

Mr. L. B. Collins, second officer of the American S. S. *Truscaloosa City*, Capt. A. W. Pratt: Reports that in approximate latitude $40^{\circ} 48' N.$, longitude $54^{\circ} 30' W.$ at about 6 p. m. S. A. T. on the 14th, on a true course of 269° , the temperature of the water was $48^{\circ} F.$, having fallen 11° since 5 p. m.; sea glassy. At 6:15 p. m. crossed into a ruffled surface, and it was observed that two currents existed, one flowing north and the other south. The wake of the vessel was distinctly divided, the smooth surface being carried north and the wake made in the ruffled surface moving south. After being in the ruffled surface for 10 minutes the water temperature had risen to $61^{\circ} F.$, and continued to rise until 8 p. m., when it registered $68^{\circ} F.$

On the 24th there was a moderate disturbance over the western portion of the southern steamer lanes as shown on Chart X. Storm log is as follows:

French S. S. *Britannia*:

Gale began on the 23d, wind SW. Lowest barometer 29.70 inches at 11 p. m. on the 23d, wind SW., 8; position, latitude $40^{\circ} N.$, longitude $59^{\circ} 40' W.$ End of gale on the 25th, wind NW. Highest force of wind 9; shifts not given.

The observer on the American S. S. *Swiftstar* reports that on the 24th and 25th while between the 82d and 85th meridians near the 24th parallel, encountered a northerly set of current of 15 miles, contrary to chart. Between Sand Key and Alligator Light experienced a strong inshore set, compelling a 7° -change in compass course to overcome same.

The observer on the British S. S. *Corinthic*, reports that on the 25th at latitude $38^{\circ} N.$, longitude $67^{\circ} W.$ observed abnormally large refraction between 8 a. m. and 4 p. m. which caused sights to vary to the extent of 3° longitude. At 10 a. m. air $61^{\circ} F.$, water $62^{\circ} F.$, barometer 30.19 inches, wind ENE., 3; cloudy and dry.

On the 28th there was a Low central near latitude $40^{\circ} N.$, longitude $57^{\circ} W.$, and moderate southerly gales prevailed over a limited area between the 48th and 51st meridians, with comparatively high barometric readings.

On the 29th and 30th there was a slight disturbance of small extent off the coast of Ireland. Storm log follows:

American S. S. *Editor*:

Gale began on the 29th, wind WNW., 7; lowest barometer 29.60 inches at 4 a. m. on the 30th, wind SW., 7; position, latitude $48^{\circ} 50' N.$, longitude $18^{\circ} 37' W.$ End on the 30th, wind WNW. Highest force of wind 9, WNW.; shifts WNW.-W.-WSW.-NW.

551.506 (265.2)
NORTH PACIFIC OCEAN.

By F. G. TINGLEY.

As determined from observations at the island stations of Dutch Harbor, Honolulu, and Midway Island, pressure over the eastern half of the North Pacific Ocean during May was below normal in middle and low latitudes and above normal in the region bordering the Aleutians. At no time during the month did pressure at the latter two stations equal the normal. At Honolulu the departure was approximately -0.06 inch and at Midway Island -0.14 inch. At Dutch Harbor the departure was $+0.12$ inch, or, by decades, $+0.24$, -0.12 , and $+0.25$ inch.

At the beginning of the month anticyclonic systems covered the region between the Hawaiian Islands and the American mainland and that lying between Midway Island and the western Aleutians. Moderate depressions appeared along the American coast, to the westward of the Hawaiian Islands, and southeast of Japan. By the 4th the anticyclones had merged into one system covering the entire eastern half of the ocean with its crest to the southward of the Gulf of Alaska. The depression to the

southeast of Japan had moved north-northeastward to the region of the Kuril Islands and developed somewhat. During the several days following this date it moved slowly across the Aleutians and Bering Sea and disappeared over Alaska.

Several vessels, eastward bound, were more or less under the influence of this depression for a period of some 10 days. One of these was the Japanese S. S. *Tokushima Maru*, Capt. Shibutani, Yokohama (April 29) for Vancouver. On the 3d and 4th, when in latitude 46° - $47^{\circ} N.$, longitude 160° - $164^{\circ} E.$, this vessel experienced moderate to strong easterly gales.

On the 7th the Japanese S. S. *Arabia Maru*, Capt. K. Komuja, Yokohama (May 1) for Victoria, under the influence of the same depression, had a fresh SE. gale when in latitude $49^{\circ} 11' N.$, longitude $177^{\circ} 40' W.$

While this disturbance was moving slowly east-north-eastward from the Kuril Islands two other depressions were forming, one to the northward of the Hawaiian Islands, the other over Japan. During the period from the 8th to the 15th the former moved very slowly in the direction of the British Columbia coast where it merged with another depression then covering the Rocky Mountain region. The Hawaiian Islands depression reached its greatest development on the 12th and 13th in latitude $45^{\circ} N.$, longitude $140^{\circ} W.$ On these dates the Japanese S. S. *Tokushima Maru* and *Arabia Maru*, previously referred to, again experienced fresh to strong easterly gales, being now some few hundreds of miles off the American coast.

The second of these two depressions, forming over Japan during the period from the 7th to the 10th, moved slowly in the direction of Alaska, where it was central on the 23d, thence, in varying formation, southeastward over western Canada and the United States, reaching the Atlantic coast on the 29th.

As in the case of the depression of the 4th, a group of ships sailing from ports in the Orient was under the influence of this disturbance for several days, with this difference, however, that whereas in the case of the earlier storm the vessels were in front of the center and experienced head winds, in the later one they were in the rear of the center and had westerly to northerly winds. These varied generally in force from a fresh breeze to a moderate gale.

Only three vessels reported having seen the aurora borealis, so widely observed on the 14th. These were the Dutch S. S. *Bali*, Capt. C. E. Plugge, in approximately latitude $43^{\circ} N.$, longitude $135^{\circ} W.$, the American S. S. *Hyades*, Capt. E. Petterson, Observer A. G. Popkin, in latitude $33^{\circ} 18' N.$, longitude $146^{\circ} 44' W.$, and the American S. S. *Manoa*, Capt. E. H. Sandelin, Observer Oliver Bergmann, in latitude $30^{\circ} 42' N.$, longitude $141^{\circ} 05' W.$

Two ships reported having experienced severe earthquake shocks on the 14th.

One of them was the U. S. S. *Cleveland*, Capt. E. T. Costien, U. S. N., commanding. Observer, Lieut. A. E. Schrader, U. S. N. The *Cleveland* was in the harbor of Manzanillo, Mexico, at the time. At 3:10 p. m., local time, there was a severe shock, of 7 to 8 seconds, east to west motion, undulating. At 3:13 p. m. there was a second shock, $1\frac{1}{2}$ to 2 seconds, fairly light.

The other vessel to experience these shocks was the British S. S. *Spectator*, Capt. W. T. Owen, Observer Wm. Squirrell, Panama for San Pedro. At 3:14 p. m. the *Spectator*, in latitude $18^{\circ} 50' N.$, longitude $104^{\circ} 42' W.$ (off Manzanillo), experienced a very violent shock, shaking the ship from stem to stern. Other shocks were felt

until after 4 p. m., but not so violent. According to Mr. Squirrel, other vessels in the vicinity also reported having felt the shocks.

Notwithstanding the gales referred to, the month as a whole was a quiet one, as would be expected from the advance of the season. This was particularly true of the southern part of the ocean. Mr. N. G. A. Parker, observer on the British S. S. *Nile*, Capt. C. H. Cross, states in his report:

551. 506 (73)

WEATHER OF THE MONTH IN THE UNITED STATES.

In general.—The outstanding feature of the month was the anticyclonic control which persisted until the 20th. The anticyclones most influential in this regard had their origin in the Canadian Northwest; associated with their slow movement toward the east-southeast there was a drift of air from higher to lower latitudes and unseasonably cool days during the first half of the month. During the last half higher temperatures prevailed so that the month as a whole in New England, the Lake region, the great interior valleys, the Plains States and the West Gulf States, was one of temperature above the normal. Precipitation was deficient over the same identical regions, also in the north Pacific coast States. It was greater than the average in Atlantic coast districts from Cape Cod to Florida; also in Southern California and generally over the middle and southern plateau regions.

An event of more than passing interest was the severe magnetic storm of the 13th–17th. This storm was accompanied by disturbances of the magnetic and electrical conditions over a large portion of the earth and brilliant auroral displays. A brief summary of the distribution of the auroral display will appear in the June REVIEW.—A. J. H.

CYCLONES AND ANTICYCLONES.

By W. P. DAY, Observer.

Lows, as a rule, were ill defined and erratic in movement. Offshoots from the subpermanent low pressure area in the Southwest were frequent.

High pressure areas were numerous, but with one or two exceptions avoided interior districts, being more effective in Atlantic coast sections.

Tables showing the number of HIGHS and LOWS by types follow:

Lows.

	Al- berta.	North Pa- cific.	South Pa- cific.	North- ern Rocky Moun- tain.	Colo- rado.	Tex- as.	East Gulf.	South At- lantic.	Cent- ral.	Total.
May, 1921.....	2.0	1.0	4.0	2.0	1.0	1.0	1.0	1.0	13.0
Average number, 1892-1912, inclu- sive.....	2.9	1.3	1.2	0.7	1.4	0.7	0.2	0.3	1.0	9.7

Highs.

	North Pacific.	South Pacific.	Alb- erta.	Plateau and Rocky Moun- tain region.	Hud- son Bay.	Total.
May, 1921.....	3.0	1.0	5.0	2.0	11.0
Average number, 1892-1912, in- clusive.....	1.3	0.5	3.3	0.7	0.9	6.7

We left Yokohama on May 1 for Honolulu, taking the northern route or Great Circle track, 3,394 miles, and had an exceptionally fine passage, arriving at Honolulu on the morning of the 12th. I should say the month of May was ideal for such route.

Another interesting note is by Mr. G. Clarke, second officer and observer on the British S. S. *Empress of Japan*, Capt. W. Dixon Hoperoff, Yokohama for Vancouver (May 26–June 6). Mr. Clarke states that during the entire voyage the winds were from S. to NE., no westerlies.

THE WEATHER ELEMENTS.

By P. C. DAY, Climatologist and Chief of Division.

[Weather Bureau, Washington, D. C., July 1, 1921.]

PRESSURE AND WINDS.

The atmospheric pressure exhibited two distinct types during the month and sharply contrasted weather conditions were the result.

During the first half of the month the pressure was persistently high along the northern border from the Rocky Mountains eastward, the so-called Polar Front extending well into the upper Mississippi Valley during the first few days, and, gradually drifting eastward, extending its influence into the Atlantic coast districts, where it diminished somewhat in force and near the end of the first decade gave signs of dissipating. However, early in the second decade, high pressure again became effective in the Northeastern States and Canadian Maritime Provinces, gradually extending southeast into the Atlantic and becoming central near the Bermudas by the middle of the month. During this period a second high-pressure area had moved into the upper Missouri Valley, and it too passed eastward over about the same course as that first mentioned. Upon reaching the Atlantic coast, however, it slowly settled to the southward, and near the beginning of the last decade of the month had become established over the Southeastern States with a corresponding movement of warm air from the south into the central valleys and thence eastward, where cool, northerly winds had prevailed so continuously during the earlier part of the month.

Low-pressure areas were usually ill-defined and few of them traversed long distances as well-developed storms. The average pressure for the month was highest over the Great Lakes and lowest in the far Southwest. In the districts east of the Rocky Mountains the average pressure was nearly everywhere greater than normal although usually the departures were less than one-tenth inch. Between the Rocky Mountains and Pacific coast, pressure averaged less than normal as a rule; although local areas in the valley of the Colorado River and along the immediate coast had departures slightly above normal.

High winds during the month were usually associated with thunderstorms only and hence were largely local and covered comparatively small areas, although about the first of the month high winds occurred over southern New England and along the middle Atlantic coast, and again about the 4th and 5th over the same districts.

The persistence of high pressure in the Great Lake region caused northerly winds over much of the Ohio Valley, Middle Gulf, and Atlantic Coast States, but between the Mississippi River and Rocky Mountains the wind was mainly from some southerly quadrant, and this was the case also in much of the Plateau region. In the far Northwest and generally along the Pacific coast the winds were from northerly to westerly points.