

551.515 (73)

SECTION III.—FORECASTS.

FORECASTS AND WARNINGS FOR SEPTEMBER, 1917.

By H. C. FRANKENFIELD, Supervising Forecaster.

[Dated: Weather Bureau, Washington, D. C., October 1, 1917.]

GENERAL PRESSURE DISTRIBUTION OVER THE NORTHERN HEMISPHERE EXCEPT EUROPE AND INTERIOR ASIA.

High pressure prevailed uniformly throughout the month over the Pacific Ocean, although only slightly above the normal over the southeastern portion. Over the Aleutian Islands alternations of moderately high and low pressure prevailed until after the 16th, when low pressure predominated, with a marked depression on the 21st and a more sustained one of somewhat less intensity from the 24th to the 27th, inclusive.

Over Alaska high pressure ruled during the first 8 or 10 days of the month, and low pressure thereafter, the principal depression occurring on the 22d, one day after its appearance at Dutch Harbor in the Aleutian Islands.

Over the United States the month was one of moderately high pressure as a rule until the last few days of the month, except in the Gulf and South Atlantic States, where below normal conditions prevailed during the second half of the month, with a tropical storm from the Caribbean Sea that reached the Middle Gulf coast on Sept. 29, when a barometer reading of 28.51 inches was reported at Pensacola, Fla.

Pressure was also high over the North Atlantic Ocean during much of the month. A storm from that section of the ocean to the eastward of the Lesser Antilles passed near the Island of Bermuda on the 4th, moving in a northeasterly direction (29.46 inches at Hamilton), but no further data have been obtained at this writing.

Other Caribbean Sea and Atlantic disturbances are discussed in another portion of this report.

WASHINGTON DISTRICT.

On the morning of September 5 a well-defined disturbance was central a short distance northwest of Lake Superior, and southwest storm warnings were accordingly ordered on Lake Erie and the Upper Lakes, except western Lake Superior, where northwest warnings were ordered. At 3 p. m. the warnings were extended over Lake Ontario. The disturbance moved almost due eastward attended by some moderately strong southwest winds over the Northern Lakes, but over the southern and eastern sections only moderate to fresh winds occurred.

On the 6th there were indications of a disturbance near the Windward Islands. Unsettled conditions continued during the 6th and 7th, after which the disturbance disappeared. The usual advisory messages were distributed on both days, but no warnings were issued.

On the morning of the 8th a moderate disturbance from the west was central over Virginia, with high pressure to the northeastward, indicating increasing northeast winds, and at 11 a. m. northeast warnings were ordered displayed on the Atlantic coast from Sandy Hook, N. J., to Boston, Mass. Only moderately strong

winds occurred during the afternoon, and at 9 p. m., with the disturbance dissipating over North Carolina, the warnings were lowered.

On the morning of the 10th there were some slight evidences of the formation of a disturbance over the west Caribbean Sea and of another at about latitude 14°N., longitude 64°W. Special observations were requested and the usual advices issued. The situation was kept under careful observation during the ensuing four days of moderately low pressure, but no storm of consequence developed, although on the morning of the 13th there was a moderate but clearly defined circulation over southeastern Cuba. However by this time the barometer was falling rapidly along the South Atlantic coast with increasing northeast winds, and at 2 p. m. northeast storm warnings were ordered from Jacksonville, Fla., to Fort Monroe, Va., it being apparent at that time that there was a disturbance some distance off the Georgia coast, possibly an offshoot from the general Caribbean depression. Fresh to strong northeast gales occurred along the Carolina coast, continuing until the morning of the 17th. Pressure was only slightly below normal, but at the same time it was quite high to the northward and northeastward. On the afternoon of the 14th the northeast warnings were continued from Charleston, S. C., to Fort Monroe, Va., and at 10 p. m. extended northward to Nantucket, Mass. While the winds were strong north of the Virginia capes, no severe gales were reported over that region. Warnings, however, were continued for a second period of 24 hours, as the disturbance persisted near the North Carolina coast. On the morning of the 17th the disturbance began to move northeastward, and northeast storm warnings were ordered from Block Island, R. I., to Boston, Mass. At 8 p. m. the disturbance was off Nantucket Lightship with a strong northeast gale in progress (64 miles an hour), and the northeast warnings were accordingly extended northward to Eastport, Me. The storm center turned more to the eastward during the night of the 17th-18th, and no strong winds occurred along the immediate Maine coast, although they must certainly have prevailed a short distance at sea. On the morning of the 19th the storm center was in the vicinity of Sable Island, where the barometer read 29.14 inches, and by the following morning it had passed beyond the field of observation, going some distance south of Newfoundland, St. Johns reporting a barometer reading of 29.54 inches in the evening of the 19th with light northeast winds.

The tropical storm of September 21-29, 1917.—On the morning of September 21 heavy southeast and south sea swells were reported from the Leeward Islands. Special observations indicated their continuance, and accordingly at 4 p. m. advices were issued to the effect that there was a disturbance a short distance north of the Virgin Islands moving northwestward. At 10 a. m. on the following day this information was repeated, but delayed reports received sometime later indicated that the disturbance was a short distance south of the Island of Santo Domingo, moving westward or west-northwestward and proper advices were immediately issued. However,

there were still indications that a more moderate disturbance had moved northwestward to the north of the Leeward Islands as indicated by a later fall in pressure in the Atlantic with accompanying northeast gales. During the 22d and the ensuing night the disturbance continued westward, and early in the morning of the 23d it passed with great intensity directly north of the Island of Jamaica, moving in a northwesterly direction. The observer at Kingston reported a barometer reading of 29.14 inches at 4:45 a. m., and press reports stated that great damage had been done over the northern portion of the Island. At noon of the 2d northeast storm warnings were ordered on the South Florida coast from West Palm Beach on the Atlantic side to Boca Grande on the Gulf side, and advices issued urging that every precaution against a dangerous storm should be taken. On the morning of the 24th the storm center was apparently in the vicinity of the Grand Cayman Island, and advices were issued accordingly. At 4 p. m. further advices stated that the storm was apparently nearing the Yucatan Channel or extreme western Cuba and extreme caution was urged for all vessels in the Gulf of Mexico. In the meantime pressure had fallen considerably over the Atlantic Ocean in the vicinity of latitude 30° N. and near the coast, probably the secondary depression noted several days previous north of the Virgin Islands. Over the North Atlantic marked high pressure prevailed, and northeast storm warnings were therefore ordered at 10:30 a. m. from Fort Monroe, Va., to Wilmington, N. C., with forecast of strong northeast winds or moderate gales. After the receipt of special reports in the afternoon northeast warnings were ordered at 7 p. m. on the New England coast from Block Island, R. I., to Provincetown, Mass. In both localities the strong winds occurred as forecast.

The tropical disturbance continued on its northwesterly course, and on the morning of the 26th all vessels in the Gulf of Mexico were again advised to exercise extreme caution. There were, of course, very few radio reports received from the vicinity of the storm, but approximate localities of the center from day to day were as follows: On the morning of the 25th a short distance south of extreme western Cuba, where the barometer at Isle of Pines read 29.42 inches with a northeast wind of 30 miles an hour; on the morning of the 26th near and a little west of latitude 25° N., longitude 85° W., the steamer *Gulfmaid*, then in that vicinity, reporting a strong southeast gale and a heavy sea; on the morning of the 27th about 150 miles south or south-southeast of the mouth of the Mississippi River, the steamer *Abarangez* in latitude 26° 30', N., longitude 87° W., reporting a barometer reading of 29.56 inches, with a southeast gale of 74 miles an hour; in the evening of the 27th, south of and probably about 75 miles from the mouth of the Mississippi River, the steamer *Abarangez* reporting a barometer reading of 29.62 inches with a southeast hurricane wind blowing 90 miles or more; on the morning of the 28th the storm center was close to the mouth of the river, the steamer *Suriname* anchored at Pilottown, La., reporting a barometer reading of 29.18 inches with a northeast hurricane wind. At 9 a. m. the *Suriname* reported a barometer of 29.06 inches with the wind backed to north and still blowing a hurricane. This was probably very close to the storm center, for by noon the wind at Pilottown, La., where the *Suriname* lay at anchor, shifted to northwest with a barometer reading of 29.24 inches and a wind velocity of 74 miles an hour. Barom-

eter, wind and weather reports from the *Suriname* were as follows:

Hour.	Barom-eter.	Wind.		Weather.
		Direction.	Velocity.	
<i>Sept. 27, 1917.</i>				
8 a. m.	29.80	e.	14	Partly cloudy.
2 p. m.	29.74	e.	18	Rain.
4 p. m.	29.72	e.	18	Do.
8 p. m.	29.66	e.	40	Cloudy.
10 p. m.	29.66	e.	40	Rain.
12 midnight	29.58	e.	56	Do.
<i>Sept. 28.</i>				
2 a. m.	29.50	ne.	90	Do.
4 a. m.	29.36	ne.	90	Do.
8 a. m.	29.18	ne.	90	Do.
9 a. m.	29.06	n.	90	Do.
10 a. m.	29.08	n.	90	Do.
12 noon	29.24	nw.	74	Do.
2 p. m.	29.36	nw.	64	Do.

Barograph traces for New Orleans, Mobile, and Pensacola are on file.

After 4 p. m. of the 28th no telegraphic reports were received from Mobile during the progress of the storm, and none from Pensacola after noon of the same date. A belated message from Mobile received shortly before midnight stated that the lowest barometer reading during the storm was 29.16 inches and the maximum wind velocity 98 miles an hour from the north. The message also stated that there had been no injurious tides (owing to the prevailing northerly winds); that there had been no deaths in Mobile; and that vessels had taken refuge up the river. The damage was limited mainly to roofs and frail structures.

The storm evidently recurved very close to and just east of the mouth of the Mississippi River, moved thence northeastward, passing to the southward of Mobile, and at 7 p. m. passed south of Pensacola, Fla., with a barometer reading of 28.51 inches, a maximum wind velocity for 5 minutes of 103 miles an hour from the southeast, and an extreme velocity of 125 miles an hour from the same direction. The damage was estimated to have been rather less than during the hurricane of October 18, 1916, when the lowest barometer was 28.76 inches and the maximum and extreme velocities 114 and 120 miles an hour, respectively. During the storm of September 28 the tide at Pensacola rose 4½ feet above the normal height.

The following details have been supplied by William F. Reed, jr., meteorologist and official in charge of the Pensacola, Fla., station:

The roar of the hurricane surf could be heard in Pensacola, which is 6 miles from the Gulf coast, by 12 midnight of the 26th, when the center of the storm was some hundred miles distant. The surf on the morning of the 27th increased to "very high" by 10 a. m., but subsided somewhat in the afternoon, when southerly winds by 6 p. m. became light and shifted to east.

On the morning of the 28th (Friday) the future course of the hurricane was uncertain; the surf had been very high all night; easterly winds were increasing and the barometer began falling. Flocks of small seagulls were observed flying inland between 6 a. m. and 7.30 a. m. seeking places of safety at the heads of the bayous. Upon inquiry I found that old residents considered this a sure sign of the immediate approach to our coast of a hurricane, and that these small gulls flew inland in large flocks just previous to the storm of September 26-27, 1906. On Friday morning shipping interests and commanding officers at the navy yard and forts and superintendents of railroads were phoned to take every precaution, since the premonitory signs indicated that the storm was close at hand.

The full force of the storm at Pensacola was felt near 4 p. m. on the afternoon of September 28. The lowest pressure (reduced to sealevel)

was 28.51 inches, at 6 p. m.; the highest wind velocity for a five-minute period was 103 miles from the southeast at 3.48 p. m. The table below shows the barometer readings, wind directions and velocities at short intervals during the 23th. The center of the hurricane evidently passed south of Pensacola, probably a distance of 50 miles.

The damage at Pensacola and vicinity was largely due to wind and wave action. A number of small craft, including the U. S. S. *Quincy*, were washed ashore or grounded and considerable damage was done to wharves, docks, and boat houses along the Gulf shore.

The damage by wind is estimated at \$100,000
 The damage by wave action and water at 50,000
 The damage to small craft 20,000

Total for Pensacola and vicinity 170,000

Heavy damage appears to have been sustained in Santa Rosa County, where much timber was blown down and crops, live stock, and buildings suffered from wind and rain.

TABLE 1.—Barometer readings (sealevel) and wind velocities for the five minutes ending with the times given at Pensacola, Fla., Sept. 28, 1917, Weather Bureau office.

[Wm. F. Reed, jr., and G. S. Kennedy, observers.]

Time.	Barometer.	Wind.		Tide above normal.
		Direction.	Velocity.	
<i>Sept. 28, 1917.</i>				
	<i>Inches.</i>		<i>Miles per hour</i>	<i>Fcet.</i>
7:00 a. m.	29.73	ne.	25	2.0
8:20 a. m.	29.69	e.	38	2.5
10:00 a. m.	29.61	e.	53	3.0
11:00 a. m.	29.56	e.	56	
11:30 a. m.	29.50	e.	60	
11:45 a. m.	29.46	e.	67	
NOON	29.45	e.	72	3.5
12:30 p. m.	29.43	e.	80	
1:00 p. m.	29.38	e.	80	
1:30 p. m.	29.31	e.	76	
2:00 p. m.	29.21	e.	84	
2:30 p. m.	29.13	e.	82	
2:35 p. m.		e.	96	
2:45 p. m.	29.09	se.	90	
3:00 p. m.	29.08	se.	84	
3:15 p. m.	29.03	se.	90	
3:30 p. m.	29.00	se.	94	4.5
3:45 p. m.	28.93	se.	96	
4:00 p. m.	28.90	se.	96	
4:15 p. m.	28.86	se.	96	
4:30 p. m.	28.81	se.	96	
4:45 p. m.	28.75	se.	96	
5:00 p. m.	28.71	se.	96	
5:15 p. m.	28.62	e.	94	
5:30 p. m.	28.54	e.	96	
5:37 p. m.		e.	100	
5:45 p. m.	28.51	e.	96	
6:00 p. m.	28.51	e.	92	
6:15 p. m.	28.51	ne.	78	
6:20 p. m.		ne.	88	
6:30 p. m.	28.52	ne.	80	
6:45 p. m.	28.56	ne.	84	
7:00 p. m.	28.62	n.	78	
7:15 p. m.	28.65	n.	92	
7:30 p. m.	28.80	nw.	88	
7:45 p. m.	28.83	nw.	88	
8:00 p. m.	28.90	nw.	80	
8:15 p. m.	28.92	nw.	92	
8:30 p. m.	28.99	nw.	84	
8:45 p. m.	29.04	nw.	84	
9:00 p. m.	29.09	nw.	78	
9:15 p. m.	29.11	nw.	80	2.5
9:30 p. m.	29.17	nw.	84	
9:45 p. m.	29.19	nw.	71	
10:00 p. m.	29.22	nw.	76	
10:15 p. m.	29.24	nw.	60	
10:30 p. m.	29.30	nw.	70	

Press reports stated that five lives were lost at Crestview, Fla., an inland town about 40 miles northeast of Pensacola. No other loss of life was reported.

On the morning of the 29th the storm was central over southeastern Alabama with greatly decreased intensity (29.48 inches at Montgomery), but with sufficient rains to necessitate the issue of warnings of a moderate flood over the watershed of the lower Alabama River.

On the evening of the 29th the center was over southwestern Georgia with a still further decrease in intensity (29.64 inches at Thomasville), and by the morning of the 30th the remnants had passed off the Georgia coast,

the general low-pressure conditions along the South Atlantic coast having joined forces with another disturbance from the West that was central over Ontario. As pressure was rising rapidly in the rear of the general depression and falling over the North Atlantic Ocean, north-west storm warnings were ordered at noon September 30 from Delaware Breakwater, Del., to Nantucket, Mass. At 10 p. m. the warnings were extended to Eastport, Me. Moderate gales occurred along the New Jersey coast, but none to the eastward and northward, and at 10 a. m. October 1 the warnings were lowered.

The first display of warnings of the approaching storm was made at 5 p. m. September 25, when hurricane warnings were ordered on the Gulf coast from Apalachicola to Mobile, and all Gulf shipping was again warned to take every precaution necessary to insure safety. It was thought at that time that the storm would probably reach the Gulf coast some time during Wednesday night or Thursday morning, but subsequent developments proved that the movement of the storm center was slower than had been anticipated. Half an hour later southeast storm warnings were ordered on the Gulf coast of Florida from Key West to Tampa and northeast warnings from Rockwell to Carrabelle, and moderately strong winds occurred during the night along the south coast. At 5 p. m. of the 26th the hurricane warnings were continued from Apalachicola to Mobile, and at 10 p. m. extended westward to New Orleans, it appearing probable at that time that the storm center might possibly strike the Gulf coast a little farther west than had been first anticipated. At 11 a. m. of the 27th the hurricane warnings from Apalachicola to St. Andrews, Fla., were changed to southeast storm and inland storm warnings were given wide distribution over extreme northwestern Florida, southwestern Alabama, southern Mississippi, and southeastern Louisiana.

The hurricane warnings east of New Orleans were renewed on the morning of the 28th, and southeast storm warnings again ordered at St. Andrews and Apalachicola, it being apparent at the time that the recurving of the storm was in progress, although on the previous evening there had been no such evidence.

At noon, after the wind at Pilottown, La., had changed to northwest with rapidly rising pressure, the forecaster at New Orleans notified shipping at Texas ports that vessels bound for Atlantic and Caribbean ports could proceed with safety.

At 8 p. m. of the 28th, although reports were missing from the vicinity of the storm center, the surrounding pressure distribution indicated a sufficient gradient to warrant the extension of storm warnings (southwest) on the Gulf coast of Florida from Carrabelle to Rockwell, and on the Atlantic coast (southeast and northeast) from Jacksonville, Fla., to Fort Monroe, Va. However, as the decrease in the storm's intensity was very rapid only fresh winds occurred, except in the vicinity of Jacksonville, where a velocity of 44 miles an hour from the southeast was reported on the afternoon of September 29.

The storm passed too far south of Mobile to cause serious damage at that place.

Frost warnings.—From September 5 to 8, inclusive, there were a few light local frosts over widely scattered areas in the extreme north, but on the morning of the 9th a high-pressure area of great magnitude was central over Manitoba, accompanied by temperatures below the freezing point, and frost warnings were accordingly ordered for upper Michigan and northern and central lower Michigan, and on the following morning frost

occurred as forecast. At this time the crest of the high pressure area was over Minnesota, and general frost warnings were ordered for the entire Lakes Region, the central portions of Indiana and Ohio, western and northern Pennsylvania, the interior of eastern New York and northern New Jersey, and the greater portion of New England. Heavy frost was forecast for the Upper Lakes Region, also frost for the cranberry marshes of New Jersey. On the morning of the 11th frosts occurred almost exactly as forecast. The frost was heavy in localities, and there was even a light frost in the District of Columbia, probably the earliest date of frost for many years. At New Lisbon, N. J., in the cranberry bogs, the minimum bog temperature was 23°, while at Hazardville, in the tobacco section of Connecticut, the minimum temperature was 22°. The high-pressure area was decreasing in magnitude, but frost warnings were again ordered for the Middle Atlantic States, the upper Ohio Valley, and the Lakes Region, except upper Michigan. This forecast was also verified, the frost extending into extreme southern Virginia. By this time the pressure was falling generally, and no further warnings were issued except for the cranberry bogs of New Jersey, which were followed by a bog temperature of 30° on the following morning.

There was no further occasion for frost warnings until the 20th, when a rapid pressure rise following a moderate disturbance over northern Illinois indicated the probability of frost on the following morning over upper Michigan, contingent upon clearing weather. The weather cleared but only light local frosts occurred. Local frosts again occurred in other portions of upper Michigan on the morning of the 22d for which no warnings had been issued. A frost warning issued on the morning of the 22d for the New Jersey cranberry bogs failed on account of increased wind velocity, other conditions being favorable. Warnings for northern New England were fully verified on the morning of the 23d, the frosts also extending into northern and western New York. The warnings were repeated on the 23d for northern New England, and frosts were reported on the following morning. No frosts occurred over the eastern districts from the 24th to the 30th, inclusive, and none was forecast. On the morning of the 30th, with a marked disturbance over Ontario, low pressure throughout the Atlantic States and rapidly rising pressure, with low temperatures over the Plains States, frosts were forecast for the Upper Lakes and western Lower Lakes regions and the upper Ohio Valley. On the morning of October 1 frosts were reported in the upper Lakes Region, Indiana, and western Ohio. There were also light local frosts in Kentucky and Tennessee.

WARNINGS FROM OTHER DISTRICTS.

Chicago forecast district.—The special warnings issued during the month of September were confined for the most part to frost warnings, and especially to the cranberry and tobacco sections of Wisconsin.

General frost warnings for whole States, however, were issued at various times during the month, the more important ones being those of the 9th, 10th, and 21st for the western Lakes Region, and valleys of the upper Mississippi and the Red River of the north, and those of the 27th and 29th for these sections and also the middle and lower Missouri Valley. The warnings, as a rule, were well verified, and the interest in the situation was most intense on account of the possible damage to the corn

crop which, as a matter of fact, suffered considerable injury in the more northerly sections.

In the special warnings issued, as well as in the summary published in the corn and wheat region bulletin of the Chicago center, special reference was made not only to the probability of impending frost but also as to moderation later on; in fact during the second half of the month a special long-range forecast was daily included in the summary, covering the situation quite fully and it met with general approval among the grain interests.

The tobacco interests in Wisconsin are of much importance, and the situation there this fall was most unusual, as the entire crop had been purchased as it stood in the field, the buyer taking chances of damage by frost. Moreover, the season was two weeks or more later than usual, so that harvesting was not completed until near the close of the month. The tobacco growers of Wisconsin have practically no means of protection, except to cut their plants, as smudging is not practiced to any extent; and it is often a question as to whether the loss will be greater from cutting immature plants or exposing them to frost. This must depend upon the maturity of the plant on the one hand and the possible damage by frost on the other. A plant only slightly damaged is more satisfactory than one rather immature. Each case, however, must be left to the judgment of the grower, after having been advised as to the probable weather conditions.

The chief damage to the tobacco crop was done on the nights of the 9th and 10th, when more or less heavy frost occurred throughout the region. Advisory messages were sent in advance to the various growers; the message of the 10th stating that the temperature would moderate the following day. The frosts which occurred later were local and not severe and of little consequence as compared with the above.

The conditions in the cranberry marshes were even more critical than in the tobacco region, as previous drought had resulted in a shortage of water for use in flooding the marshes. Warnings of positive frost were issued to the marshes on the 5th, 9th, 10th, 20th, 21st, 27th, 28th, and 30th. The frosts were most severe on the nights of the 9th, 10th, and 30th, in some of the bogs the temperature falling as low as 14° and 15°. The warning messages usually contained advice as to the probability of moderation later on, in order that the growers might conserve their water by allowing it to remain on the bogs until after the second night if frost was again likely. Moreover, other advices were sent to them from time to time.

Special fire-weather forecasts were made during the month for the national forests of Montana, Wyoming, and the Black Hills, the messages including probability of rain, direction and velocity of wind, and change in temperature. The advices to Montana were discontinued on the 14th when general rains closed the fire-weather season in that State. Forecasts were continued to the Black Hills and Wyoming for the balance of the month, as the general rains of the 14th were not sufficiently heavy in these sections to eliminate the fire danger.

Special long-range forecasts were made as follows:

September 15, for the following week for Rapid City, S. Dak. In connection with the forecast, "Prospect seems favorable for fair weather during greater portion of coming week with moderate temperature first half

of period," the observer at Rapid City under date of September 22 reports as follows:

To-night brings to a conclusion a highly successful week for the First Alfalfa Palace Fair at Rapid City, the success of which was made possible by the ideal weather during the week. On one day only was there any precipitation and then only 0.05 inch. I desire to congratulate you on your excellent forecast for the event, and I assure you the action taken in this connection is greatly appreciated by the citizens of Rapid City.

September 10, 11, and 12, for Topeka, Kans., for the following week:

September 10: Somewhat doubtful at present about weather conditions this week and can not make forecast with definiteness to-day.

September 11: Prospects still a little uncertain balance of week, but present indications do not point to much precipitation. Temperature will now rise and continue moderate.

September 12: Present prospect for mostly fair weather and mild temperature balance of week.

Regarding these advices the section director at Topeka under date of September 13 writes as follows:

I wish to thank you for the special messages regarding probable weather conditions for the State fair here this week. They were exactly what we needed, even if somewhat negative in character, and the information contained in them was given a timely circulation in both afternoon and morning papers.—*H. J. Cox, District Forecaster.*

New Orleans forecast district.—The most noteworthy feature of the weather in this district in September, 1917, was the severe tropical storm which caused hurricane winds in southeastern Louisiana, south and east of New Orleans, on the 28th. Ample warnings regarding this hurricane were issued from the central office at Washington. A separate report on the storm and the distribution of the warnings will appear in the October REVIEW.

Small-craft warnings were issued on the 15th for the Louisiana coast and the Texas coast from Port Arthur to Corpus Christi, because of the presence of a disturbance off the Louisiana coast. This disturbance moved northwestward and small-craft warnings were ordered on the 16th on the Texas coast east of Matagorda Bay. The warnings were justified except that velocities were moderate west of Matagorda Bay on the 15th.

Northeast storm warnings were ordered displayed at Burrwood, Morgan City, Empire, and Pilottown, La., at 4.30 p. m. of the 26th, because of the tropical disturbance in the middle eastern Gulf, for the benefit of shipping and fishing interests. These warnings were changed to hurricane warnings at 10 p. m. on advices from the central office and were verified. The apparent extent and continued northwestward movement of the tropical disturbance made it appear advisable to display northeast storm warnings on the Texas coast, and such warnings were ordered from Port Arthur to Corpus Christi on the morning of the 27th. The available data at that time did not furnish good indications of the probable location of the recurve in the path of the disturbance. The recurving of the storm near the mouth of the Mississippi River, on the morning of the 28th, prevented it from being felt to any great degree on the Texas coast.

Fresh to strong north winds occurred on the east Texas coast.

Frost warnings were issued on the 26th for the Texas Panhandle and northwestern Oklahoma: light frost occurred in the Panhandle and frost temperatures in northwestern Oklahoma. Warnings of the probable occurrence of frost in central and northeastern Oklahoma and extreme northwestern Arkansas were issued on the 27th, but temperatures the following morning were a little too high for frost under the conditions.

For the benefit of growers who were harvesting rice or other crops, forecasts of fair weather were extended 24 hours beyond the usual period for Arkansas on the 21st, 22d, and 29th, and for Louisiana on the 29th. These forecasts were verified.—*R. A. Dyke, Assistant Forecaster.*

Denver forecast district.—Temperature conditions during September were more favorable than usual—at least during recent years. Frost warnings for high districts were issued on the 14th, 15th, 23d, and 24th, and for lower elevations on the 25th, 26th, 27th and 29th. The damage that resulted from the frosts was small.—*Frederick H. Brandenburg, District Forecaster.*

San Francisco forecast district.—For nearly the entire month of September the pressure was relatively low in the Pacific States. It was relatively high over Alaska until about the 7th, when the barometer fell and relatively low pressure continued in that locality until the 26th, at which time cable trouble occurred and no more reports were received from Nome, Tanana, Eagle, Valdez, Juneau, and Sitka.

The dry spell was broken in the western portion of the North Pacific States on the 8th and in the eastern portion on the 11th. No rain of consequence occurred in California until the 21st, when moderate amounts fell in the northern half of the State. Dry weather still continues in the southern half of California and in portions of Nevada.

Small-craft warnings were issued for Washington seaports and at the mouth of the Columbia River on the 14th and 26th; storm warnings were issued from Eureka to Mendocino on the 21st and from Harford to San Diego on the 29th. The small-craft warning on the 26th was fully verified. That on the 14th was not, as the storm moved eastward farther north than expected, and the highest wind reported was 36 miles per hour from the southeast at North Head, Wash. The storm warnings were verified, but issued too late to be of the fullest value to the public.

Frost warnings were issued on four occasions for Nevada and once for southeastern Idaho. They were all verified. Light frosts formed once in western Nevada and heavy frost formed once in northeastern Washington without warnings.

Special rain warnings were issued on the 21st, 28th, and 29th for the benefit of the fruit industry in California, and they all were verified, the one issued on the 21st being especially timely and beneficial.—*E. A. Beals, District Forecaster.*