

with the exception of the one of the 26th to 30th. Several reporting vessels were involved in the latter storm, of which the following may be named:

American S. S. *Granite State*, Capt. H. Wallis, Observer F. H. Spring, Calcutta for San Francisco; U. S. Army transport *Dix*, Capt. C. A. Olsen, Observer O. C. Radford, Manila, via Miike, for Honolulu; U. S. Army transport *Thomas*, Capt. Frank Hall, Observer A. B. Taylor, Manila, via Miike, for Honolulu; Japanese S. S. *Toyooka Maru*, Capt. S. Oya, Observer M. Takahara, Yokohama for Seattle; American S. S. *Nanking*, Capt. T. H. Dobson, Observer A. A. Wahldram, Yokohama for San Francisco. The highest force of wind reported by any of the vessels named was 10, ENE., by the *Dix*. This was on the 29th in latitude 30° 02' N., longitude 180°. At 1 a. m. of the 29th *Dix* had the lowest barometer reported, 29.39 inches.

On several occasions during the month vessels on coastwise routes north from Panama reported E. to SE. gales. The most important of these seems to have been that of the 25th and 26th. This was encountered by the American S. S. *Hattie Luckenbach*, Capt. Edward J. Boe, Observer Edward E. Krayn, Panama for San Pedro. The storm log is as follows:

Gale began on the 25th; lowest barometer, 29.72 inches, occurred at 4 p. m., same date, in latitude 19° 35' N., longitude 105° 05' W.; end of gale on 26th; highest force of wind, 9, SE.; shifts, SE., ESE., SE.; high, irregular sea.

A strong breeze with a rough sea continued on the 27th and 28th, until the vessel reached about latitude 26° N.

THREE TYPHOONS IN THE FAR EAST DURING SEPTEMBER, 1921.

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

[Weather Bureau, Manila, P. I., October 18, 1921.]

Following is a brief account of the three most important typhoons of this month of September:

The first was a China Sea typhoon, the second was a Formosa typhoon, and the third a Japan typhoon. The second must have passed also over or very close to the Batan Islands in the Philippines; but it is much regretted that owing to lack of communications with those islands no word has been as yet heard from them at the time we are writing these notes (October 17).

China Sea typhoon, September 1 to 4.—This typhoon was formed on the 1st of September in the neighborhood of the Paracels in about 113° longitude E. and 16° latitude N. It moved practically northward and entered China about 150 miles west of Hongkong in the evening of the 3d. No details have been received of any big damage done by this typhoon. The British steamer *Loonsang* experienced a gale from the southeast quadrant on her way from Hongkong to Manila on September 3.

Formosa typhoon, September 14.—This typhoon was noticed on our weather maps as forming on the 7th to 8th about 300 miles west of Yap near 133° longitude E. and 9° latitude N. It took a northwesterly direction and reached the southern part of Formosa during the night of the 13th. The approximate position of the typhoon at 6 a. m. of the 12th and 13th was, respectively, 126° longitude E., 18° latitude N., and 123° 30' longitude E., 20° latitude N. The typhoon traversed the western part of Formosa and the northern part of Formosa Channel, moving practically north. Then it recurved westward and entered China near Foochow during the night of the 14th to 15th. The barometric minimum

recorded in Formosa was that of Taito, 741.00 mm.¹ (29.17 ins.) at 12 midnight of the 13th.

Although it was a well-developed typhoon not much damage was done in Formosa according to a report received from the Director of Taihoku Observatory.

Japan typhoon, September 25.—This typhoon seems to have formed on the 21st to 23d to the northeast of Luzon in about 127° 30' longitude E. and 20° latitude N. It moved NNE. and crossed Japan during the night of the 25th. Once in the Sea of Japan it recurved northwest toward Manchuria. The approximate position of this typhoon was as follows on the 24th, 25th, and 26th:

September 24, noon, 23° 25' latitude N., 130° 40' longitude E.
September 25, noon, 29° 05' latitude N., 134° 20' longitude E.
September 26, 6 a. m., 37° 45' latitude N., 135° 50' longitude E.

According to press dispatches published by the Manila papers much damage was done in Japan by the winds, rains, and floods during this typhoon.

SQUALLS IN GULF OF FONSECA.

E. F. McCartin, U. S. N., acting as meteorological observer on board the U. S. S. *Cleveland*, which for some days during September was in the harbor of Amapala, Honduras, has furnished the following note regarding the squalls which occur at that place.

In Amapala, Honduras, the barometer usually drops sharply as temperature increases up to 1 p. m. Violent squalls at sunset are frequent, sometimes reaching a wind force of 9 and lasting from 15 to 30 minutes. They are accompanied by heavy rain and a sharp drop in temperature. These squalls usually develop at the northeastern end of the Gulf of Fonseca and travel to seaward.

THREE SUCCESSIVE TYPHOONS OVER THE PACIFIC BETWEEN THE PHILIPPINES AND JAPAN, AUGUST 1 TO 20, 1921.

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

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

Very stormy weather prevailed over the Pacific between the Philippines and Japan for no less than 20 successive days, August 1 to 20, owing to three severe typhoons which moved one after another from the Western Carolines or the Ladrone Islands to the China coast between Hongkong and Shanghai.

Once more we could realize in the three cases the great importance of the two daily weather reports we are receiving at present from our advanced stations of Yap and Guam. With these observations at hand, Manila Observatory was able to announce the first typhoon on August 2, four days before it reached Formosa; and the second and third, on August 8 and 10, 6 and 10 days, respectively, before they reached the China coast to the south of Shanghai. For the whole period of 20 days we were able to broadcast typhoon warnings by wireless and cable, following day by day the tracks of the three typhoons.

The Formosa and China typhoon, August 1 to 7.—This typhoon appeared in our weather maps as forming over the Western Carolines to the E. of Yap and SSW. of Guam, on August 1 near 10° latitude N. and 143° longitude E. For about three days the typhoon seems to have moved NW., then it moved almost due W. for over one day, and on the 5th it took again a northwesterly

¹ 739.6 mm. (29.12 ins.) gravity correction applied.