

moved southwestward to Czechoslovakia, Prague, 30.42 inches; and the low over the Mediterranean had remained practically stationary, but with a slight increase in intensity, and heavy snow and violent gales occurred in Constantinople. On the morning of the 3d snow was reported at Palermo, Sicily. Canals in Holland had frozen over. By February 8 the Mediterranean low had moved northeastward to Kustanai in the Province of Turgai where it rapidly dissipated; pressure increased over southern Europe and remained high in the Provinces of Yakutsk and Irkutsk, Bargusink and Bratski-Ostrog, 31 inches, with an extension to the northwest, Obdorsk, 30.74 inches. By the morning of the 11th, a low of considerable intensity had formed over the Mediterranean, Leghorn, Italy, 29.50 inches, and pressure had increased over northern Europe to 30.77 inches at Helsingfors. By the 12th, the Rhine, Lake Constance, parts of the Baltic, and the Elbe from Hamburg to Dresden were frozen. On the 15th ice floes were floating on the Grand Canal at Venice. High pressure in the north and low pressure in the south prevailed until the 23d of

the month, when the high pressure finally gave way and cyclones were again permitted to take normal courses.

One of the most striking features during the period of January 21 to February 21 was the great preponderance of positive pressure departures over the Northern Hemisphere. During most of the period pressures were above normal over most of the continental areas, the largest departures occurring over Central Asia, where, except for the last few days, pressures were 0.20 inch to 0.90 inch above normal. Negative departures were confined for the most part to rather small areas in northern oceanic regions.

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WATERSPOTS IN THE STRAIT OF MALACCA

The following description of several waterspouts observed in the Strait of Malacca was furnished to the Weather Bureau by Capt. F. G. Randall, master of the British steamship *Flowergate*, in a communication dated at Singapore, February, 1929:

On the morning of the 17th of February, in the Malacca Strait, in latitude 4° 28' N., longitude 98° 51' E., at 10:40 a. m., local mean time, observed waterspouts forming on the starboard bow, about 15 miles distant. The atmospheric conditions at the time were a southeast wind, force 2, sea 1, with heavy, ragged cumulo-nimbus clouds, the approximate height of which by sextant was 2,500 feet, with a range of about 8 points of the compass. Cirrus clouds were observed in the zenith.

Two large and four small waterspouts were observed forming simultaneously, the average length of the well-defined trunks being 1,200 feet; sketch attached. (See fig. 1.) Five minutes after their formation a circular disturbance of the sea beneath the spouts was also observed, but owing to its distance from the vessel, no definite statement can be made as to its nature.

At 12:50 p. m., local mean time, on the same day, in latitude 4° 13' N., longitude 99° 16' E., a well-defined waterspout was observed

about 1 point on the port bow, distant 5 miles. A black trunk was observed reaching to within 20 feet of the sea, and a conical disturbance of fierce intensity was seen immediately beneath the trunk. The water was plainly to be seen ascending in a spiral, but we were unable to tell the period of the revolution. This spout lasted from 0:50 p. m. to 1:15 p. m., when it dispersed. (Fig. 2.)

At 1:20 p. m. a circular distortion of the sea, like water foaming over an area of about 400 feet, was observed about 1 mile distant on the starboard beam. Five minutes later a black trunk was observed descending from the cloud to meet the disturbance on the sea. The direction of rotation was anticlockwise and at a good speed. The water disturbance resolved itself into a conical shape, about 100 feet high, where the spiral became dark. The approximate height of the trunk was observed to be 1,366 feet, by sextant, with an approximate circumference of 100 feet. This spout commenced at 1:20 p. m. and dispersed of its own accord at 1:35 p. m. After the sea disturbance had ceased, the ragged, truncated cone was seen to be still revolving in the cloud, which slowly traveled in a northwesterly direction. After the dispersing of the spout a few heavy drops of rain fell. The atmospheric conditions at time of observation were a southeast wind, force 2, sea 1, and heavy cumulo-nimbus of an approximate height of 2,000 feet.

WATERSPOUT ON HILLSBOROUGH BAY, TAMPA, FLA., APRIL 2, 1929

551.515 (759)

By WILLIS E. HURD

The information contained in this description of a waterspout that formed in Hillsborough Bay on April 2, 1929, was furnished by Mr. George V. Fish, an assistant at the Tampa Weather Bureau Station. At 6 p. m. of that date Mr. Fish and two companions were fishing about a mile from the western shore of the bay, which is here about 5 miles wide, and 7 miles from the business section of the city. (See fig. 3.) At this time a threatening cumulo-nimbus cloud appeared over the eastern shore and the wind freshened. The fishermen began rowing toward their pier on the western shore, and while thus engaged observed a whirl of spray rising on the water almost underneath the spreading cloud. Mr. Fish, believing a waterspout was forming, the rowers made greater haste toward land. Shortly a "gray funnel twisted out of the front of the cloud and down from the center of it dropped a long gray tail as another rose up out of the center of the spray to meet it." They joined in midair producing a slanting spout, the base of which was carried by the wind in advance of the cloud. It was estimated to be about 1,500 feet long, and the vertical height from the water to the cloud base, about 1,200 feet. The spout

was funnel-shaped at top and bottom, the base being about 40 feet in diameter at the point several feet above water where it emerged from the ring of spray. The diameter midway was approximately 10 feet. The whirling direction of both spray and spout was distinctly clockwise.

While the waterspout was taking a southwesterly course toward the center of the bay, the Collier Line steamer *City of Tampa* was proceeding southward on a line that seemed likely to intercept the path of the phenomenon. As the two neared each other, Captain Borden reduced the steamer's speed to permit his passengers to view the spout at close range. They were so near at one time that it was necessary to hold hats and fold the deck chairs, owing to the stiffening wind, and the captain, becoming fearful of an actual contact, fired at the spout with the live-saving gun, whereupon the spiral broke and faded though the ring of surface spray whirled on past the steamer. Shortly afterward the spout reformed and "after meandering back across the vessel's bow a second time, settled on a course in the general direction of Tampa Bay and the open gulf."

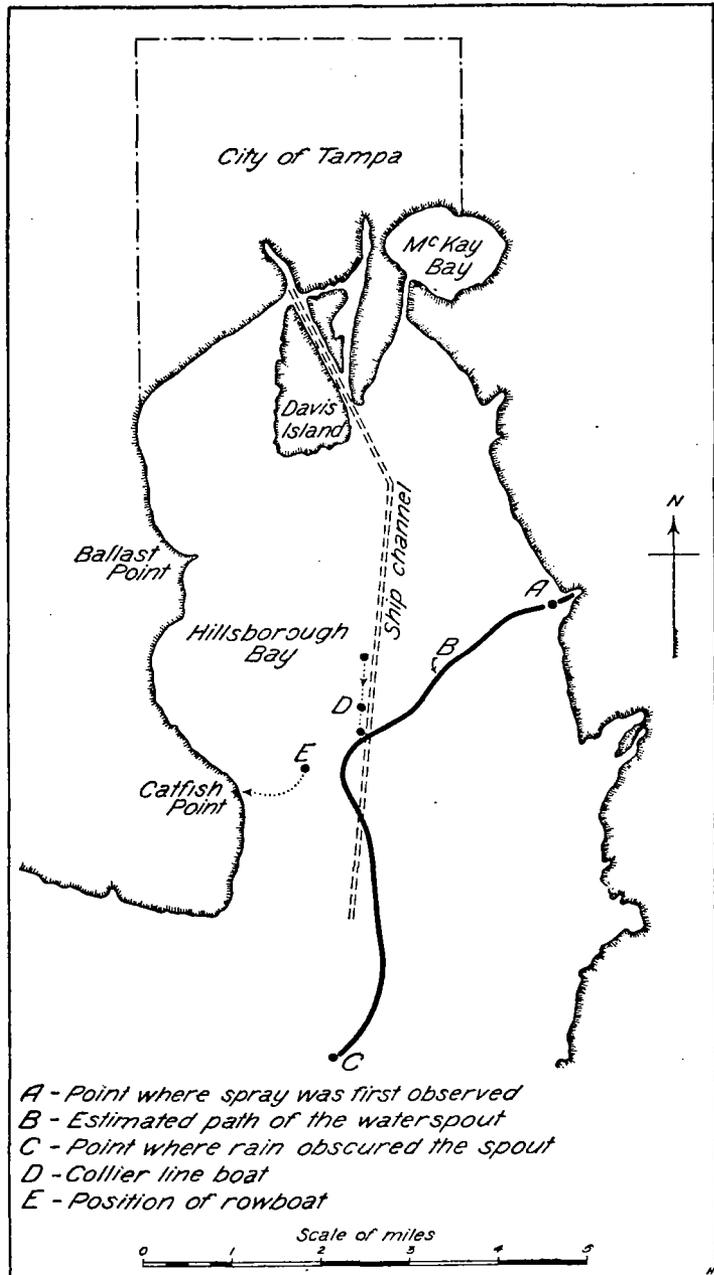


FIGURE 3.—Hillsborough Bay, Tampa, Fla., showing path of the waterspout of April 2, 1929, the course of the steamship *City of Tampa*, and the position of the observer. From drawing by Mr. George V. Fish, of the Tampa Weather Bureau Station

It now remained under observation until a rainstorm, coming between it and the steamer, obliterated it from further view.

"A tremendous roaring accompanied the spout," said Mr. Fish, although he did not hear it, this information being later given to him by Captain Borden. "A solid cone of water rose up in the center of the spray to a height of from 15 to 18 feet. Around this cone the spray was being whirled, the rays from the setting sun producing on it all the colors of the rainbow."

The following generalizations were arrived at by the observers:

(1) The whirl on the water was visible before the funnel appeared in the cloud and before any whirling motion in the cloud was observed.

(2) The spout dropping from the cloud and the one rising from the spray developed simultaneously and met in midair.

(3) The forces at work were so strong that the pressure at the center was lowered to a point whereby the water was pressed up to a height of 15 or 18 feet, and mud and seaweed were drawn up from the bottom of the bay through 15 feet of water.

(4) The path of mud left by the spout is the best check on the diameter of the spiral at the base. The path on the water was estimated to be about 50 feet wide.

(5) The waterspout preceded the rain by from 3 to 5 miles. After the base spray passed the bow of his ship, Captain Borden steamed directly under the great funnel in the cloud to observe the mighty whirling. All was in brilliant sunshine at the time.

(6) The water spray was drawn so rapidly to the cloud that the spiral upward movement was plainly evident.

(7) The circulation on the water was clockwise.

(8) No accurate check on the duration of the spout is obtainable, since it was continuing unabated when the rain hid it from view.

Remarking upon the frequency of the phenomenon in Hillsborough Bay, the man from whom Mr. Fish rented the boat "said that he had seen seven waterspouts during one thundershower the previous summer."

Mr. Fish mentioned "another experience had by Captain Borden some years ago with a sailing vessel in a waterspout. It came upon him rapidly, and while he made all haste to lower and secure his canvas, he was unable to complete the work before the waterspout engulfed the ship. It stripped his booms, breaking some, and wrecked other parts of his deck gear, as the vessel pitched and spun about, finally to emerge deluged with water."

EVIDENCE OF PROLONGED DROUGHTS ON THE COLUMBIA PLATEAU PRIOR TO WHITE SETTLEMENT

551.573 (79)

By OTIS W. FREEMAN

Ellsworth Huntington, A. E. Douglass, and others have presented much evidence favoring wet and dry years alternating over centuries of time in the southwestern United States. The following note presents proof of prolonged drought in the past on the Columbia Plateau in the Northwest.

A large number of lakes exist on the lava plateau southwest of Spokane. These occupy basins in channels of the "scablands." According to J. H. Bretz, of the University of Chicago, a great flood was produced by the very rapid melting of a continental glacier. The swift torrents scoured away the surface soil and the resulting bare basaltic bedrock is locally called "scabrock."

The numerous interlaced channels once filled by flood waters are called "scablands." Basins eroded by the flood are often occupied by lakes which vary in size from mere ponds in potholes to deep, rock walled lakes 10 miles in length.

Most of the lakes have no visible outlet. Many are highly alkaline, especially in the drier sections of the Columbia Basin. Typically the lakes occupy elongated basins with steep cliffs descending abruptly into deep, rock water, but in places along the shores of the lakes, particularly at their heads, material has been deposited, making swamp or shallow water. Decreased rainfall causes the water level to sink and trees can grow on the