visible only near the horizon. By 7.04 the primary bow was complete, with very bright colors (red on the outer edge and greenish-blue on the inner). A few minutes later two complete and one fragmentary supernumerary bows appeared inside the primary; they were very distinct and the colors were unusually bright for such bows. The display disappeared rapidly about 7.14 p. m., eight minutes after sunset.—M. J. C.

Warm autumns of late years.—For many years there has been a decided tendency to warm autumns in most sections of the United States, especially in eastern areas. During the past 15 years, up to and including the fall of 1933, the average temperature for the months of September, October, and November, comprising the fall season, has been above normal at Boston 13 times, New York 11, Philadelphia 11, Washington 13, Atlanta 10, Columbus, Ohio 9, Chicago 9, St. Paul 9, St. Louis 10, and Kansas City, Mo. 9.

The fall of 1933, in line with this recent trend, was above normal in nearly all parts of the country. Most of the western half of the country was decidedly warm, with the mean temperature for the 3 months ranging from 4° to 6° above normal. Precipitation this fall was deficient in most sections of the country. Outstanding dry areas were noted in some of the Middle Atlantic States, the central Gulf sections, and in central and southern Pacific coast districts.—National Weekly Weather and Crop Bulletin, U. S. W. B.

Weather Bureau records show that when the temperature rose to 75° on last November 2 at Detroit the local record for high temperatures so late in the season was broken while two weeks later, on November 16, the thermometer sank to 8°, which is the lowest on record at that place for so early in the fall season.—C. J. Root.

Five kinds of ice.—Prof. P. W. Bridgman of Harvard University, by subjecting water to enormous pressure, produced some years ago four kinds of ice differing in some of their properties from one another and from the ordinary ice that occurs in nature. Ordinary ice is less dense than water, as shown by the fact that it floats, but all of the other kinds are denser than water.

One interesting application of all this is the powerful expansive force exerted by water when it freezes, resulting in the bursting of water pipes and even of far stronger metal containers, reaches a limit at the point where a container of sufficient strength compresses the expanding ice so strongly that the latter changes from ordinary ice to one of the other kinds.

When this compressive force amounts to 30,000 pounds per square inch, the ordinary ice changes to the variety known as “ice III,” which is about 3 per cent denser than water. It thus tends to shrink instead of expand and the rise of pressure is arrested.

To put it another way—freezing water cannot exert a greater pressure than 30,000 pounds per square inch on the walls of a containing vessel.—C. F. Talman, in Why the Weather? (SS).

“NEW DEAL” FOR WEATHER BUREAU CONTEMPLATES MANY NEW ACTIVITIES

Weather maps issued by the U. S. Weather Bureau will take on some of the appearance of battle maps, if one of the outstanding recommendations of a special committee of the Science Advisory Board is put into effect. The preliminary report of this committee, which will be published tomorrow, strongly advocates the adoption of the method of weather study known as “air-mass analysis,” first developed in Norway, for general use in the United States. This method is not intended to supplant the one now in
use, but to supplement it, so that weather maps with the familiar roughly elliptical outlines of "highs" and "lows" will be accompanied by others showing the weather as "battle lines."

The "battle-line" weather map is no mere figure of speech, for the "air-mass analysis" method of weather forecasting uses as its basic data information gained by the study of great moving mountains of air that migrate down from the poles and up from the tropics, meeting, pushing against each other, and over-riding or under-running like players in opposing football lines. The interplay of forces borne in these air masses gives us rain and snow, wind and fair weather. The air-mass analysis method has been in successful use in Europe for several years, especially for the benefit of aviation.

Airplanes, whose movements are benefited by the new method, are essential to the gathering of data used in it; for the air-mass analysis method must have figures on temperature, pressure and humidity from aloft as well as on the ground. For this reason, among others, the committee recommends also the integration of all the present separated weather-studying and reporting services into one central organization, consolidated under the Weather Bureau, except for the activities necessary to the Army and the Navy. The meteorological work of the Army and Navy, however, should be closely coordinated with the work of the Weather Bureau, the committee recommends. This would have a double advantage, for Army and Navy planes can be used for the gathering of weather data aloft in connection with their regular training schedules at little or no added expense, while the wire and radio reporting services, which the committee suggests should be concentrated in the hands of the Weather Bureau, will render fuller and more dependable information available to all organizations interested.

In addition to these two major recommendations, the committee also considers the following innovations desirable:

A certain decentralization of the general forecast work of the Weather Bureau by the establishment of more numerous district forecast centers in place of the five now existing.

An extension of climatological work which looks toward long-range forecasting.

Efforts toward cooperation with other countries in the Northern Hemisphere, particularly Canada, Mexico and Russia (Siberia) in securing appropriate meteorological data which will disclose the movements of major air-masses over all these areas, in the interest of increasing the time range of weather forecasting.

"Postgraduate" training for Weather Bureau meteorologists, which will give their scientists the benefits of the best university and research institution training, keeping them constantly up to date in their information and methods.

Establishment of a permanent Weather Bureau Committee, composed of four or five of the outstanding scientists of the country, to advise on matters of weather service and policy.

The committee, which has spent several months of intensive study and conference on Weather Bureau problems, consists of Dr. Isaiah Bowman, chairman of the National Research Council and director of the American Geographical Society; President Karl T. Compton of Massachusetts Institute of Technology; Charles D. Reed, observer at the U. S. Weather Bureau Station, Des Moines, Iowa; and, as chairman, Dr. Robert A. Millikan, director of the Norman Bridge Laboratory of Physics, California Institute of Technology.

The committee was appointed by the Science Advisory Board, which is a functional organ of the National Academy of Sciences at the National Research Council. The Science Advisory Board and its committees also have in hand other science problems of the national government, on which reports will be made later.—Science Service.

The Weather Bureau has been assigned 696 temporary employees for two months, for the purpose of compiling and arranging records of public value. Pay for these employees, 75 per cent of whom must be women, is to come from funds allotted by the Civil Works Relief Program.
THE FIRST BALLOON FLIGHT

The year, 1783, saw man taking to the air for the first time and staying up—in a balloon. It has been noted as tragic irony that in sesqui-centennial year, 1983, the United States should have sustained the greatest air disaster in history through use of a lighter-than-air craft.

On June 5, 1873, the Montgolfier brothers, Stephen and Joseph, paper manufacturers of Annonay, France, built a hot-air balloon out of paper and linen with a capacity of 23,430 cubic feet. This was their first public experiment. For months before that day they had experimented with small balloons and on one occasion had sent their “aerostatic machine” to a 600-foot altitude. The brothers believed their fire of wool and straw in a pit beneath the mouth of the bag generated a new type of gas. Although hydrogen had been discovered it was not utilized until some time later.

The first public exhibition was a great success. The balloon had a circumference of more than 100 feet and its gaily painted exterior and its ability to rise from the ground by “magic” excited the crowd tremendously.

The success of the Montgolfiers’ balloon drew official attention to aeronautics and the Académie Des Sciences in Paris went to work, raised money and made possible the building by J. A. C. Charles and the Brothers Robert of the first hydrogen balloon. The balloon was completed on the morning of August 27 and it was filled with the highly inflammable hydrogen and then escorted by hand lines, in the midst of a torchlight procession, through lanes of thousands of spectators to the Champ De Mars. Miraculously there was no accident.

History records as important the ascension of another Montgolfier before the members of the Académie 16 days later and a week later another Montgolfier was sent up for the benefit of King Louis XVI and his court at Versailles. Joseph Montgolfier placed a sheep, a rooster, and a duck in a small basket beneath the bag.

The next step was to get a man to take the hop. Finally a young man named Jean-François Pilatre de Rozier came forward and the Montgolfiers built a special balloon more than 70 feet high. Underneath they slung a wicker basket in the midst of which, hung by chains, was a grate. The idea was for the pilot to keep up the supply of “gas” to prolong his flight. On October 15 De Rozier went aloft to the height of 84 feet in a tethered balloon and by vigorous stoking managed to stay up nearly five minutes.

De Rozier made several tethered flights and on November 21, with the Marquis D’Arlandes aboard, he set out from a garden in the Bois De Boulogne on the first cross-country flight in history. They had the grate and an ample supply of straw. They flew across much of Paris, alternately shoving straw into the flames and with wet sponges putting out fires in the fabric.—Detroit News, Contributed by C. J. Root.