

A tropical storm of moderate intensity developed over the eastern portion of the Carribean Sea on the 23d and after moving westward, it passed northwestward over the Bahama Islands to a position a considerable distance off the Georgia coast, where its recurve to the northeast was obstructed by high pressure to the north and east, and it was forced inland over Georgia and the Carolinas, causing torrential rains on the 29th and 30th. Wireless reports from vessels off the south Atlantic coast while this storm prevailed, were to the effect that high winds and seas, and heavy rains were in progress. Advisory warnings were sent to ports on the Atlantic and Gulf coasts daily following the appearance of this disturbance in the West Indies, and no loss of vessels or lives has yet been reported. While the disturbance was in progress off the south Atlantic coast another storm developed over the middle Gulf and moved thence westward and passed inland near the mouth of the Rio Grande, on the 31st. Advisory warnings were issued on the 27th and northeast storm warnings were ordered for the Texas coast the morning of the 30th. High winds and high tides were experienced along the lower Texas coast, and there was some damage to property in the vicinity of Brownsville.

The following remarks from the Corpus Christi Daily Caller of August 31 referred to the work of the Bureau in connection with this storm:

On account of boisterous seas and unfavorable weather reports, the *Grey Fox* yesterday hugged Central Pier, not venturing forth on her customary visit to Tarpon. Several other boats, mostly fishing craft, were deterred from sailing by the red flags floating from the United States signal pole. This is one of many concrete examples of the value of the Weather Bureau.

## WEATHER, FORECASTS, AND WARNINGS FOR THE MONTH.

By EDWARD H. BOWIE, in charge of Forecast Division.

high tides were reported on the Louisiana and Texas coasts. Torrential rains were recorded along the Texas coast. No wrecks of vessels or loss of lives have so far been reported. Ample warnings were issued in connection with this storm, particularly to Gulf interests affected.

The following is an extract from a report by the district forecaster at New Orleans, La., on the above-mentioned storm:

The advisory warnings relative to the location and probable movement of the tropical disturbance were received daily commencing September 6, and were distributed by telegraph to shipping in ports along the Gulf coast and by wireless to several vessels in the Gulf of Mexico and Caribbean Sea. Among other advices the following was issued on the 13th: "Continue northeast storm warnings 10 p. m. all stations Texas coast. Tropical storm apparently approaching south Texas coast. High northeast to north winds indicated for next 24 hours." The next day the following was issued: "Advisory 9:10 a. m. Texas coast. The tropical disturbance is moving inland near the mouth of the Rio Grande, where it shows considerable intensity this morning. High east winds and dangerous high tides will continue on the coast of Texas to-day and possibly to-night." A wind velocity of 60 miles from the east was reported from Corpus Christi during the 12 hours ending 8 p. m., the 14th, and again at 8 a. m. of the 15th. The tide in the bay at Corpus Christi was higher than for several years. The warnings of the Weather Bureau were so well and efficiently distributed that no loss of life has been reported from the Texas coast and there have been no reports of damage to shipping within the territory that could be reached by the warnings.

The following is an editorial from the Times-Democrat, New Orleans, La., of September 15:

About one week ago the United States Weather Bureau sent out advices warning shipping that a tropical storm had made its appearance in the vicinity of Porto Rico. Daily advices were distributed by wireless to ships at sea and by telegraph to coast stations so that vessels at sea were kept as well posted as to the location, movement, and severity of the storm as the vessels lying at anchor in the harbors along the coast. Monday night reports received by the Weather Bureau indicated that the storm was 100 to 150 miles out in the Gulf, south of Louisiana. Tuesday morning the slow rain and gusty winds, which characterize an approaching storm, prevailed over southern Louisiana, and sugar and rice planters were greatly alarmed, because a severe wind storm would have damaged the cane badly and rice being ripe, the grain would have been thrashed out and the yield greatly reduced. With every local prospect indicating the approach of the storm, the United States Weather Bureau sent warnings broadcast announcing that the tropical storm was some distance southeast of the Texas coast, moving northwestwardly toward the mouth of the Rio Grande, and that brisk winds and high tides would prevail along the Texas coast. Wednesday morning the hurricane was moving inland near the mouth of the Rio Grande, as predicted by the Weather Bureau twenty-four hours previous.

The following editorial appeared in the Daily Picayune, New Orleans, La., September 15:

Notwithstanding the threatening weather which prevailed over southern Louisiana Tuesday no damage was experienced, as the storm passed southward some distance out in the Gulf. However, sugar and rice planters were greatly alarmed. A severe wind storm at this season of the year would lodge the cane and would result in great injury to the rice crop, because few of the rice planters are prepared to flood their rice fields to such an extent as would prevent great damage from high winds. The excellent advices issued from day to day by the United States Weather Bureau in connection with this storm from the date of the inception has been in keeping with its past record. Tuesday morning, long before the storm was being felt at any coast station, shipping, commercial, and agricultural interests along the Gulf coast were advised that the storm was some distance out in the Gulf southeast of the Texas coast, and was moving in a northwesterly direction toward the mouth of the Rio Grande. Yesterday morning the storm was moving inland, with its center near the mouth of the Rio Grande, and the high winds and high tides had occurred along the Texas coast, as though conditions had been made to fit the Weather Bureau's warnings. The value of a service which can foretell where such storms will strike the coast, as was done in this case, can not be estimated. These are but a few of the many great services rendered the public by the Weather Bureau since Prof. Willis L. Moore became its chief. He has given special attention to the improvement of forecasts and warnings, and the general public can testify as to the marked degree of success which he has attained.

On the morning of the 6th conditions over the eastern Caribbean Sea were unsettled and a 6 p. m. special from San Juan, Porto Rico, showed a steady fall in the barometer accompanied by high wind. During the night of the 6th, at San Juan, the velocity of the wind increased to 72 miles an hour from the northeast, with lowest barometric pressure 29.76 inches at 7:20 p. m. The center of the storm passed south of the island, causing considerable damage thereon, which was confined largely, however, to the north coast, east of San Juan; great havoc was reported by the telegraph and telephone companies to their lines and considerable damage was caused by phenomenally heavy rain, which washed cane fields and raised rivers to unprecedented flood heights. Rainfall at some stations broke all previous records for intensity, a fall of 13 inches in 12 hours being reported from Comerio. Brisk to high northeast winds, occasionally reaching hurricane force, prevailed over practically the entire island during the late afternoon and the night of the 6th, the highest winds occurring between 7 and 8 p. m., with a secondary high velocity between midnight and 2 a. m. On the morning of the 7th the storm was apparently central southwest of Porto Rico, moving in a west-northwest direction. All shipping was advised as to the location, intensity, and probable direction of movement of the storm. On the 8th the storm was apparently central south of the east end of the Island of Cuba, and on the 10th was near the north coast of Yucatan and moving northwest. It reached the Texas coast near the mouth of the Rio Grande River on the 14th. High winds and unusually

## THE TROPICAL HURRICANES OF OCTOBER, 1910.

There is some evidence that two tropical disturbances, one closely following the other, passed over the western end of the Island of Cuba during the second decade of October, 1910, both of which caused much damage in Cuba. These storms took quite distinct courses, the first after passing over Havana and slightly west of Key West, Fla., lingered northwest of the Florida keys for two days and then appeared to dissipate in the central part of the Gulf of Mexico; while the second storm moved northward over central Florida and passed eastward into the Atlantic Ocean off the coast of South Carolina.

The first hurricane was observed southwest of Cuba near the Yucatan Channel on the morning of October 13, and advisory warnings were issued at 9:30 a. m. to Gulf and south Atlantic ports. From that time until the final disappearance of the second hurricane in the Atlantic shipping interests and all parts of the country likely to feel the effects of the disturbances were kept fully informed of the position, probable course and force of the storms, resulting unquestionably in the saving of an immense amount of property and in greatly diminishing the loss of life.

On the evening of October 13 the first tropical storm was central south of the western end of Cuba; it reached Havana at about 1 o'clock on the 14th accompanied by a deluge of rain that



flooded the streets. Considerable damage to crops and other property resulted from the heavy rains and high winds in western Cuba. The storm then advanced northward to the Florida keys. The first detailed account of the progress of the disturbance is given by Mr. F. D. Young, in charge of the local office of the Weather Bureau at Sand Key, Fla., who reported as follows:

The barometer began to fall about midnight of the 12th, and fell slowly but steadily to 29.55 inches at 5 p. m. on the 14th. Much rain fell on the night of the 13th, and the wind velocity steadily increased. At 3.30 p. m. the waves began to wash over the island, carrying the sand from under the light-house and shifting it to a position farther north. The barometer remained at about 29.60 inches till 8 p. m. on the 16th. On the morning of the 16th the waves began to subside and several steamers passed.

High southeast winds and heavy rains also occurred at Key West on the 14th, but at that point also the barometer began to rise on the 16th. Reports from vessels at sea by wireless, as well as the logs of ships entering the harbor of Tampa after passing through the storm, indicate that the first hurricane moved northward into the central portion of the Gulf of Mexico west of the Dry Tortugas. At 8 a. m. of the 14th the Ward Line steamship *Vigilancia* was reported about 180 miles west of Sand Key with the barometer 29.40 inches, and at the same hour the Mallory Line steamship *Brazos* was 164 miles west of the Tortugas and reported a strong gale with high seas from the east-northeast, pressure 29.82 inches. The disturbance apparently maintaining its great intensity and wide extent was almost stationary in the east Gulf during the 15th and 16th, and was then dissipated in the central Gulf. The following report is of special interest:

Report of Captain Sullivan, American steamship *Jean*. A new steel ship, 3,125 gross tons; length, 311 feet; beam, 41.6 feet; depth, 21.8 feet. Time, 90th meridian:

After running into a fierce gale in which she lay to for 24 hours off Jupiter, the ship made for Florida Strait, expecting that the hurricane had passed. Sand Key was passed at 11.55 p. m. on the 16th, and signals exchanged. Ship headed east-southeast. It was then blowing a strong gale from an easterly direction, sky cloudy and threatening. At the beginning of the hurricane the position was made from well-known landmarks, latitude, 24° 26' N., longitude, 82° 41' W. Ship hove to. The storm lasted from 5 a. m. to 8 p. m., during which time the ship drifted against unusually strong stream from Gulf 60 miles in a direction west-southwest by west  $\frac{1}{2}$  west. During this time it was impossible to see the sea for the rain and spray. Immense seas came over the ship, even wetting down the chart house on the bridge deck, so that water had to be constantly baled out. Boats were stove in, and much of the fittings loosened, and the port bow plate was dented as if the ship had run into some heavy fixed obstruction. At 11:25 a. m. the ship arrived at the center of the storm. Overhead the sky was perfectly clear, but the horizon was dirty, wind almost calm, and sea fearfully choppy. At 1 p. m. the wind came fiercely from the west-northwest of hurricane force lasting till 7:30 p. m., when it began to moderate. The wind blew hardest when the barometer was between 28.10 and 28.30, both going up and down. The barometer at the time of reaching the center at 11:25 a. m. was below the scale, but was carefully marked with the set hand and subsequently with a file. This was estimated by means of a paper protractor by Mr. Wurtz as 27.72 inches, which with present correction would be 27.80 inches. The barometer rose slightly on entering the center. Ship's position at that time approximately 27 miles south of Tortugas.

On the 16th of October heavy rains again began to fall in Havana accompanied by dangerous gales, and a new hurricane of great intensity was observed central slightly west of Havana on the morning of October 17. The full force of this storm was felt at Havana during the 17th. Hurricane warnings were continued at southern ports of the United States and special efforts were made to disseminate warnings of the approach of a dangerous storm to all points in Florida and on the south Atlantic coast. The progress of the storm is revealed by the reports of the Weather Bureau officials at Sand Key, Key West, Jupiter, Tampa, and Jacksonville, Fla., Savannah, Ga., and Charleston, S. C.:

*Sand Key, Fla.*—The barometer began to fall rapidly about midnight of the 16th, and reached 28.62 inches at 12:20 p. m. on the 17th. At noon the wharf and wood pile were washed away and the light-house shook and swayed in the wind. Great trouble was experienced in keeping the doors closed. The force of the wind drew large nails from the doors. The sand was all washed from sight by this time, and monster waves broke over the

whole island, reaching nearly up to the water tanks. Spray from the waves mingled with the rain and made it impossible to see more than 200 feet.

The wind blew from the southeast up to 1:05 p. m., when it changed to south. The velocity increased and the swaying of the building stopped the clock several times. The gusts sometimes lasted several minutes and their estimated velocity was 125 miles an hour. At 1:30 p. m. the dingy broke away and was lost, and the boathouse went to pieces and was washed into the sea. At 1:50 p. m. the barometer reached its lowest point 28.40 inches. Telephonic communication with Key West was broken at 2 p. m. The wind shifted to southwest at 6 p. m.

At about 3:30 p. m. the barometer began to rise slowly, but the wind continued with unabated fury till about 6 p. m., when it began to subside. At 4 a. m. on the 18th the wind was still strong enough to shake the light-house, but the size of the waves had very much diminished. Telephone communication with Key West was resumed at about 7 p. m. After the storm was over the island was completely covered with water about 2 feet deep at its shallowest point, and about 5 feet deep under the light-house.

Some conception of the force of the wind may be gained from the following. The windows and doors were all kept closed, but two panes of glass were blown out on the windward side. The air that was forced in through these holes increased the pressure at the opposite side of the house about 0.05 inch. When the door was opened to let the air go through the barometer fell about 0.05 inch and when the door was closed it immediately rose again.—F. D. Young, Assistant Observer.

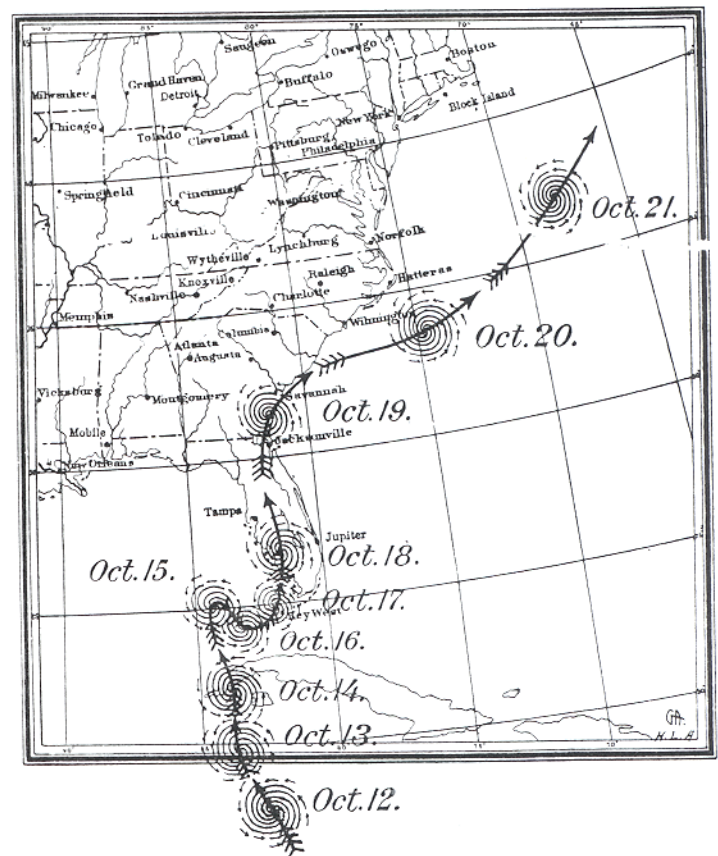


FIG. 1.—Path of the storm.

*Key West, Fla.*—The atmospheric pressure rose slightly on the 16th to 29.60 inches. After 10 p. m. it began to fall rapidly and reached its lowest reading, 28.47 inches, at 3:20 p. m. on the 17th. A gradual rise in pressure followed to 29.29 inches at midnight of the 17th, and to 29.75 inches at midnight of the 18th.

Brisk to high northeast winds varying in velocity from 30 to 50 miles with gusts of 60 miles an hour prevailed from midnight to 8 a. m. on the 17th, shifting to southeast after 8 a. m., and increasing in velocity to from 48 to 80 miles an hour. At 12:25 p. m. the wires to the anemometer cups were torn away by the wind at the moment when the velocity was 72 miles an hour. From 3 to 4 p. m. the wind was from the south, after which it shifted to southwest and continued steady in that direction during the remainder of the 17th and 18th. The wind reached its greatest force between 2:30 and 4:30 p. m. of the 17th, when it was estimated that the highest velocity was over 90 miles an hour, and that gusts of 110 miles an hour were frequent. The wind lessened slightly after 5 p. m. (17th), but continued during the night until 3 a. m. of the 18th with a velocity of over 60 miles an hour, after which it gradually diminished. The storm lasted 30 hours.

The tide and sea swell were unusually high. At 7 a. m. of the 17th the waves were dashing over the southern and western sections of the island



and by 9 a. m. the Weather Bureau grounds in the southwestern section of the city were entirely submerged. The tide, wind, and swell steadily increased during the morning and afternoon, and at 3 p. m. the basement of the building was covered with water to a depth of 7 feet. The new United States army dock and the marine hospital dock were swept away and the debris pounded against the office building with terrific force. The waves at times were over 15 feet high and dashed against the office windows. The rainfall during the storm was moderately heavy, the estimated amount being 3.89 inches up to 8 p. m. on the 17th. At 1:50 p. m. the rain gage was carried out to sea. The damage in the city and along the keys was considerably less than during the storm of the preceding year, and a conservative estimate places the amount below \$250,000. The destruction was mostly limited to marine property and to houses along the beach. The French line steamship *Louisiane* went ashore at Sombrero Light, but 600 passengers were safely removed by the revenue cutter *Forward*. A number of small schooners were wrecked.—*C. J. Doherty, Observer.*

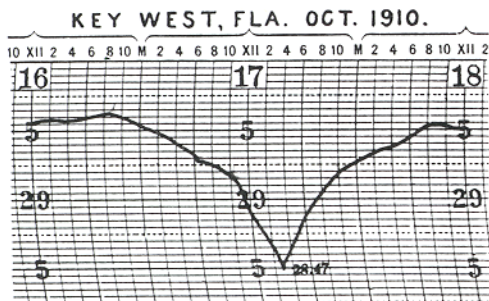


FIG. 2.—Barograph trace at Key West, Fla., October 17, 1910.

The hurricane entered Florida south of Cape Romano and thence pursued a northerly course over central Florida, but somewhat nearer the west coast and entered southeastern Georgia west of Jacksonville on the morning of the 19th.

*Tampa, Fla.*—The wind set in quite steady from the northeast on the night of the 12th increasing somewhat during the 13th. On the 14th the wind increased to brisk, shifting to more easterly and the barometer began slowly to fall. Toward night it backed again to northeast, fresh. The clouds became denser with alto-stratus from the east and cirrus from the southwest. Over the northwestern horizon clear sky was visible much of the time, while it became very threatening with clouds of dark gray color in the south. No great amount of rain occurred until the 15th. The pressure slowly decreased, the wind becoming more steadily northeast and continuing brisk, while high winds and sea were reported beyond the bar. On the 16th a more rapid fall in pressure occurred, reaching 29.71 inches at midnight. The rain fell with little interruption until 10:15 a. m. when it ceased. On the 17th the barometer fell at an increasing rate, the wind rose steadily and rain began early in the morning. By 9 a. m. all the clouds were denser and rapidly flying scud crossed the sky. By the night of the 17th the wind was blowing a gale still from the northeast, coming in violent puffs followed by lulls. Wires were beginning to go down and communication with the outside world became more difficult. At midnight the barometer had fallen to 29.30 inches, breaking all previous records, and continued falling until about 7:45 a. m. of the 18th. The wind increased during the early morning hours of the 18th, attaining an extreme velocity of 60 miles an hour at 2:37 a. m., but it is believed that momentary gusts reached a velocity of at least 70 miles an hour, though the maximum recorded for a continuous 5-minute period was 48 miles at 2:18 a. m. The verifying velocity was last attained at 6:57 a. m.

The lowest pressure by corrected barograph was 28.91 inches at 7:45 a. m. By this time the wind had shifted to northwest, and by 11 a. m. it had become west, where it remained until the storm velocity had ended. By 10 p. m. on the 18th the wind was blowing moderate from the southwest. During the 19th the barometer rose steadily, but did not reach normal until the 21st of October.

Locally the damage was comparatively small for so severe a storm, probably the greatest loss being to the citrus interests. The most careful estimate, based on comprehensive reports from 200 localities, has been made by the Citrus Exchange. Their estimate is that about 10 per cent of the whole crop has been destroyed, while in only a few instances have the groves been injured. The least damage lies in the north of Tampa, while the damage increases southward toward the Everglades, which is probably the part of the peninsula traversed by the center of the storm.

Shipping in Tampa Bay and to the northward was damaged but little. The northeast winds carried the water out of the bay, and the lowest water ever known on this coast was generally reported. In the Hillsboro River at Tampa the water fell 9 feet below mean tide, the usual depression being about 1 foot. Forty vessels were counted at daylight on the morning of the 18th aground in the river. Little damage resulted, except in the case of

the small bay steamer *Mistletoe*, which rolled over on the bank so far as to fill with water as the tide returned. The estimated damage was about \$1,500. The other small craft appear to have suffered no injury, although in some cases the owners were put to some expense to maintain an even keel till the water returned.

A few small boats on the coast and possibly some buildings and other structures were injured or destroyed, but there appears to have been no loss of life in this section.

More destruction attended the storm in the vicinity of Charlotte Harbor and the Caloosahatchee River. Seven men were drowned in the wrecking of four Cuban fishing schooners at Punta Gorda; a negro was drowned in attempting to cross the Peace River near Nocatee, and a one-armed man and a baby were drowned by high tide in the vicinity of Thousand Islands. Dwellings and property were also destroyed in the vicinity of Chokoloske, and aid was required to feed and cloth the sufferers. It is also reported that buildings at Flamingo were destroyed. The center of the storm must have entered Florida near Cape Romano, for while the tide seems to have been blown offshore from Boca Grande northward, the keys and islands south of the cape were swept by great waves from the Gulf that reached a great distance inland. The survivors could only escape by climbing trees.—*George B. Wurtz, Local Forecaster.*

*Jupiter, Fla.*—The first storm began on the 13th and lasted until the 16th, causing unusually heavy rains but very little wind and not much decrease in pressure. The lowest barometer, as shown by the barograph, was 29.70 inches; the highest wind 37 miles an hour. The wind direction was southeast until 1 p. m. of the 14th, when it backed to northeast as the second storm approached. The warnings issued on the 17th by the Weather Bureau were especially timely and fortunate. People believing the weather to be breaking after the first storm were resuming their usual avocations, boats and other property that had been protected were being brought out for use, and the people might thus have been caught quite unawares. The warnings, however, were distributed as widely as possible, boat parties were turned back, farmers and others were advised to hurry home, work on a big bridge was stopped, and property made safe.

The second storm began with high and increasing east winds, rain, and diminishing pressure. Storm velocity began at 2 p. m. on the 17th, the wind steadily increasing to 56 miles an hour at 6:25 p. m.; then it moderated rapidly to 24 miles and veered to southeast at 8 p. m. From 8:20 p. m. it steadily increased to 58 miles at 10:20 p. m., and from 50 to 58 miles was maintained until midnight, when the wind shifted to south. From 12:20 a. m. to 6 a. m. on the 18th the velocity ranged from 60 to 70 miles until it veered to the southwest at 9 a. m., when the wind gradually diminished in force, falling below a gale at 7:45 p. m.

The rainfall at this point did more damage than the high wind. It had rained every day from the 3d to the 13th, with a total fall of 5.96 inches, and the creeks and flat woods were full of water when the first storm began. From the 14th to the 18th, inclusive, 14.27 inches more fell. The inlet being closed the rivers rose 8 feet above normal high water, which, in a flat country like this, puts practically all land under water from 1 to 8 feet. Fortunately the sea remained low and comparatively smooth, so that it was possible to open the inlet and let the water out. Distant lightning was observed at short intervals in the south and west from 8 p. m. to midnight on the 17th, but no thunder was heard. Vivid lightning, loud crashing thunder, and local whirls that prostrated trees were reported in the Everglades, 50 miles southwest of Jupiter, during the night of the 17-18th. Large numbers of pine trees were blown down by the south wind in the vicinity of Jupiter. The lowest atmospheric pressure was 29.21 inches at 3 a. m. on the 18th.

Along the coast where nine-tenths of the people live only one life was lost, one man having been killed by falling timbers near Lemon City. The property loss was confined to small boats, boathouses, and docks. These losses will total about \$3,000 in the section of 210 miles from Titusville to Miami. The railroad bed of the Florida East Coast Railway was seriously washed out in several places and repairs will be very expensive.

At sea the American schooner *Harry T. Hayward*, bound from Baltimore to Knight Keys, Fla., was blown ashore at Boca Ratone and is said to be a total loss. Three seaman were drowned; the rest of the crew were saved after being in the rigging 12 hours. The vessel and cargo are said to be valued at \$110,000.

One unusual feature was the absence of swells and high seas; the ocean remained low and there was no ground swell after the storm. The inlet was opened on the 17th and the sea was so smooth that men worked in it, the water surface being 8 feet lower than the river.—*H. P. Hardin, Observer.*

The passage of the hurricane over the latter part of its course presents fewer matters of interest, as it undoubtedly curved eastward into the Atlantic south of Savannah. Mr. A. J. Mitchell, Section Director at Jacksonville, estimates that the velocity of the storm was about 12 miles an hour, and that the center passed about 30 miles west of Jacksonville. At Lake City, about 40 miles distant, the wind backed to north and northwest, while at Jacksonville it veered from northeast to southwest and west. The usual calm was observed at the center of the storm. At Jacksonville the pressure, which had been declining slowly, began to fall more rapidly after the morn-



ing observation of the 17th, but did not reach its lowest point, 29.09 inches, until 12:30 p. m. on the 19th, at the moment when the wind shifted to southwest. The wind did not attain any great velocity until the 18th, when it increased steadily from the northeast and reached a maximum velocity of 56 miles an hour at 4.05 p. m. From about 10 a. m. to 4:45 p. m. the velocity ranged from 36 to 56 miles an hour, with an extreme velocity for one minute of 65 miles. The wind shifted to southwest and soon to west about midnight of the 18th, the velocity continuing from 36 to 38 miles an hour for the succeeding 10 hours. Rain was continuous on the 18th and the high winds forced moisture into almost every building in the city. The total rainfall during the storm was 5.94 inches, the bulk of which fell from 9:50 a. m. 6 p. m. on the 18th.

As a result of the continuous northeast winds the tide was unusually high, and low places in the city were submerged. Though much apprehension was felt for the safety of the 1,500 or more workmen employed on the extension work of the Florida East Coast Railway between Miami and Key West, no life was lost. Very little damage occurred at Jacksonville. Estimates of the damage to citrus fruits and to truck crops in central and northern Florida vary so widely that a trustworthy statement of the true extent of the loss can not be made, though it must have been considerable.

The interruption of telegraphic communication with cities near the coast led to exaggerated newspaper reports of the damage done in the coast cities of Georgia and South Carolina. At Brunswick, Ga., the docks were under water and the flooded area extended to the railway depot, interrupting traffic for a short time.

The hurricane warning was received at Savannah at 10:20 p. m. of the 17th and was disseminated as quickly and as widely as possible by telegraph and telephone, and at 10:50 p. m. the first hurricane rockets were sent up. Rockets were also sent up at the Yacht Club and at Tybee Island. A special train removed the inhabitants of Tybee Island to Savannah. After 12 noon on the 18th, when the pressure was 29.71 inches, the barometer began to fall more rapidly, reaching 29.52 inches at midnight. During the morning of the 18th the wind steadily increased from the northeast, the weather became more threatening, and at 8:25 a. m. light rain began. In the afternoon the weather was threatening and ominous, with wind of increasing force and gusty in character, and frequent rain squalls. The wind attained a velocity of 50 miles an hour at 1:30 p. m., 60 miles at 11:15 p. m., and at 1:30 a. m. on the 19th reached its highest velocity, 70 miles an hour from the northeast. The wind now diminishing changed its direction from northeast to east at 2:55

a. m. (19th) and to southeast at 5 a. m., and by 9 a. m. had fallen below the verifying velocity of 36 miles an hour. The lowest atmospheric pressure was 29.30 inches at 2 p. m., and by 4 p. m. the wind had backed to northwest and the sky showed signs of clearing.

Mr. H. B. Boyer, Local Forecaster, states that the damage done by the storm at Savannah and its environs was of a minor character. No lives were lost and shipping interests enjoyed complete immunity.

*Charleston, S. C.*—The atmospheric pressure fell slowly on the 18th, reaching a minimum of 29.65 inches; the lowest atmospheric pressure attained during the storm was 29.39 inches at 6:30 p. m. on the 19th. Beginning at 7 p. m. on the 17th the wind gradually increased in velocity until 1 p. m. on the 18th, when a gale of 52 miles an hour was attained. The wind fell off on the afternoon of the 18th, becoming as light as 22 miles an hour from 6:45 to 7:05 p. m. Beginning with secondary high tide at 7:46 p. m. the wind became stronger, with occasional gales, during the night, attaining a maximum velocity of 58 miles an hour at 1:42 a. m. on the 18th, when it became southeast, blowing from that direction until 6:45 p. m. The wind then backed slowly through east and north to northwest. Sudden downpours of rain were frequent on the 18th and 19th. The total rainfall on the 18th was but 0.62 inch and on the 19th 3.04 inches. During a period of 49 minutes, from 8:48 to 9:37 a. m. on the 19th, 1.16 inch of rain fell.

There is no doubt that greater damage to property resulted from the effects of high tides than from the wind. This was especially the case in the rice-growing districts of the Ashepoo and Combahee rivers, where at least one-fourth of the crop was destroyed by the overflow. Roughly it is estimated that such losses may amount to at least \$75,000. No loss of life occurred in this section and property losses in the vicinity of Charleston were small. Here also the tides caused the greatest amount of damage. Although warnings had been given of expected high tides large quantities of perishable goods were allowed to remain in basements, resulting in its damage. On the morning of the 19th the normal high tide was due to reach 6.3 feet, but owing to the storm a height of 8.55 feet was attained, a stage sufficient to cover the low-lying portions of the city and to inundate many basements. The injury to small boats and rafts insecurely fastened will not exceed \$3,000.—*R. Q. Grant, Local Forecaster.*

The hurricanes of October, 1910, have been described in more than the usual detail because of their intrinsic interest and because the remarkably small loss of life and of vessels at sea shows so emphatically the value of the modern system of storm warnings. Without the knowledge of the position, path, and force of the storms obtained by the Weather Bureau and widely disseminated to threatened points the loss of life and of property would undoubtedly have been appalling. The low pressure observed by Captain Sullivan of the steamship *Jean*, 27.80 inches (corrected), ranks among the lowest pressures recorded on the earth's surface. It may be of interest to state that the lowest sea-level pressure ever observed was 27.02 inches on August 2, 1891, during a typhoon in the China Sea. (*Hann. Meteor.*, 2d ed., page 155.)