newfoundland and finally merged with an extra-tropical cyclone southeast of Greenland.

PRESSURE

The lowest pressure so far reported for the 1944 hurricane is 947.2 millibars (27.97 inches) recorded at Hatteras, N. C., about 8:20 a. m. of the 14th. The reading is only 0.12 of an inch higher than the low pressure of 943.1 millibars (27.85 inches) observed aboard the S. S. *Carinthia* during the hurricane of 1938. It is quite possible that, when readings of barometric pressure become available from ships heavily involved in the recent storm, even lower readings than those above will be reported.

The lowest sea-level pressure on record is a reading of 26.185 inches taken on August 18, 1927, aboard the Dutch steamship *Sapoeroea*, while she was involved in a Pacific typhoon 460 miles of the Island of Luzon in the Philippines. The lowest sea-level pressure on record in the Western Hemisphere is 26.35 inches, recorded in the Florida Keys storm of September 2, 1935.

WINDS

The highest wind velocity recorded by instrument was an extreme velocity of 134 miles per hour, observed at approximately 12:20 p. m. on September 14, at Cape Henry, Va. Maximum wind velocities equaled or exceeded all previous records at Hatteras, Cape Henry, Atlantic City, New York, and Block Island.

Stations in table 1, a summary of meteorological conditions accompanying the 1944 hurricane, are arranged in a time sequence corresponding, as nearly as possible, to the order in which they were affected by the storm.

TIDES AND INUNDATION

Fortunately, and in contrast to the hurricane of 1938, the recent storm struck inland over Connecticut, Rhode Island, and southeastern Massachusetts at a time of normally low tide. In addition the latest storm struck the coast obliquely, with coastal points on the left or weaker side of the center. As a result the great storm tide which is created by the stronger winds in the righthand quadrants, expended most of its force at sea. No tide heights were recorded in the recent storm which even remotely approach the 20- to 25-foot levels registered in 1938.

LOSS OF LIFE AND PROPERTY DAMAGE

A total of 390 lives were lost as a result of the 1944 hurricane, a large proportion of them as a result of marine casualties. The 46 deaths listed as occurring along the coastal areas of the United States is less than 10 percent of the 494 fatalities resulting from the storm of 1938. Heavy marine casualties were directly related to intensified patrol work and other exigencies resulting from war conditions. Property damage has been estimated at approximately $100,000,000 or about one-third that estimated for the 1938 hurricane.

A survey of the hurricanes of the past 50 years shows that a constantly-improving hurricane warning service has brought about a progressive reduction in the number of deaths per unit of hurricane damage. A tabular breakdown of casualties and damage, by States, is included in table 4.

WARNINGS AND ADVISORIES

A total of 51 warnings and advisories were issued by the Hurricane Warning Centers at San Juan, Miami, Washington, and Boston. Prompt dissemination of these warnings by news distributing agencies resulted in the evacuation of thousands of persons in threatened areas, and the safeguarding from storm damage, insofar as was possible, of protectable property. In New York City, during the period of storm inquiries from September 12 to 15 inclusive, a total of 289,486 calls were received over the automatic telephone system.

HISTORICAL STORMS OF NEW ENGLAND

Below are descriptions of three of the most severe New England hurricanes. Other storms, probably all of tropical origin, which seriously affected the New England States occurred on August 19, 1788; September 8, 1869; October 23–24, 1878; and August 24, 1893.

August 15, 1635. Probably the earliest tropical storm on record in New England began shortly after midnight with heavy rain and a wind that had shifted from south-southwest to northeast. Later the wind increased in violence and was accompanied by torrential rain. After the gale had continued 5 or 6 hours, the wind changed to northwest and gradually subsided. During that month a hurricane, possibly the same storm in an earlier stage, occurred between Martinique and St. Kitts.

September 22–23, 1815. The "Great September Gale" of 1815 was one of the most destructive hurricanes to reach New England. Heaviest damage occurred in Rhode Island and central Massachusetts. On the coast of Connecticut high tides and hurricane winds destroyed many buildings and numerous vessels were driven ashore. The storm began on September 22 and reached its height shortly before noon on the following day. This storm, which had moved up from the West Indies, had been recorded at St. Bartholomew on the 18th. A survey of the damage caused by this hurricane convinced W. C. Redfield that the storm was a "progressive whirlwind," and as a result he began his study of cyclonology.

September 3, 1821. The center of this destructive hurricane crossed the western part of Long Island and passed northward into Connecticut.

Complete accounts of most of these early New England storms can be found in "Historic Storms of New England" by Sidney Perley, The Salem Press, 1891.

ACKNOWLEDGMENTS

The Weather Bureau wishes to express its sincere appreciation to the many organizations and agencies which performed essential roles in vitalizing the Hurricane Warning Service.

To the Army Air Forces newly organized Weather Unit goes credit for the early detection of the storm, and for securing fixes on the center, direction of movement, and wind intensities, at a time when the hurricane was still some distance east of Antigua in the West Indies, and 5 days before signs indicative of such a circulation could have been picked up on the Atlantic coast. With the absence of radio weather reports from ships, this aircraft reconnaissance service, which is employed by the Army, Navy, and Coast Guard, was the only source of early observational data.

Equally appreciated is the unqualified support given by all news distributing agencies who, through their vast facilities, were charged with getting the warnings to the public. Personnel of the newspapers and the radio networks bent every effort toward the fulfilment of this trust.

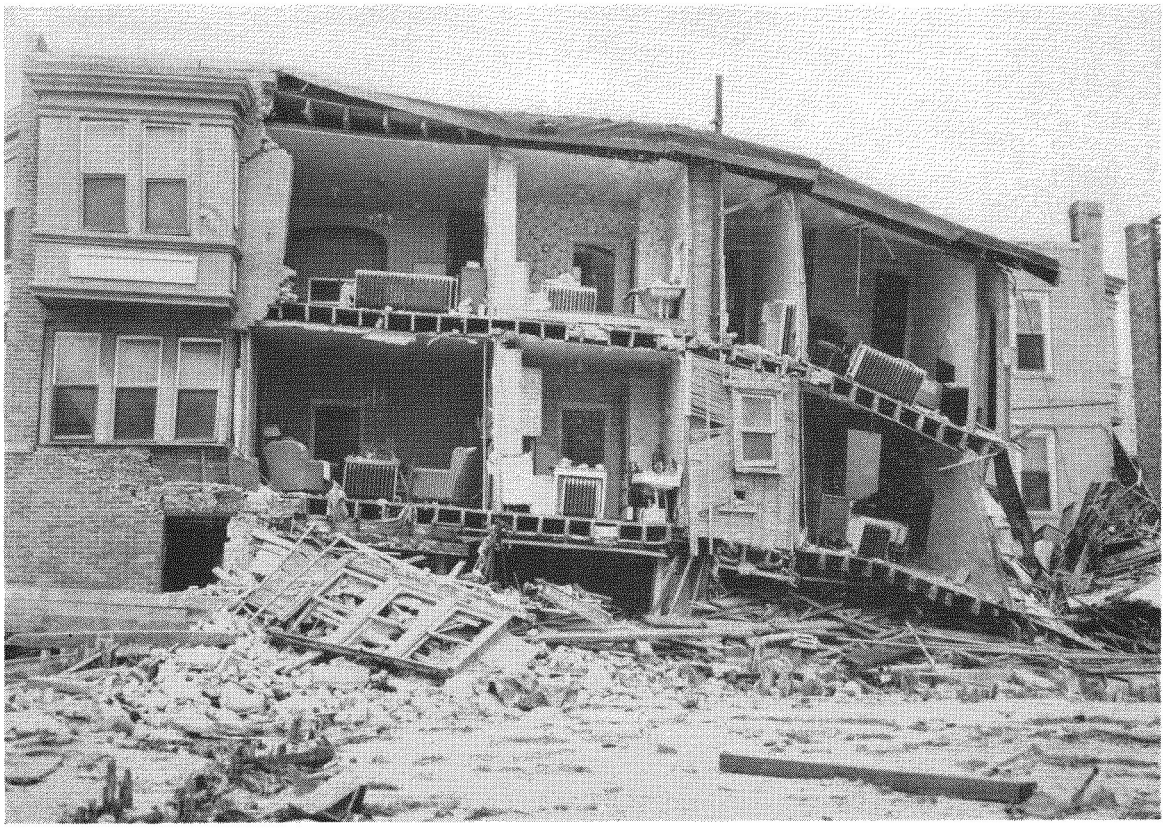

FIGURE 1.—Wall torn from building on Seaside Avenue, Atlantic City.

FIGURE 2.—Debris and structural damage near the Boardwalk, Atlantic City.

FIGURE 3.—Paving completely undermined on Seaside Avenue, Atlantic City.

FIGURE 4.—Heinz Ocean Pier, Atlantic City, after the hurricane.

TABLE 1.—*Meteorological data for the hurricane of Sept. 8–16, 1944, E. S. T.* [1]

Station	Lowest pressure	Time of lowest pressure	Velocity and direction at time of lowest pressure	Maximum wind velocity and direction for a 5-minute period	Time of maximum velocity	Extreme wind velocity and direction (fastest mile from register)	Time of extreme velocity	Velocity of extreme gust	Duration in hours of winds over 38 miles per hour
Hatteras, N. C.	27.97	8:20 a		90 [2] W [5]	10:00 a	110 [2] W			5
Elizabeth City, N. C.	28.88	10:35 a		70 NNW	10:30 a	75		84 I	6½
Norfolk, Va.	29.11	11:45 a		56 NW	11:50 a	73		90 [2]	4
Cape Henry, Va.	28.86	12:10 p		85 NW [5]	12:22 p	134	1:13 p	150 [2]	7
Atlantic City, N. J.	28.73	5:00 p		82 N [5]	4:30 p	91 NE	4:30 p		7
Trenton, N. J.	29.18	5:40 p		49 N	5:43 p	54		66 I	3
Philadelphia, Pa.	29.31	6:40 p		32 N	5:33 p	34		60 I	
New York, N. Y.	29.08	7:15 p		81 N [5]	7:27 p	99			5
New Haven, Conn.	28.86	8:50 p	26 NNE	33 N	11:38 p	38 NE	8:09 p	65 I	0
Hartford, Conn.	28.94	9:50 p	41 N	50 N	10:03 p	62 N	10:05 p	109 [4] N I	3½
Fishers Island, N. Y.	28.41	9:45 p	17 NE	78				96	
Block Island, R. I.	28.34	10:09 p	38 SW	82 SE [5]	9:30 p	88 SE	9:31 p		7
Providence, R. I.	28.48	11:20 p	20 NW	43 SE	10:04 p	49	10:04 p	90 ESE	2
Nantucket, Mass.	29.04	11:28 p	54 SW	57 SW	11:47 p	79	12:45 a	90 [3] I	
Fall River, Mass.	28.53	10:30 p	— ESE						
Worcester, Mass.	28.92	10:50 p	— NNE						
South Weymouth, Mass.	28.55								
Blue Hill, Mass.	28.62	12:11 a	12 NW	67	10:40 p	77	10:43 p		
Boston, Mass.	28.62	12:25 a	15 NNE	60 NE	10:23 p	72 NE	10:28 p	98 I	5h.–17 m.
Concord, Mass.	28.78	1:10 a	26 N	60	9:45 p	65	9:48 p		
Gloucester, Mass.	28.61	12:40 a	20 NE [3]	70 [2]	10:50 p				
Rockport, Mass.	28.59	1:00 a	15 ENE	70 E	1:35 a			80	
Concord, N. H.	29.16	1:45 a		41 NE	12:05 a	47		55 H R	2
Portland, Maine	29.01	3:10 a	26 N	40 NE	1:08 a	50	1:08 a	60 [2]	1
Bangor, Maine	29.14	6:00 a	15 NNW	40	7:30 a	58	7:00 a	72	
Eastport, Maine	29.01	8:00 a	4 WSW	39 E	3:50 a	40	3:52 a		0.2
Millinocket, Maine	29.37	7:30 a	19 NNE	25	6:30 a				
Houlton, Maine	29.37	7:40 a	18 N	22	6:26 a	33	6:32 a		
Extreme pressure and highest velocities	27.97			90 [2] W		134		150 [2]	7

[1] Data represents observations taken on the 14th and 15th of September. [2] Estimated.
[3] Indicator failed before highest velocity. [4] Clocked for 4 seconds (10:07 p). [5] Equals or exceeds all previous records.
I Wind taken from indicator. H R Wind taken from hourly record.

TABLE 2.—*Comparative data on the hurricanes of Sept. 17–21, 1938, and Sept. 8–16, 1944*

Storm	1938	1944
Date	Sept. 17–21, 1938	Sept. 8–16, 1944.
Place where first reported	Near 21° N., 52° W	Located by aircraft reconnaissance near 22.5° N., 62.5° W.
Coast lines crossed	New York and Connecticut	New York, Connecticut, Rhode Island, Massachusetts, and Maine.
Lowest barometer reported at sea.	943.1 millibars (27.85 inches) S. S. *Carinthia*.	
Lowest barometer reported along coast.	946.2 millibars (27.94 inches) at Bellport Coast Guard Station, Long Island, N. Y.	947.2 millibars (27.97 inches) at Hatteras, N. C.
Maximum wind velocity and direction for a 5-minute period.	87 miles per hour from the southwest at Providence, R. I., Blue Hill, 121 S. [1]	Estimated 90 miles per hour from the west at Hatteras, N. C.
Extreme wind velocity and direction (fastest mile from register).		134 miles per hour at Cape Henry, Va.
Velocity of extreme gust	186 [1] miles per hour at Blue Hill Observatory, Milton, Mass.	Estimated 150 miles per hour at Cape Henry, Va.
Place of dissipation	Ontario, Canada	Merged with extra-tropical LOW in the north Atlantic ocean southeast of Greenland.
Number of persons killed	494 lives lost in New York and the New England States.	46 lives lost along the east coast. 344 lost at sea.
Estimated damage	$250,000,000 to $350,000,000	Approximately $100,000,000.

[1] The extremely high wind at Blue Hill at some distance from the hurricane center, can partially be attributed to the upslope effect at that station. Winds at the level of the surrounding country were considerably lower.

TABLE 3.—*Storm tides during the hurricanes of Sept. 17–21, 1938, and Sept. 8–16, 1944*

Station	1938		1944	
	Highest tide [1]	Time of highest tide (E. S. T.) [2]	Highest tide [1]	Time of Highest tide (E. S. T.) [2]
	Feet		*Feet*	
Hatteras, N. C.	5.0	8:00 a. m.	7.0	9:30 a. m.
Norfolk, Va.	4.4	1:30 p. m.	5.8	12:30 p. m.
Cape Henry, Va.	4.0	10:15 a. m.	[3] 3.6	12:45 p. m.
New York, N. Y.	6.4	4:30 p. m.	6.4	8:30 p. m.
New Haven, Conn.	9.4	9:00 p. m.	10.5	10-11 p. m.
Providence, R. I.	17.6	6:00 p. m.	12.0	10:45 p. m.
Boston, Mass.	11.3		11.4	10:45 p. m.

[1] Height above mean low tide.
[2] Storm tides for the 1938 hurricane were observed on Sept. 21 and those for 1944 on Sept. 14.
[3] Estimated.

TABLE 4.—*Fatalities, casualties, and property damage in the hurricane of Sept. 8–16, 1944**

State	Killed	Injured	Homes destroyed	Homes damaged	Other buildings destroyed	Other buildings damaged	Boats destroyed	Boats damaged
Connecticut	4	0	60	5,136	500	4,550		
Delaware	0	0	0	1,800		850	0	
Maryland	0	0	0	650	15	300		
Massachusetts	26	9	230	3,898	158	915	110	534
New Jersey	9	320	463	3,066	217	635	21	101
New York	6	1	117	2,427	272	852		
North Carolina	1	4	28	316	80	351		
Rhode Island	0	4	23	5,525	368	7,597		
Virginia	0	0	0	1,350	31	782		
Total	[1] 46	338	921	24,168	1,641	16,832	131	635

[1] A release by the public relations office of the fifth Naval district lists 344 men, dead or missing, from 5 vessels wrecked and sunk during the hurricane of Sept. 8–16, 1944. The casualties were from the destroyer *Warrington*, the Coast Guard cutters *Jackson* and *Bedloe*, the light vessel *Vineyard Sound*, and the minesweeper *YMS-409*. The cutters capsized and sank while protecting a Liberty Ship torpedoed off the North Carolina coast, and the light vessel dragged anchor and sank about 2 miles to the northeastward of her station off Martha's Vineyard, Mass.

*Fatalities, casualties, and property damage in the hurricane of Sept. 17–21, 1938**

State	Killed	Injured	Homes destroyed	Homes damaged	Other buildings destroyed	Other buildings damaged	Boats destroyed	Boats damaged
Connecticut	97	109	101	1,878	1,235	2,301		
Massachusetts	117	331	298	3,021	1,111	2,406		
New Hampshire	12	32	31	1,051	292	1,133		
New Jersey	0	0	0	2	0	0		
New York	60	31	57	405	156	173		
Rhode Island	207	204	441	1,378	677	719		
Vermont	1	1	8	284	93	388		
Total	494	708	936	8,019	3,564	7,120	2,605	3,369

*Condensed from reports released by the American Red Cross.

Chart I. Tracks of the Destructive September Hurricanes of September 1938 and 1944.

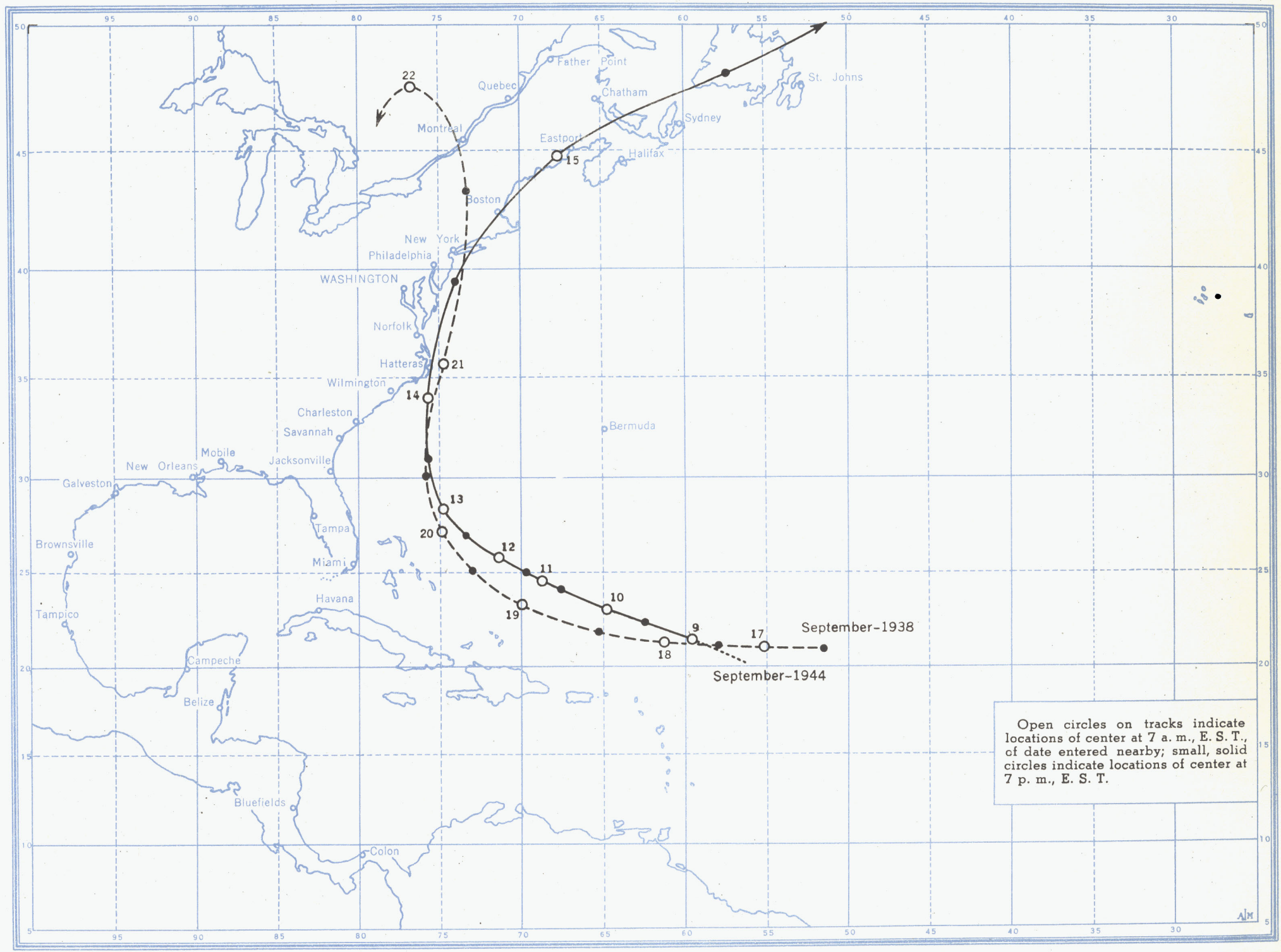

Chart II. Tracks of the September Hurricanes of 1815 and 1821.