(b) Exception: But if, with such a LOW, the cirri lying across the south and southeast sky spread rapidly outward from the south and increase noticeably in density, it is an indication that the LOW is either moving or developing northward and may bring precipitation to the observer. This sometimes occurs when the morning pressure changes did not clearly indicate the northward turn of the LOW. If the LOW is too far east to affect the observer's locality, the successive arrangement of cirri in the southwest sky often shows that fact in advance. When the above movements of cirri from nearly south occur in the morning, precipitation usually follows by mid-afternoon.

Another type of cirrus, or Ci.St., from the southwest or west-southwest, shows by its successive forms and arrangement that rain will occur on the morrow, that it will usually begin before morning, and that the heaviest portion of the storm will pass to northwest of Peoria. This set of indications is seen at Peoria in front of many of the southwest LOWS that were headed toward the Ohio Valley or Tennessee, but turn northward during the day and later cross Iowa. The pressure changes of the morning map may, or may not, have shown this tendency.

In summer detached cirrus clouds appear two to eight hours or more ahead of a large share of the local storms. Often the arrangement of cirri indicates the portion of sky to be traversed by the heaviest portion of the storm. When cirrus plumes or streamers move endwise, or ths wisps and patches of Ci.St. persist, along the same line across the sky, then if there is any marked difference in density or number or in clearness of outline among those clouds, the heaviest portion of the storm will usually follow the path marked by the heaviest or clearest or most numerous cirri. This rule does not hold for Ci. streamers moving obliquely. Sometimes there are bars and streamers moving endwise and others in oblique position but moving in the same direction. In such cases the principal portion of the storm is likely to follow the streamers that move endwise.

Rapidly moving Ci. streamers from west or west-northwest, with or without focal points, when succeeded by broken clouds or patches of clear sky, usually indicate fair weather if the wind accompanying the cirri is fresh from the west; otherwise not.

Cirri from the west, with or without streamers, and streamers with or without focal points, may increase toward mid-afternoon. There may also be other clouds, A.St., Ci.Cu., or A.Cu.; the general cloudiness may break up between 3 or 4 p. m. and sunset, sometimes clearing almost completely. This sequence, with southerly or easterly winds, is an almost infallible indication of rain to begin before morning, often with thunder.

A.Cu., in summer, are one of the most useful rain indicators.

Detached A.Cu., from southwesterly (south to west) points, in the morning, nearly always mean thunder showers in afternoon, most frequently between 2 and 6 p. m. This may not hold just after another storm.

Detached A.Cu. from northwesterly points, in morning, are nearly as useful. Sometimes their rain comes quicker than that after A.Cu. from southwest.

Exception: Occasionally a wind shift or a sprinkle of rain comes with the morning A.Cu. When that occurs no afternoon developments may follow. Under such conditions the morning A.Cu. seem to mark the center of a disturbance that is passing eastward and produces no more showers for that locality. But when A.Cu. occur in morning without rain or wind shift, they are connected with a disturbed or unstable condition to westward that will usually develop Cu.Nb. in the stronger convectional overturn of afternoon.

A.Cu. often mark the paths of showers, or of the heaviest portions of more general thunderstorms, several hours (often four to eight) in advance. Sometimes this is done by detached groups of A.Cu. occurring only in certain portions of the sky or persisting along certain paths; at other times by the formation of lines or bars of heavier or denser development, that move longitudinally, persisting along certain paths. When such bars or lines move obliquely or laterally they do not have the same significance. When scattered bars move laterally, any subsequent associated rain is apt to be brief, and light in amount, unless other cloud indications at the time show otherwise.

In north-central Iowa there occurs a combination of clouds, chiefly cirri and A.Cu., in which A.Cu. cover one-fourth to one-half or more of the sky through midday and much of the afternoon; being preceded and attended by cirri, and clearing toward evening. This is invariably followed by active thunder showers between midnight and morning. The clouds are from westerly points. In a modified form of the combination they may move from the southwest, at least in Illinois. The Iowa combination seldom occurs at Peoria except with modifications.

In northern Iowa, after a clear summer day with southerly wind, the appearance of even a single bar of A.St., or a few fragments of A.Cu., near the northwest horizon at sunset, often indicates scattered showers next day; even though the evening weather map carries no rain in the northwest. The showers may be more or less general, and may arrive by early morning. The occurrence of that evening indication should put the forecaster on guard, unless the evening map shows plainly that no pressure wave is possible. This occurrence seems to be associated with some of the occasional high pressure waves of summer that traverse the north-central border States, without, as a rule, extending their influence very far south. The indication is seldom useful at Peoria.

Cumulus: When conditions favor the development of showers, the cumuli of morning or middle forenoon often show the paths to be followed by afternoon showers. In some seasons and in certain types of weather this indication has frequently been found useful, particularly in Iowa.

There are many cloud indications that will reward the attentive meteorologist with considerable assistance in serving his community.

HIGHWAY WEATHER SERVICE.

During the winter of 1918–19 the Highway Weather Service was in operation to a greater or less extent at some 23 stations in 13 States. At most of these stations, principally in the northern States, it was a winter service only and was discontinued in the spring to be resumed the coming winter. At a number of stations, however, the service has been continuous.

This Service, now entering its third season, consists mainly of the collection and distribution of information in relation to the condition of the main State highways and of the dissemination of warnings of expected cold waves and heavy rains or snows. At some stations that are corn and wheat region centers the information is obtained from such of the substation observers as are located on or near the main highways, a word to represent the road conditions, as "Good," "Passable," "Bad," etc.,

being added to the daily report. This addition, by an arrangement with the telegraph company, can be made without increasing the expense of the report. At some of the corn and wheat region stations referred to a column is added to the bulletin giving the road conditions, but in some cases where this is not feasible a separate card bulletin is issued. At other stations the information is obtained from correspondents who are furnished with franked postal cards and make daily reports by mail, the information contained thereon being summarized at the central station, published on the daily bulletins, and otherwise distributed. The mail reports are supplemented by reports by telephone or telegraph, at Government expense, as occasions may require, on the occurrence of unusual conditions. The correspondents are largely persons connected with State highway commissions or interested in automobile traffic, and serve without compensation.

AERIAL WEATHER FORECAST SERVICE IMPROVED.

[Reprinted from Aerial Age Weekly, New York, Aug. 18, 1919, p. 1048.]

WASHINGTON, D. C.—The Weather Bureau * * * has prepared a map of the United States divided into 13 zones, for which forecasts are to be made for aviators and balloon pilots. These forecasts are made twice daily, at 9:30 a. m. and 9:30 p. m., and cover conditions for the succeeding 24 hours.

Since July 21, forecasts have been made with the country divided into seven zones, with such satisfactory results that the number of zones has been increased to 13.

The Air Service has sent out the revised map to their active stations throughout the country and the forecast will be forwarded at the time made,[1] it being intended that all cross-country fliers shall be advised of the weather conditions before starting on any contemplated flight, thereby reducing * * * to a minimum the liability of injury to aviators, balloon pilots, passengers, and property, as far as weather conditions are concerned.

PLANT TEMPERATURES.

[From Annual Report of the Director of Bureau of Standards, year ending June 30, 1916, pp. 92-93.]

As a result of inquiries by botanists and agronomists concerning the transmission, reflection, and temperature of growing leaves and methods for determining the same, experiments were made on methods of making temperature measurements with needle-pointed thermocouples of fine (0.05 mm.) wires inserted into the ribs or petiole of a leaf. Data on transmission and reflection have been published in Scientific Paper No. 196, Diffuse Reflecting Power of Various Substances. The temperature measurements are relative values, which fluctuate very rapidly with every breeze that blows. In quiet air, in the shade, the thick succulent stem of a burdock leaf was 3.5° C. below the room temperature (below the temperature of the water in which it stood), while the leaf was only 0.5° C. below. Similarly leaves of other plants were 0.2 to 0.5° C. below the room temperature. In the sun, however, conditions were different. The cooling by transpiration of water is not rapid enough in comparison to the rate of absorption of solar energy. The temperature of a growing plantain leaf exposed to the sun was 5 to 6° C. higher than the air temperature.

[1] It is expected that arrangements soon will be made for the press services to handle these forecasts, for publication in newspapers located in the regions where flying is more or less general.

PRECEPTS FOR FORECASTING RIVER STAGES ON THE CHATTAHOOCHEE AND FLINT RIVERS OF GEORGIA.

By C. F. VON HERRMANN, Meteorologist.

[Dated Weather Bureau, Atlanta, Ga., Aug. 8, 1919.]

GENERAL SUMMARY.

Preliminary investigation has shown that there does not seem to be a very definite correlation between the river stages at upper and lower river stations on the Chattahoochee and Flint Rivers, and that a scheme for forecasting flood stages could not be based on gage relations, at least without a very extended and time-consuming investigation. This probably results from the fact that the rains over the watershed of these two rivers frequently approach from the west or southwest, covering the lower courses first, and later advance to the upper watershed; although the reverse operation also takes place. In general, then, although the rise in the river may seem continuous at any point, the curve graphically representing the rise is in reality complex, resulting from the combination of two or more curves at different phases. Occasional use is made of gage relations in general, since the limit of a possible rise may be determined for each river gage by the crest stages at the upper stations, and especially between the two lower stations on the Flint-Albany and Bainbridge, and the two lower stations on the Chattahoochee-Eufaula and Alaga. This matter will, however, be made the subject of a separate investigation when time permits. In order, therefore, to complete a practical scheme for forecasting river stages another plan was followed, the principle of which may be described as follows:

It is evident that in every case and under all conditions the stage of a river must be a function of the rainfall over the watershed above the station. That is, for any station a factor may be found which will give the probable rise in the river in feet on the river gage corresponding to an average rainfall of 1 inch over the watershed. But this factor will necessarily be modified by many different causes, some of them of permanent character (which need not be considered) and others of fluctuating character which determine the various different rises due to nearly the same amount of precipitation. These fluctuating factors are, for example, the irregular distribution of rainfall, the rapidity of fall, the previous condition of the ground (or level of the ground waters), temperature conditions, initial stages, effect of water released from power dams, and many others.

The study required the untangling of these different factors in order that each might be given its proper value or weight in the rules for forecasting. Nevertheless the number of rules should be kept to the smallest possible minimum in order not to defeat the aim of the river forecast scheme, to enable the forecast official quickly to determine the probable stage of a river from telegraphed rainfall reports. A too minute dissection of rules would defeat this purpose.

The factor or rise in feet for each inch of precipitation will, of course, be different for each river station. Its value depends primarily on the nature of the bank at the