

covered a limited area in the westerly quadrants, as shown by following storm logs.

British S. S. *Arkansas*:

Gale began on the 17th, wind NW. Lowest barometer 29.70 inches at 5 p. m. on the 20th, wind N., 10, in latitude 42° 30' N., longitude 30° 31' W. End of the 22d, wind NNE. Highest force of wind 10; shifts NNW.-NNE.

Danish S. S. *Virginia*:

Gale began on the 19th, wind NNE. Lowest barometer 29.63 inches at 2 p. m. on the 19th, wind NNE., 10, in latitude 44° 38' N., longitude 33° 10' W. End on the 19th, wind NNE. Highest force of wind 10, NNE.; steady from NNE.

This disturbance increased considerably in extent during the next three days, and on the 21st and 22d a number of vessels in the southeastern division of the ocean reported moderate to strong gales. Storm log follows:

American S. S. *Pioneer*:

Gale began on the 20th, wind NNE. Lowest barometer 29.82 inches at 11 a. m. on the 20th, wind NE., 7, in latitude 35° 15' N., longitude 41° 48' W. End on the 22d, wind NNE. Highest force of wind 8, NNE.; steady from NNE.

On the 22d there was a LOW of limited extent off the south coast of Newfoundland. Storm log follows.

British S. S. *Comeric*:

Gale began on the 22d, wind NW. Lowest barometer 29.86 inches at 5 a. m. on the 22d, wind NW., 9, in latitude 41° 30' N., longitude 55° W. End on the 22d, wind N. Highest force of wind 9; shifts S.-NNW.

This disturbance remained nearly stationary during the next two days, varying in intensity, and by the 24th it was of exceptional severity, as shown by following storm logs.

Belgian S. S. *Eglantier*:

Gale began on the 23d, wind WNW. Lowest barometer 28.96 inches at 11 a. m. on the 25th, wind N., 8, in latitude 44° 38' N., longitude 54° 40' W. End of gale on the 26th, wind W. Highest force of wind 12; shifts, NW.-S.-SE.-N.-NW.-W.-WSW.

American S. S. *City of Freeport*:

Gale began on the 23d, wind NNW., 7. Lowest barometer 29.39 inches at 8 a. m. on the 25th, wind W., 10, in latitude 42° 35' N., longitude 57° 10' W. End of gale on the 26th, wind WNW. Highest force of wind 11, W.; steady from W.

From the 25th to the 26th this Low moved rapidly in a northeastward direction, as on the latter date the center was near latitude 49° N., longitude 38° W. Storm logs follows.

British S. S. *Parthenia*:

Gale began on the 25th, wind SSE. Lowest barometer 29.30 inches at 3 p. m. on the 26th, wind SSE., 9, in latitude 53° 50' N., longitude 28° 42' W. End of gale on the 26th, wind SSE. Highest force of wind 10, SSE.; shifts not given.

On the 28th and 29th there was a disturbance of limited area near Hatteras, in which only one vessel reported heavy weather. Storm log follows:

American S. S. *W. G. Warden*:

Gale began on the 27th, wind S. Lowest barometer 29.76 inches at 9.50 p. m. on the 28th, wind WSW., 10, in latitude 32° N., longitude 78° 26' W. End of gale on the 29th. Highest force of wind 11; shifts SSW.-WSW.-W. by N.

On the 30th there were two well-defined LOWS on the Atlantic; one central near Sydney, Nova Scotia, and the other near latitude 51° N., longitude 20° W. Gales were reported by vessels in widely scattered sections of the ocean, as shown by the following storm logs.

British S. S. *Navarino*:

Gale began on the 30th, wind SSW. Lowest barometer 29.50 inches at midnight on the 30th, wind SW., 8, in latitude 38° 34' N., longitude 50° 40' W. End of gale on December 3, wind NW. Highest force of wind 9, NW.; shifts SW.-WSW.-W.-NW.

Dutch S. S. *Eibergen*:

Gale began on the 29th, wind SE. Lowest barometer 29.20 inches at 7 a. m. on the 30th, wind S., 10, in latitude 50° 52' N., longitude

11° W. End of gale on the 30th, SW., 4. Highest force of wind 10; shifts SE.-S.-SW.

American S. S. *H. M. Flagler*:

Gale began on the 30th, wind SW. Lowest barometer 29.80 inches on the 30th, wind SW., 7, in latitude 36° 15' N., longitude 7° 18' W. End of gale on December 1, wind W. Highest force of wind 9, SW.; shifts SW.-S.

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NORTH PACIFIC OCEAN.

By F. G. TINGLEY.

At all three island stations in the eastern part of the North Pacific Ocean pressure during November was below normal by small amounts, as follows: Dutch Harbor, -0.19 inch; Midway Island, -0.04 inch; Honolulu, -0.02 inch. At the first-named station there were two major depressions, one reaching a minimum of 28.82 inches on the 8th, the other a minimum of 28.52 inches on the 27th. The highest pressure was 30.02 inches on the 13th. At Midway Island the lowest pressure, 29.80 inches, occurred on the 14th and the highest, 30.26 inches, on the 19th, 21st, and 22d. At Honolulu the lowest and highest pressures, with dates, were, respectively, 29.79 inches on the 16th, 30.13 inches on the 23d. Along the American coast from Cape Mendocino northward pressure was slightly below normal; to the southward of that point it was somewhat above normal.

Considering the ocean as a whole the month must be regarded as stormy, no less than 30 reporting vessels on trans-Pacific routes having experienced gales on one or more days, although during the first half of the month relative quiet prevailed east of the 165th meridian, E. longitude. West of this meridian numerous gales occurred, centering chiefly around the periods 4th-10th and 18th-23d.

On the 21st an unusually severe storm prevailed on the Oregon and British Columbian coasts. It accompanied a deep depression which formed on the southwestern side of an extensive area of high pressure that developed between Alaska and Hudson Bay on the 19th and 20th. In this storm the American tug *Sea Eagle*, bound from San Francisco to Astoria, and carrying a crew of 12 men, was lost with all hands off Peacock Spit.

From the 24th to the 27th vessels on the eastern part of the northern steamer route experienced fresh to strong southerly to westerly gales.

Representative storm logs for November are as follows:

American S. S. *Abercos*, Capt. Olaf H. Hansen, Observer C. D. Felter, Portland for Panama. Gale began on 3d in latitude 14° 18' N., longitude 96° 07' W., wind NE.; lowest barometer 29.89 inches at 4 a. m., same date; highest force of wind, 8, NE.; shifts, NE., E., NE., NNE.; ended on 4th.

American schooner *Melrose*, Capt. F. K. Klebingat, Hilo for Port Angeles. Gale began on 3d, wind SE.; lowest barometer, 29.56 inches at 4 a. m. of the 4th in latitude 47° 55' N., longitude 129° 04' W.; highest force of wind, 11, SSE.; shifts, SSE., S., W.

British S. S. *Empress of Japan*, Capt. A. V. R. Lovegrove, R. N. R., Observer G. Clarke, Vancouver for Yokohama. Gale began on 1st, wind S.; lowest barometer, 29.08 inches, at 8 p. m., same date in latitude 50° N., longitude 173° 30' E., with wind WSW., 7; gale ended on 3d; highest wind force, 10; shifts, S., WSW.

Average weather for voyage, moderate gales from W. and NW.; high westerly seas; clear weather; occasional snow squalls.

British S. S. *Melville Dollar*, Capt. Wm. Wright, Observer W. A. Gosse, Vancouver for Yokohama. Gale began on the 10th, wind SW. by W.; lowest barometer, 28.41 inches at 8 p. m. of 9th in latitude 49° 05' N., longitude 171° 35' E., highest force, 10; W. by N.; shifts of wind, SW. by W. by N.; end of gale on 12th.

Dutch S. S. *Silvanus*, Capt. H. J. van Hal., Nagasaki for Vancouver. Gale began on 22d, wind ENE.; lowest barometer, 28.59 inches at 7:45 p. m. same date in latitude 50° 16' N., longitude 176° 57' W., wind N., 12; gale ended on 23d, wind NNW. Very high sea.

Japanese S. S. *Honolulu Maru*, Capt. K. Hirano, Observer S. Fuji-kawa, Yokohama for San Francisco. Gale began on 8th, wind SE.; lowest barometer 28.86 inches at 11 p. m. of 9th in latitude 42° 30' N.,

longitude 157° E., wind WSW. 10; ended on 11th; shifts, SE., SW., WSW., W., WNW.

Second gale began on the 17th, wind S.; lowest barometer 29.11 inches at 8 a. m. of 18th in latitude 46° 06' N., longitude 161° 20' W., wind NE. 8; gale ended on 20th; highest force, 10; shifts, S., SE., E., NE., N., NW., W.

Japanese S. S. *Tokushima Maru*, Capt. S. Shibutami, Observer Y. Hirata, Vancouver for Yokohama. Gale began at 4 a. m. on the 24th; lowest barometer, 29.27 inches, occurred at 1 p. m. in latitude 46° 09' N., longitude 149° 30' W.; highest force, 12, WNW.; no shifts; gale ended same day. Tremendous sea.

The *Tokushima Maru*, as well as several of the other vessels named, also experienced gales on other days.

Two typhoons occurred in the Philippine area during the month. A description of these will be found in an accompanying article by Rev. José Coronas, S. J., of the Philippine Weather Bureau.

TWO TYPHOONS OVER THE PHILIPPINES IN NOVEMBER, 1921.

By JOSÉ CORONAS, S. J., Chief, Meteorological Division.

[Weather Bureau, Manila, P. I., November 30, 1921.]

Two typhoons visited the Philippines during the month of November causing considerable damage, particularly in the Visayan Islands, the damage being done rather by heavy rains and floods than by the force of the winds, as the typhoon centers were not very deep.

Typhoon of November 10 and 11.—This typhoon appeared on our weather map of November 7 to the south of Guam near 10° latitude N. and 144° or 145° longitude E. With observations received from Yap, as compared with those received also from Guam, we could locate the center at 6 a. m. of the next day, November 8, between 139° and 140° longitude E. and in about 12° latitude N., the typhoon having moved WNW. since the preceding day. From the 8th it moved westward at a rate of progress of 17 to 18 miles per hour, which is considered extraordinarily high for low latitudes. Yet, when the typhoon crossed the island of Samar on the 10th, its velocity was of only about 10 miles per hour; then it increased again to 15 miles per hour on the 11th, and finally it almost stopped moving after the 12th, remaining almost stationary for about four days from the 13th until it filled up on the 17th in the neighborhood of the Paracels near 114° longitude E. and 16° latitude N.

Our weather maps of the 9th showed clearly the typhoon to the east of Samar. The center reached that island near and to the north of Borongan at 9 a. m. of the 10th, and passed practically over Calbayog at 2 p. m. of the same day, the barometric minimum observed there being 742.47 mm. (29.23 inches), gravity correction not applied. The position of the center was, therefore, at 2 p. m. of the 10th, about 12° latitude N., between 124° and 125° longitude E; its direction was then due west. Toward 10 p. m. an unexpected change in the direction of the typhoon took place: it began to move NW. or NW. by N., and hence the typhoon came to pass to the north of Manila at about 2 p. m. of the 11th. Almost immediately afterwards it inclined again westward, entering the China Sea in the evening of the 11th between Bolinao and Iba. We give herewith the position of the center on the 11th and 12th.

November 11, 6 a. m., 13° 15' latitude N., 122° 15' longitude E.
 November 11, 2 p. m., 14° 55' latitude N., 121° 05' longitude E.
 November 12, 6 a. m., 16° 10' latitude N., 117° 05' longitude E.
 November 12, 2 p. m., 16° 10' latitude N., 116° 20' longitude E.

While the typhoon passed near Manila it was very mild, rather a depression, but it seems to have increased again in intensity in the China Sea. Many steamers had

a very rough passage in coming to or going out from Manila. The Japanese steamer *New York Maru* was stranded on the 16th in the Paracels reefs 300 miles south of Hongkong. The greatest damage seems to have been done to the crops in Negros and Capiz Provinces.

Typhoon of November 24 and 25.—This typhoon was shown in our weather maps of November 21st, 2 p. m., in about 9° latitude N. and 144° or 145° longitude E. It was very similar to the typhoon of the 10th, and the first part of the track almost identical to that of the former, but with a rate of progress much more regular and constant, as it moved for the 21st to the 26th, inclusive, at a rate of about 12 miles per hour. The direction of the typhoon was WNW. on the 21st and 22d, but it moved almost due W. from the 23d to the 27th.

The approximate positions of the center for 2 p. m. of the 22d to 26th are as follows:

November 22, 10° 45' latitude N., 139° 45' longitude E.
 November 23, 11° 20' latitude N., 134° 45' longitude E.
 November 24, 11° 45' latitude N., 129° 55' longitude E.
 November 25, 12° 10' latitude N., 124° 30' longitude E.
 November 26, 12° 10' latitude N., 120° longitude E.

On the 27th, the typhoon being about 200 miles west of Mindoro, it began to incline to the N. and then to NNE. on the 28th, and it finally filled up on the 29th, west of Balintang Channel near 20° latitude N. and 118° longitude E.

The most remarkable feature of the typhoon was a tremendous wave from the sea that flooded the municipalities of Ibayay and Macato in the Province of Capiz in the evening of November 25, when the center of the typhoon was passing about 15 or 20 miles to the north. Over 100 persons are said to have perished, and great losses to crops and properties are reported caused, not by the force of the winds, but rather by sea waves or heavy rains and floods. The first news to reach our observatory was contained in the following telegram received from our observer: "Strongest ever observed, 9 feet deep flood destroyed and washed away observatory outdoor instruments: occurred November 25 evening."

NOTES ON WEATHER IN OTHER PARTS OF THE WORLD.

British Isles.—The general rainfall for November, expressed as a percentage of the average, was: England and Wales, 75; Scotland, 55; Ireland, 106; British Isles, 75. * * *

In London, Camden Square, the mean temperature for November was 39.4° F., or 4.0° F. below the average. * * *

Northern Europe.—London, November 7: Many persons were killed and enormous damage caused by heavy gales that have been sweeping northern Europe for 30 hours. * * * There has been heavy loss of shipping in British ports and telephone and telegraph communication is interrupted.—*Washington Times*, Nov. 7, 1921.

Brazil.—During November unusual frequency of high pressure was associated with cold winds from the south over the southern States. Drought affected seriously the crops in the center and south, especially cotton, rice, sugar, and maize, and reduced sensibly the estimates of the coffee crop for next year.¹

South Africa.—Natal, November 20: Great snowstorms have occurred here, causing trains to stay at their terminals. In some places the snow lay 7 feet deep, and cattle and sheep have been frozen to death.—*Binghamton Morning Sun*, Nov. 22, 1921.

¹ *Meteorological Magazine*, December, 1921, pp. 333-334.