

and the following day caused gales of force 8-10 in the neighborhood. The storm area moved eastward and northward; and on the 18th was closely followed by another low-pressure area of slightly greater intensity which, on the 19th to 21st, lay first to the southward of and then over the central Aleutians, with lowest pressure 28.88 inches, and maximum wind force of 10.

On the 23d gale conditions set in near 41° N., 163° W., with barometer depressed to 29.10 inches. On the 24th the pressure dropped to 28.47 inches—the lowest reading of the month in high latitudes—near 48° N., 160½° W. The gale field was of great extent on this date, with wind-forces up to 10. Thenceforward until the end of the month the cyclone fluctuated with lessened intensity north and south of the eastern Aleutians and south of the Peninsula of Alaska, with no gales exceeding force 8 reported as occurring within its boundaries.

Typhoons.—One major typhoon of disastrous proportions, and five lesser typhoons occurred in the Far East during September. Rev. Fr. Bernard F. Doucette, S. J., of the Philippine Weather Bureau, in an accompanying note, has discussed these storms; and it remains for the present report only to add a few comments with reference to the most important typhoon of the month which, according to some estimates, caused more material damage in southern and central Japan than any recent natural agency other than the great earthquake of 1923. In addition to the losses elsewhere enumerated, the partial destruction of the islands' rice crop through hurricane winds and rain must be further mentioned as a national calamity.

During the passage of the typhoon over Shikoku Island on September 21, Kochi Observatory recorded a pressure reading of 684 millimeters (26.93 inches), which is the lowest sea-level barometer reading ever recorded at an official observatory.

Cyclone off the Mexican west coast.—On September 16 a depression was forming at some distance south of Acapulco. It advanced in a northwesterly direction, and by the 18th was apparently central about 125 miles south of Manzanillo. Up to this time the depression seems to have given no evidence of severity, except that at 9 a. m. on the 18th the American S. S. *Mauna Kea*, near 20½° N., 108°10' W., encountered very high short swells which pitched the ship violently and submerged her hatches. At 8 p. m. on the 18th, however, the American S. S. *Edgar F. Luckenbach*, southbound, encountered winds of fresh gale force in approximately 21° N., 108° W. Gales thereafter continued to be experienced by the ship until near noon of the 19th, reaching hurricane force at times between 1 and 5 a. m., with lowest barometer 29.43 at 1 a. m. in 20°42' N., 107°25' W., and southeasterly winds throughout.

During the 19th, 20th, and 21st the cyclone passed rather slowly northward just outside the mouth of the Gulf of California, accompanied by strong gales to hurricane velocities over a narrow region between Cape Corrientes and southern Lower California. The lowest barometer reported was 28.81 inches, read on the American S. S. *Mauna Ala*, in 22°23' N., 109°14' W., at 8 p. m. of the 20th, accompanied by a northeast gale of hurricane force. By morning of the 22d the cyclone, diminished to a shallow Low, lay just outside Lower California near 24° N., whence it moved northward and apparently disappeared over the peninsula.

A minor disturbance appeared near Acapulco on the 10th and off Manzanillo on the 11th. Reports from the northeastern edge of the disturbance show a gale of force 8 southwest of Acapulco on the 10th and a gale of force 7 near Cape Corrientes on the 11th.

Fog.—Fog lessened materially this month as compared with August. It was observed on the 21st and 22d at the entrance of the Gulf of California; on 8 days off the California coast; and on 4 days off the Washington and Oregon coasts. Along the entire length of the upper steamship routes, scattered fogs occurred on 1 to 4 days in most of the 5° squares.

TYPHOONS IN THE FAR EAST DURING SEPTEMBER 1934

By BERNARD F. DOUCETTE, S. J.

There were six typhoons during September 1934 over the regions of the Far East. A large and very severe typhoon crossed Balintang Channel, passing close to and south of Basco, early in the month. Two typhoons moved simultaneously toward Naha, then combined (or else one vanished); but the next day found an intense typhoon which moved rapidly north and caused much destruction in Japan September 21. Toward the end of the month a typhoon crossed northern Luzon, causing considerable damage.

First typhoon, September 1-11, 1934.—About 700 miles east of the archipelago this typhoon appeared on the weather map of September 1. It moved west-northwest, changing to northwest, crossing the Balintang Channel and then curving to the northeast when it reached the northern part of the Formosa Channel. The positions of its center are given below.

September 1, 2 p. m.: Latitude 14°30' N., longitude 135° E.
 September 2, 6 a. m.: Latitude 15° N., longitude 133° E.
 September 3, 6 a. m.: Latitude 15°30' N., longitude 130° E.
 September 4, 6 a. m.: Latitude 17° N., longitude 125° E.
 September 5, 6 a. m.: Latitude 20°15' N., longitude 122° E.
 September 6, 6 a. m.: Latitude 23° N., longitude 120°30' E.
 September 7, 6 a. m.: Latitude 26° N., longitude 122° E.
 September 8, 6 a. m.: Latitude 29° N., longitude 125° E.
 September 9, 6 a. m.: Latitude 35° N., longitude 134° E.
 September 10, 6 a. m.: Latitude 44° N., longitude 144° E.
 September 11, 6 a. m.: Latitude 47° N., longitude 147° E.

This typhoon passed close to and south of Basco during the forenoon of September 5; 704.38 millimeters (27.731 inches) was recorded as a minimum pressure at Basco, September 5, 6:35 a. m., with southeast winds, force 5. Winds from east-northeast, force 11, were recorded before the minimum; and from the south, force 10, after the minimum.

The winds and the rains caused great destruction over the northern regions of the archipelago, floods washing away bridges, roads being inundated, and crops destroyed.

Second typhoon, September 11-16, 1934.—This typhoon formed in the Pacific, and first gave indications of its existence on the weather map September 11, 2 p. m., its location being latitude 17° N., longitude 128° E. It moved west-northwest to latitude 18° N., longitude 125° E. (Sept. 12, 6 a. m.), continued west-northwest, crossing Balintang Channel as a depression, and increased in energy September 13 (latitude 19° N., longitude 120° E.). The next day it was close to and south of Pratas at latitude 20° N., longitude 116° E. On the 15th it was over the island of Hainan and it disappeared over Indo-China, September 16.

Third and fourth typhoons, September 13-22, 1934.—These two typhoons formed within 3 days of each other over the Pacific near the Caroline Islands. They moved over different paths to the region south of Naha, where both combined into one severe typhoon, or else one increased in intensity while the other vanished. The single typhoon of September 20 moved rapidly northward

to Japan, where it caused great destruction to life and property.

The determination of the positions given below is quite accurate, due to observations received from the U. S. S. *Gold Star*, en route Guam to Manila, S. S. *Silverbelle*, and S. S. *Foylebank*, both en route San Francisco to Manila. All three passed through San Bernardino Strait on their way to Manila. Officers on these ships were certain of the existence of the typhoons, which were quite far from the ships. The observatory received daily reports from the *Gold Star* which enabled the position of the third typhoon to be given with the daily forecasts. The positions of the fourth typhoon were not known until the observations from the ships were obtained on their arrival at Manila. The positions of the third September typhoon were as follows:

September 13, 6 a. m.: Latitude 10° N., longitude 143° E.
 September 14, 6 a. m.: Latitude 11° N., longitude 142° E.
 September 15, 6 a. m.: Latitude 12° N., longitude 135° E.
 September 16, 6 a. m.: Latitude 13° N., longitude 132°.30 E.
 September 17, 6 a. m.: Latitude 14° N., longitude 131° E.
 September 18, 6 a. m.: Latitude 16° N., longitude 126° E.
 September 19, 6 a. m.: Latitude 20° N., longitude 124° E.

The U. S. S. *Gold Star* was in the northwestern sector of this typhoon on its journey to Manila.

The fourth September typhoon appeared on the weather map September 15, 2 p. m. From the variations of wind and pressure at Guam, it seemed that a disturbance of some kind was passing to the southwest of the island. It was assumed that a typhoon was moving northwest, but no determinations of the center could be made until the S. S. *Silverbelle* and S. S. *Foylebank* arrived at Manila when the following positions were determined:

September 16, 6 a. m.: Latitude 13°.30 N., longitude 140° E.
 September 17, 6 a. m.: Latitude 17°.30 N., longitude 135°.30 E.
 September 18, 6 a. m.: Latitude 22° N., longitude 131°.30 E.
 September 19, 6 a. m.: Latitude 24° N., longitude 129° E.

Thus, on September 19 two typhoons appeared, one centered about 180 miles northeast of Aparri, moving north, the other about 550 miles northeast of Aparri, moving northwest. The next day, September 20, only one typhoon appeared, about 120 miles south of Naha. It is difficult to determine whether the two typhoons combined into one, or one vanished while the other increased in intensity. It is assumed here that the so-called third typhoon vanished while the fourth continued, the following being the positions on the next few days:

September 20, 6 a. m.: Latitude 25° N., longitude 128° E.
 September 21, 6 a. m.: Latitude 33° N., longitude 134° E.
 September 22, 6 a. m.: Latitude 42° N., longitude 150° E.

It will be noticed, if these positions are plotted, that the typhoon recurved to the northeast on September 20.

This typhoon caused great destruction to life and property as it passed over Japan, September 21. The strong winds and heavy rains, together with large waves from the sea, did much harm in the Osaka prefecture. From Manila newspapers of September 27, the following report from Japanese authorities was quoted: 2,523 people were killed, 13,184 people were injured, 656 people missing; 34,262 buildings were destroyed and 40,274 buildings seriously damaged; 10,931 vessels of various sizes were wrecked or sunk. Of the dead, 1,665 were in the Osaka prefecture, which suffered most. Rain and disease intensified the suffering of the homeless, approximately 200,000, in the Osaka prefecture.

Fifth typhoon, September 22-29.—This typhoon first appeared southwest of Yap, September 22, moved northwest for 3 days, then crossed Balintang Channel September 25-26, moving west-northwest, changing to west-southwest in the China Sea. It entered Indo China September 28. The positions of the center day by day are given below:

September 22, 2 p.m.: Latitude 8° N., longitude 137° E.
 September 23, 6 a.m.: Latitude 10° N., longitude 135° E.
 September 24, 6 a.m.: Latitude 13° N., longitude 131° E.
 September 25, 6 a.m.: Latitude 18° N., longitude 125° E.
 September 26, 6 a.m.: Latitude 20° N., longitude 119° E.
 September 27, 6 a.m.: Latitude 18° N., longitude 113° E.
 September 28, 6 a.m.: Latitude 17° N., longitude 108° E.

Sixth typhoon, September 27-October 2.—This typhoon formed September 26 south of Yap and was definitely located September 27. It moved northwest, changing to west-northwest for a day, and then moved directly for northern Luzon. It crossed the Cagayan Province south of Aparri and was in the China Sea, September 30, where it moved westward to Indo China.

September 27, 6 a.m.: Latitude 7° N., longitude 137° E.
 September 28, 6 a.m.: Latitude 12° N., longitude 125° E.
 September 29, 6 a.m.: Latitude 16° N., longitude 124° E.
 September 30, 6 a.m.: Latitude 18° N., longitude 119° E.
 October 1, 6 a.m.: Latitude 18°.30 N., longitude 113° E.
 October 2, 6 a.m.: Latitude 21° N., longitude 108°.30 E.

This typhoon caused much damage over the northern part of the archipelago, but it is impossible to give estimates because another typhoon passed over the same course on October 4, which typhoon will be described in the report for next month. An interesting aspect of this typhoon was the heavy winds experienced at Manila (force 6 and 7 from the southwest) but light winds (force 3) at stations close to the center, as the typhoon crossed the island September 29.

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.