to establish the practical value of the service rendered to maritime interests. On Wednesday, the 7th instant, the weather conditions from Point Isabel, Tex., to West Quoddy Head, Me., seemed to the average mariner to presage fair weather. But the scientific observers in the Weather Bureau discerned indications of a severe gale which would sweep the Atlantic coast from end to end, and they ordered storm signals set. Several hundred vessels that were ready to put to sea when the warnings came remained in port. Eighteen coastwise steamships and sailing vessels which went forth from harbors regardless of the signals came to grief. Some were battered by heavy seas and others were wrecked on shore. It has been estimated by experts who write on maritime subjects that the United States Weather Bureau since its establishment has saved property to the value of $20,000,000 per annum. The American Geographical Society sets a high value on the practical services of the Weather Bureau, rating it at 2000 per cent annual return on the cost of the yearly maintenance of the system. When the Weather Bureau was established few shipmasters or shipowners recognized its value, and not until hundreds of forecasts of severe gales along the coast were validated by storms did the men who follow the sea begin to repose confidence in the scientific work by the Weather Bureau. A generation ago veteran shipmasters found delight in putting to sea when the storm signals of the Weather Bureau were out. But in time the insurance companies and the shipowners, with minds open to the teachings of science, recognized the value of the weather forecasts and brought about a general respect for the work of the Weather Bureau. Of late years the only flagrant act against the value of the weather forecasts was the positive order by an official of the Portland Steam Packet Company to Captain Blanchard, of the steamboat *City of Portland*, to voyage from Boston to Portland, notwithstanding that the Weather Bureau had set storm signals all along the coast. No other steam or sailing vessel went out of a New England port that night. She was lost with all hands.

The second important storm of the month first appeared on the morning map of the 14th, when pressures were low on the southern Pacific coast and over eastern Kansas. During the 15th and 16th the southern Pacific disturbance moved eastward to the west Gulf district, and the Kansas disturbance northeastward to the Great Lakes. During the 17th the southwestern storm moved northeastward and the Lake storm eastward, and by the evening a trough of low barometer had formed over the Atlantic States with lowest pressure in the middle St. Lawrence Valley. Attending the eastward movement of this trough of low barometer high winds and rain were followed by a decided fall in temperature over the Atlantic seaboard. In connection with this storm warnings were displayed on the west Gulf coast the evening of the 15th, on the middle and east Gulf and south Atlantic coasts and the upper Lake region on the 16th, and on the middle Atlantic and New England coasts and the lower Lake region on the morning of the 17th.

During the 21st and 22d a disturbance of moderate strength advanced from the British Northwest Territories eastward over the upper Lakes and reached the St. Lawrence Valley on the morning of the 23d. From the 23d to the 26th a disturbance moved from the Bahamas northward to the Canadian Maritime Provinces. During the 26th the rapid advance of an area of high barometer from the westward, in conjunction with low barometric pressure off the north Atlantic coast, caused high northwest winds over the Great Lakes.

On the 16th a cool wave overspread the Rocky Mountain districts, and by the morning of the 17th the temperature had fallen below the freezing point in the States of the middle and upper Missouri Valley. During the next two days the cool wave extended east of the Mississippi River attended by frost in the interior of the South Atlantic and Gulf States and by freezing temperatures in the western parts of Virginia and North Carolina and eastern West Virginia. On the 22d and 23d a cool wave advanced from the Northwest over the central valleys and the Lake region, and on the morning of the 24th frost occurred in the interior of the middle and west Gulf States and freezing temperatures in the Ohio Valley. On the mornings of the 25th and 26th frost occurred in the east Gulf and South Atlantic States and extreme northern Florida. Frost again occurred in the Middle and South Atlantic States and the Ohio Valley on the morning of the 28th with freezing temperatures in the southern Appalachian Mountain regions. The frosts of the month in the crop growing districts were announced in the forecasts.

BOSTON FORECAST DISTRICT.

The chief and only unusual feature of the month was the storm which raged with more or less fury from the 8th to 13th, and will pass into history as among the most severe and long-continued disturbances for October on record. The New England coast suffered greatly from its force, beach property being damaged in places, and the coast line terribly scarred by wind and wave. Shipping of all classes remained tied up for four or five days in all New England harbors. The winds, generally easterly, were attended by rain and fog. The northwest gales of the 17th and 18th were very severe on parts of the southern coast, resulting in some loss of life and considerable damage to shipping. Warnings were issued well in advance of the storms and were of great value to shipping and other interests. Excepting the storms mentioned the weather of the month was seasonal and pleasant.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

October was mild and dry. The only features that called for special forecasts were occasional frosts for which timely warnings were issued. The first general frost warning was issued on the 24th and frosts occurred throughout the district almost to the coast.—*I. M. Cline, District Forecaster.*

CHICAGO FORECAST DISTRICT.

There were a few storms only of marked energy in the upper Lake region during the month, although none was exceptionally severe. One storm passed over on the 3d, another on the 6–7th, and still others on the 16–17th, 22d, and 26th. The wreck of the greatest importance during the month was that of the steamer *Erie L. Hackley*, which occurred in Green Bay on the night of the 3d–4th, and resulted in the loss of twelve lives. Warnings had been displayed at Green Bay fully twelve hours in advance of this storm. Warnings were ordered well in advance of all storms except the one on the 26th, which, however, was of short duration, although one steamer and one schooner, both unseaworthy, were wrecked. The weather conditions throughout the forecast district were uneventful, unusually pleasant weather, and moderate temperature prevailing during the greater portion of the month.—*H. J. Cox, Professor and District Forecaster.*

DENVER FORECAST DISTRICT.

During the first decade several forecasts of frost were sent to portions of Colorado. The special warnings of the morning of the 11th for northern New Mexico and selected points in Colorado marked the close of the season for warnings of this character. There were no cold waves, and the weather throughout the district was in the main fine and seasonable.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

The month was an exceptionally dry one. The rainfall throughout the entire district being small. In fact the month was part of a period of prolonged drought. At San Francisco, for example, from April 16 until October 8, no rainfall amounting to .01 of an inch was recorded on any date. In other words, with the exception of a trace on May 25 and 26, June 11, August 14, and September 28 and 29, there were one hundred and seventy-five days without rain. So long a dry period is not to be found since the Weather Bureau records have been

kept at this office. Referring to some earlier records in my possssion I find that in 1867 no rain fell between April 13 and September 14, one hundred and fifty-five days. A moderate disturbance on October 9 appeared off the Oregon coast. Southeast storm warnings were displayed from the Farallones, Point Reyes Light, and northward to Eureka. The wind reached a velocity of 60 miles at Point Reyes Light.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.

The last half of the month was unusually dry. Shipping, both inland and along the coast, experienced considerable inconvenience, on account of fog between the 19th and 27th. During foggy weather, at about 4:30 p. m., October 26, the steamship *South Portland*, from Portland, Oreg., bound for San Francisco, ran on the rocks at Blanco Reef, coast of Oregon, and shortly afterwards sank. The passengers and crew numbered 40, 17 of whom were drowned. Storm warnings were issued on the 3d, 5th, 9th, and 31st and advisory messages for smaller disturbances were sent to selected seaports on the 22d, 28th, and 30th. The most severe storm of the month occurred on the 5th, at which time maximum wind velocities of 72 and 80 miles were reported at North Head and Tatoosh Island, respectively. This disturbance was also severely felt east of the Cascade Mountains, in northern Washington, and along the western slope of the Rocky Mountains in Idaho. Heavy frosts were frequent in eastern Oregon, eastern Washington, and Idaho, but as the staple crops matured the previous month, they did no harm. In western Oregon and western Washington several light frosts were reported, but they were not heavy enough to injure vegetation and at the end of the month late corn and root crops were still green and growing.—*E. A. Beals, Forecast Official.*

RIVERS AND FLOODS.

In connection with low area, No. III, over 10 inches of rain fell at New York, N. Y., during the forty-eight hours ending at 8 a. m. of the 10th, and falls almost as heavy occurred over eastern Pennsylvania and New Jersey. The waters of the Delaware, Passaic, Mohawk, and the tidewater section of the Hudson rose with great rapidity and generally attained unprecedented heights. At Albany, N. Y., during the night of the 9th, the water in the Hudson rose at the rate of a foot an hour. The total amount of the property injured and destroyed was appalling, especially in the Delaware and Passaic river valleys. Along the first-named river from below Easton, Pa., to Trenton, N. J., a distance of something over fifty miles, not a single wagon bridge was left standing. Travel and traffic were interrupted or entirely suspended in the flooded regions, and great loss of life narrowly averted at Paterson, N. J. Along the Mohawk and Hudson rivers the destruction of property was great, but was small as compared with that in the other flooded districts, and much loss and damage were obviated by the timely warnings issued by the Weather Bureau official at Albany, N. Y., as may be seen from the following extract from the Albany Press and Knickerbocker:

The local weather bureau is entitled to considerable credit for its work in connection with the recent flood. On Friday afternoon last the local official noticed that the river was rising, and about 4 o'clock notices were sent out to the merchants along Broadway and other places that at 6 p. m. that day the water would be over the docks, and that by 7 o'clock on Saturday morning a flood stage of about 15 feet would prevail. On Saturday morning at 7:20 o'clock the river was 14.06 feet above mean low water and still rising. A general forecast was sent out that morning stating that the river would begin to fall that evening and that it would continue to go down on Sunday. On Saturday afternoon a special forecast was made and announced that the river would be at its maximum height by 9 o'clock that evening. The river ceased to rise before 8 o'clock and remained at the maximum level until 9 o'clock, when it began to recede and at 8 o'clock on Sunday morning the river was 14.12 feet above the normal and still falling. The local office of the Weather Bureau was open until 9:20 o'clock on Friday evening for the purpose of sending out by telephone messages of warning and answering questions that were asked concerning the rise in the river.

The high water reported in the Mississippi River, above the mouth of the Missouri, during the latter part of the preceding month, passed the flood stage at Hannibal, Mo., on the 4th, inundating the low lands adjacent to that city, and destroying corn and wheat crops valued at $100,000. The maximum stage at Hannibal, 15.8 feet, occurred on the 10th, and exceeded previous October high-water gage records by 4.9 feet. Timely warnings of this flood were issued by the Weather Bureau official at Hannibal. There was but little fluctuation in the waters of the lower Mississippi, a high stage for the season, continuing throughout the month.

The Ohio River was slightly lower than during September, but at no time was navigation interrupted. Changes in the other navigable streams of the country were also of minor importance.

The highest and lowest water, mean stage, and monthly range at 173 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock on the Arkansas; and Shreveport, on the Red.—*George E. Hunt, Chief Clerk, Forecast Division.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocity.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	28, a. m.*	35	120	4, p. m.	46	60	4,275	6.5	658	27.4
II	3, p. m.	37	122	7, p. m.	46	60	3,650	4.0	912	38.0
III	6, p. m.	43	124	10, a. m.	49	86	2,450	3.5	700	29.1
IV	9, p. m.	34	118	16, p. m.	46	60	5,000	7.0	714	29.3
V	14, a. m.	48	124	22, p. m.	46	60	4,800	8.5	565	23.5
VI	19, p. m.	48	124	21. p. m.	37	96	1,925	2.0	962	40.1
VII	21, a. m.	47	123	25, p. m.	29	95	2,450	4.5	544	22.7
VIII	25, a. m.	53	108	38. p. m.	38	80	1,800	3.5	514	21.4
Sums							26,350	39.5	5,569	231.5
Mean of 8 paths							3,294		696	29.0
Mean of 39.5 days									667	27.8
Low areas.										
I	30, p. m.* 1, a. m.	51 39	120 120	6, a. m.	46	60	3,325 3,675	5.5 5.0	604 735	25.2 30.6
II	5, a. m.	53	122	7, p. m.	48	86	1,825	2.5	730	30.4
III	8. p. m.	35	74	14, p. m.	46	60	1,875	6.0	312	13.0
IV	9, a. m.	48	125	18, p. m.	46	60	5,700	9.5	600	25.0
V	15, a. m.	32	107	17. p. m.	35	76	2,000	2.5	800	33.3
VI	18, p. m.	53	107	21, a. m.	46	60	2,300	2.5	920	38.3
VII	20, p. m.	54	114	23, a. m.	48	68	2.275	2.5	910	37.9
VIII	23, a. m.	20	76	26, a. m.	46	60	2,250	3.0	750	31.2
Sums							25,225	39.0	6,361	264.9
Mean of 9 paths							2,803		707	29.5
Mean of 39.0 days									647	27.0

* September.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*George E. Hunt, Chief Clerk Forecast Division.*