

ships delayed their progress toward Hong Kong, being within 150 miles distance from the typhoon center. The S. S. *President Wilson* experienced west-southwesterly winds force 8 and a sea from the same direction, with a northerly swell, as she slowly proceeded from Manila to Hong Kong. A value of 29.54 inches for the pressure was reported. The S. S. *President Jefferson*, on the opposite side of the typhoon center, proceeding from northern Chinese ports to Hong Kong, had pressures around 29.64 inches with easterly winds, force 10 to 8.

No notice of serious damage in the Philippines due to this typhoon has come to the attention of the Observatory staff.

Typhoon October 9-20, 1937.—On October 9 there was a trough of low pressure extending from the Philippines to the Mariana Islands. Over the eastern portion, a depression appeared about 180 miles north of Yap and moved west by north to the 130th meridian, where it intensified sufficiently to be called a typhoon. Its further course was such that central and northern Luzon were threatened, for during October 12 to 14 it had inclined to the west-north west. Observations during the night of October 14 and early morning hours of the 15th from Tuguegarao and Echague indicated that the storm had decreased in intensity and was crossing the island, but the more complete synoptic observations of October 15 showed that the typhoon was still over the Pacific, located about 120 miles east of northern Luzon and, fortunately, during the day, inclining northward. When the typhoon had reached the eastern part of the Bashi Channel its course changed to the northeast, and when about 120 miles southeast of Naha it shifted to the east (October 17). A northeasterly direction was again followed, the change occurring during the afternoon of October 18, the storm passing about 150 miles northwest of the Bonins on its way beyond the region of observation.

The S. S. *President Hoover* passed west of this typhoon center when it was located southeast of the Nansei (Loochoo) Islands. Of the observations sent to the Observatory, the following best represents the force and energy of this severe storm. At 0400 G. C. T. (noon, 120th meridian time) October 17, the weather experienced at latitude 23.9 N. 127.7 E. was "torrential rain, high seas, and heavy swell, N.-12, barometer 29.07 in."

Newspapers of October 15 had reports of three deaths and considerable property damage over Luzon due to the typhoon weather. Over the Visayan Islands heavy rains were associated with a strong persistent southwesterly current.

Typhoon, October 10-12, 1937.—Over the western part of the trough of low pressure mentioned at the beginning of the preceding typhoon report, a depression appeared about 150 miles east of central Samar, moved west-northwest to southern Luzon, became stationary, and disappeared over Lagonoy Gulf. This storm had the characteristics of being a secondary disturbance, the primary being the typhoon of October 9-20. There was definite circulation around a center, with low barometers, but weak winds. At the same time, the southwesterly winds over the Visayan Islands were increasing in strength, until there was no more evidence of circulation over Lagonoy Gulf, this happening as the primary disturbance intensified. Because of the low values of the barometers (lower than 750 mm, 29.528 inches) this disturbance is classified as a typhoon.

Typhoon October 19-21, 1937.—The observations from the S. S. *Swartenhoudt* on the afternoon of October 19 showed the presence of a small active center about 180 miles east of Quinhon, Indo China. This typhoon moved

a short distance west-northwest and then inclined somewhat to the west-by-south, bringing it to the coast between Quinhon and Nhatrang. On the 21st, only slight traces of its existence were evident. The M. S. *Bengalen* passed about 200 miles south of the storm and reported a high choppy northerly swell.

The S. S. *Swartenhoudt* reported October 19, 5 p. m. (120th meridian time), from latitude 12.30 N., longitude 112.20 E. a barometer of 752 mm (29.606 inches) west winds, force 12, heavy rain, very high confused swell.

Depression, October 15-25, 1937.—A low pressure area formed about 300 miles south of Guam, moved in a northwesterly direction, then west-northwesterly to the regions near latitude 16 N., longitude 132 E., where it recurved to the northeast and disappeared. It gave no evidence of being intense.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST, NOVEMBER 1937

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Typhoon, November 8-13, 1937.—An extensive low pressure area over the western Caroline Islands finally, on November 8, manifested a definite center which moved in a northwesterly direction from a position about 120 miles west of Yap. On November 10 this disturbance was located about 300 miles east of San Bernardino Strait. During the forenoon, it moved a short distance to the northwest, but changed to a west-by-north course when it reached the 14th parallel of latitude, intensifying as it proceeded. At 6 a. m. November 11 it was central about 50 miles northeast of the Camarines Provinces, continuing its west-by-north motion. It crossed Pollilo Island, then passed close to and north of Infanta, Tayabas Province, likewise Manila, after which it deflected its course slightly to west-by-south, thus passing close to and south of Olongapo, Zambales Province. In the China Sea, November 12, it continued, it is supposed, this west-by-south course, inclining to the west-southwest and perhaps southwest as it approached Indo China. The morning of November 14 showed that it had practically disappeared a short distance inland, after passing between Quinhon and Nhatrang.

Barometric minima¹ along the course of the typhoon are as follows: Infanta, Tayabas, had a value of 721.14 mm (28.392 inches) at 2:40 p. m., November 11, as the typhoon center passed close to and north of the station. Hurricane winds prevailed as the typhoon passed with northwest winds backing to south. North of Manila, as the typhoon center passed between 4 and 5 p. m., values close to 740 mm (29.134 inches) were observed on recently compared aneroid barometers in private houses, thus giving dependable values. At the observatory, south of the typhoon path, the minimum of 745.40 mm (29.346 inches) was recorded at 4:35 p. m. The Friez anemometer ceased recording soon after 4 p. m. From a Beckley anemograph, the 1-hour average (the highest during the afternoon) between 4 and 5 p. m., was 64 m. p. h., from the southwest. There were many gusts of greater velocity, estimated close to 80 m. p. h. during the period from 4 to 5:30 p. m. The passage of the storm over the hilly country between Infanta and Manila had weakened the typhoon very much. In the China Sea, it did not exert its influence to any great extent and only the observation received from the S. S. *Hong Kheng*, November 13, 6 a. m., in latitude 14°12' N., longitude 110°36' E., indicated the existence of the disturbance approaching Indo China;

¹ Values of barometric minima are corrected for gravity.

since, in that position, the winds were force 9 from the northeast and the pressure was 999 millibars.

A total of 38 deaths was reported in the Manila newspapers of November 16. Property loss, mostly damaged houses, mounted above \$50,000.

Typhoon, November 16-23, 1937.—A well-developed depression manifested itself about 300 miles southeast of Yap on the morning weather map, November 15. It is possible that this disturbance originated over the eastern Caroline Islands, but no data are available at present for confirmation of this statement. The depression moved steadily and rapidly along a west-northwest course, which caused it to approach the northern part of Surigao Strait during the morning hours of November 17. It was intense enough the day before to be called a typhoon. Crossing the central part of Leyte, that is, passing close to and south of Ormoc, its course led it over the northern part of Cebu Island, and afterward over the northern part of Panay Island, the center passing close to and south of Capiz. It probably deflected its course slightly at this locality, but further information is necessary for certainty. A few hours later, it passed close to the southern coast line of Mindoro Island on its way into the China Sea. It had been proceeding along a west-northwest course from the Pacific Ocean to the China Sea, which course was changed to the north when it reached the regions between longitudes 118° and 119° . It was not until November 20 before this threat to the western coast of Luzon shifted its direction to the northwest. When about 150 miles south of Pratas, it began to recurve to the northeast, and an inclination to the east-northeast on November 22 caused the typhoon, now much weakened, to cross the Bashi Channel and move into the Pacific Ocean where, following an east-northeast and east direction, it disappeared over 600 miles east of Formosa.

Of all the barometric minima reported along the course,

only those less than 740 mm (29.134 inches) will be given. At all of these stations, hurricane winds were experienced. Guiuan, Samar Province, reported 730.21 mm (28.748 inches) at 6 a. m. November 17, the typhoon passing close to and south of the station. At the nearby town of Homouhon a calm lasting 15 minutes was experienced. Tacloban, Leyte Province, had a minimum pressure of 737.82 mm (29.048 inches) at 8:30 a. m. November 17. Ormoc, Leyte, had 718.96 mm (28.305 inches) at 10 a. m. Capiz, Capiz Province, experienced 724.98 mm (28.542 inches) at 5:45 p. m. of the same day. Many stations within a distance of 80 miles from the course had minimum values between 740 and 750 mm (29.134 and 29.528 inches). When the typhoon was in the China Sea and moving along its northerly course, many ships sent observations, which were of great assistance in locating the center. Of these, the most significant observations for indicating the intensity of the storm were those made on board the S. S. *Empress of Japan*, which, en route to Manila along a southerly course, passed close to and west of the typhoon center. At midnight, November 19-20, a pressure of 721.8 mm (28.417 inches) was had, with north-by-west winds force 11-12 near lat. $16^{\circ}24'$ N., long. $118^{\circ}36'$ E. The ship's barograph registered a minimum value of 28.08 in., uncorrected.

The Manila newspapers, published on November 23, gave the total of deaths due to this typhoon as 231, with the added qualification that all districts had not been heard from. It is quite certain that this number does not represent all the lives lost, but it is very difficult to give an estimate of those not reported. The property loss undoubtedly is in the millions of pesos. These losses, both to life and property, were distributed all along the path of the typhoon, no district being favored by any weakening of the storm, which was one of the worst typhoons to visit the Visayan Islands during recent years.