

or midway between the positions of the *Altai Maru* and the *Dilworth* on the 7th. At this point she experienced a southeast hurricane, lowest pressure 29.21 inches; heavy southeast to southwest sea and swell. The typhoon at 8 p. m. of the 9th was central slightly to the west-northwestward of Taiwan. No further reports of the storm are available at this writing.

The third typhoon of the month acted similarly to its predecessor. About August 11 it seems to have originated in the Marianas, moving thence west-northwestward until it struck Hongkong on the morning of the 18th. Here much damage was done to shipping and on shore, and there was a considerable loss of life. According to reports this typhoon is the worst experienced in Hongkong since 1906. Previous records of hurricane velocities and low pressures here are said to have been broken when the wind rose to 130 miles an hour, and the pressure fell to 28.66 inches. Among the marine casualties in the harbor were the British S. S. *Ming Sang* and the submarine *L-9*. The British S. S. *Mybie* was reported lost in the typhoon at sea on the 16th.

Fog was of frequent occurrence over the northern shipping routes, and was reported on 9 days outside of San Francisco Harbor. There were reports of fog on several days off the southern coast of Alaska, and in the Arctic Ocean between the 65th and 70th parallels.

ONE DEPRESSION AND ONE TYPHOON IN THE PHILIPPINES DURING JULY, 1923.

By Rev. JOSÉ CORONAS, S. J.

[Weather Bureau, Manila, P. I.]

Depression-typhoon of July 10 to 24.—This depression appeared on the 15th to the south of Guam, probably not far from 145° longitude E. and 6° latitude N. It moved WNW. and NW. by W. until the 17th, when it began to move westward, thus traversing the Philippines on the 18th through the southeastern part of Luzon, Marinduque, and the northernmost part of Mindoro. Although only a depression while crossing our Archipelago SE. and S. of Manila, it developed soon into a real typhoon in the China Sea. It moved WNW. from Mindoro to Paracels; but then on the 20th it recurved N. and probably even to N. by E. passing a few miles to the W. of Hongkong on the 22d. The steamers *President Taft* and *President McKinley* were involved in the storm while near Hongkong or anchored in Kowloon Harbor, Hongkong. The barometric minimum on board the steamer *President McKinley* was 29.18.¹ The typhoon was quite severe in Hongkong and Macao. Once in China, the typhoon inclined again westward. The daily positions of the center at 6 a. m. for the period July 17 to 22 were as follows:

July 17, 133° 05' longitude E., 10° 15' latitude N.

July 18, 126° 15' longitude E., 13° 20' latitude N.

July 19, 119° 20' longitude E., 13° 30' latitude N.

July 20, 114° longitude E., 15° 45' latitude N.

July 21, 112° 20' longitude E., 18° 15' latitude N.

July 22, 113° 05' longitude E., 20° 15' latitude N.

The Luzon and Hongkong typhoon of July 17 to 29, 1923.—This typhoon seems to have formed on July 17 to 18 to the south of Guam, not far from 144° longitude E. and 9° latitude N. It moved NW. on the 18th and 19th, W. from the 20th to the 23d or 24th. On the

24th, while in about 127° longitude and 16° latitude it took a WNW. direction, threatening the northernmost part of Luzon and the neighboring Colony of Hongkong. The barometric minimum observed in the Philippines was that of Aparri in the northern coast of Luzon, 733.9 mm. (28.89 inches) at 11 a. m. of the 25th. We do not know the exact minimum recorded at Hongkong, but the regular weather report for 6 a. m. of the 27th gave a barometric reading as low as 739.7 mm. (29.12 inches) with a gale blowing from NNW. The center must have passed practically over Hongkong or very close to the north.

The daily positions of the center at 6 a. m. for the period July 24 to 27 were approximately as follows:

July 24, 126° 40' longitude E., 16° 10' latitude N.

July 25, 122° 35' longitude E., 18° 05' latitude N.

July 26, 118° 30' longitude E., 20° 15' latitude N.

July 27, 114° 25' longitude E., 22° 20' latitude N.

Besides these two typhoons, another one was shown in our weather maps to the east and northeast of the Philippines. The center appeared on the 10th to the SE. of Yap in about 141° longitude E. and 6° latitude N. It moved WNW. first and then inclined northward about 300 miles to the E. of Luzon on the 12th. From the 13th to the 17th it moved practically north and finally filled up over the Eastern Sea near the Loochoos on the 17th.

A TROPICAL STORM WEST OF HAWAII.

By THOMAS A. BLAIR, Meteorologist.

[Weather Bureau, Honolulu, Hawaii, August 31, 1923.]

The U. S. S. *Vega* at noon August 20, 1923, encountered a well-developed tropical cyclone in latitude 21° 00' N., longitude 165° 00' W., about 450 miles west of Honolulu. Such storms are extremely rare in these waters, and indeed appear to have been previously unrecorded in the summer season. The excellent report of the storm made by Lieut. P. J. Gundlach, U. S. Navy, follows:

Left Guam for Pearl Harbor on 9th August, 1923. Up to 20th August very little change in weather conditions; about 50 per cent overcast and cloudy with some rain, wind from east and northeast, force 3 to 4.

About midnight 20th August wind increased to force 5, barometer normal. Wind increasing from that time, barometer falling slowly, 0.01 to 0.02 per hour. At 5 a. m. wind increased to force 7, same direction (45° true), barometer falling 0.04 in one hour. Heavy swells commenced from the southeast, wind veering [backing] to north. Heavy cross sea commenced. From 5 a. m. to noon wind increased from force 7 to 11 and barometer dropped from 29.84 to 29.32, largest drop 0.14 between 9 and 10 a. m. About 12:30 barometer commenced rising and wind veered [backed] to left to about northwest. From 1 p. m. wind veering [backing] to left, to west and then south, decreasing in force, weather moderating. At 5 p. m. wind south, force 6, barometer 29.71; barometer rising to 29.96 at midnight; no change in force and direction of wind. Then gradual change in wind to left, south to east, and barometer steadily rising to normal. Next day, conditions normal, sky clear.

At noon, 20th, at period of lowest barometer, sky cleared and sun shone brightly about 20 minutes, apparently "eye of storm center."

This was evidently a typical cyclone of small dimensions. On the same date high seas from the southwest occurred on the southwest coast of Kauai, approximately 21° 50' N., 159° 40' W. These subsided on the 21st. The only effect on the weather at Honolulu was the interruption of the trade winds on a portion of the 21st and 22d by light variable breezes from a southerly quadrant, accompanied by increased cloudiness, and on the 23d by the highest temperature recorded for two years.

¹ The barometric readings given in this article are not corrected for gravity.

No further report of the storm has been received,² and its origin and path remain unknown. Pressure at Midway Island, Honolulu, and Hilo remained normal. Although there was simultaneously an area of low pressure in Alaskan waters, pressure records at Midway Island and Honolulu and from ship reports indicate that there was no break in the belt of high pressure in middle latitudes. It does not seem probable, therefore, that this storm was in any way influenced in its origin by the northern LOW, as frequently appears to be the case with the winter storms known as "Konas." The storm may, however, have moved northward and merged with the

northern LOW on the 22d, since the observations on the afternoon of the 21st and the morning of the 22d indicate that the center of high pressure had moved eastward, and that the Alaskan LOW had extended southward a considerable distance between the 150th and 160th meridians.

Visher³ found a record of 70 tropical cyclones occurring in the northeast Pacific between the years 1832 and 1922, only 7 of which are recorded west of the 155th meridian, west longitude, and all of these occurred in October, November, or December. The present storm of independent tropical origin thus appears to be unique in this part of the ocean at this season of the year.

² See review of weather over the North Pacific Ocean.

³ S. S. Visher, *MO. WEATHER REV.*, 56: 295, 296.

DETAILS OF THE WEATHER IN THE UNITED STATES.

GENERAL CONDITIONS.

By ALFRED J. HENRY.

The weather of the current month was not greatly different from that of the preceding month; perhaps its distinguishing characteristic was a rather decided increase in barometric pressure both above the normal and as compared with the preceding month. This increase can be traced back to the movement of anticyclones which apparently originated either in the Canadian Northwest or in the bordering States of the Union—Montana and North Dakota. Like the preceding month, the high temperature normally expected in August, especially in northeastern district, was characterized by alternating periods of cool weather. The usual details follow.

CYCLONES AND ANTICYCLONES.

By W. P. DAY.

Low-pressure areas were typical of the month of August, with centers of minimum pressure moving along the northern border or in southern Canada and often with secondary developments over central districts along the line of demarcation between the northerly and southerly components of the wind.

The approach of the winter season was heralded by a marked increase in the number of high-pressure areas of the so-called Alberta type. Seven of these cooler masses of air moved down from the Canadian Northwest, while eastern Canada, which had been so prolific in HIGHS during July, produced none.

FREE-AIR SUMMARY.

By L. T. SAMUELS, Meteorologist.

The Broken Arrow aerological station was situated, during the month, in the region of largest positive temperature departures as shown on Climatological Chart III. This affords opportunity for observing the extent to which such departures prevailed in the free air. It will be noted from Table I that the departures at this station decrease with altitude becoming opposite in sign at the highest levels. During the hot period which oc-

curred in this section the first part of the month absolute record temperatures were observed at this station from the surface to 1,000 meters above. At Groesbeck previous August high temperatures were exceeded from the 1,000 to the 2,000 meter level during this period. At Ellendale, where surface departures were appreciably negative, the higher levels showed a persistence in this respect, although of smaller magnitude. The cold wave of the 22d brought temperatures lower than during any previous August since the establishment of the stations at Ellendale and Royal Center from the surface to 2,000 meters above. During this period the largest departure from the normal (15° C.) was found at the 1,000 meter level at Ellendale.

Humidities averaged generally above normal at Drexel and Ellendale and below at the other stations.

Vapor pressure departures were negative except at Drexel and the lower levels at Due West and the upper levels at Broken Arrow and Ellendale.

The resultant winds are shown in Table 2, and of particular interest among these are Ellendale and Royal Center where the northerly component for the month predominated instead of the normal southerly. This is in harmony with the negative temperature departures found at those stations. Pilot balloon observations at Groesbeck showed a persistent turning of the winds with altitude to easterly above 3,000 meters from the 1st to the 24th. During the remainder of the month the winds at these upper levels changed to westerly. This undoubtedly indicates the transition from summer to autumn conditions with the southward migration of the thermal equator. During this transition period we would expect to find light winds to considerable altitudes and that this occurred is shown by the interesting pilot balloon observation obtained at Groesbeck on the 24th. The balloon was observed with two theodolites for 81 minutes, at the end of which time the computed height was 15,360 meters. This is the highest two-theodolite observation on record in this country, and it is of special interest in that it indicates such excellent agreement with the assumed ascensional rate used in single-theodolite work. The assumed rate would have given 15,670 meters, or only 310 meters higher.

Numerous other two-theodolite observations obtained during recent months extending nearly to this height give assured evidence that single-theodolite observations are strikingly dependable to these great heights. In the lower levels, however, especially during the early after-