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RADIO DISTRIBUTION OF FORECASTS AND WARNINGS.

Radio telegraphy has reached a stage of development where it must be recognized as a potential medium for the dissemination of weather forecasts, warnings, and information, especially to the many rural or otherwise isolated communities heretofore difficult or impossible to serve adequately through available newspaper, telegraph, telephone, and mail facilities.

The number of unlicensed amateurs in the United States that have wireless receiving sets is estimated to be in excess of 20,000. The operation of receiving sets requires no license, but radio transmission is restricted and can not be engaged in except by license. There are now more than 10,000 licensed amateurs. The number of both classes is rapidly increasing, about 1,000 licenses having been issued in the month of March alone. As licensed operators also have receiving sets, it is safe to estimate that there are now more than 30,000 persons in the country in position to obtain weather forecasts by radio. A considerable portion of them are located in rural districts. Agricultural schools and colleges, moreover, are making radio telegraphy a part of their curriculums, and farm journals are encouraging the boys and girls on the farms to install this fascinating and useful apparatus. It is not unreasonable to expect that, in the not distant future, a radio outfit will be a part of every progressive farmer's equipment. This will go far toward placing him on an equality with city interests so far as information regarding weather forecasts, current happenings, market quotations, etc., is concerned.

Already, through naval radio stations, radio telegraphy is being utilized in broadcasting wind and weather forecasts, storm and hurricane warnings, and weather reports to ships at sea and on the Great Lakes. An extension of this work will soon be made by the inauguration of a similar service from each of the 20 naval radio stations on the Atlantic and Gulf coasts and on the Great Lakes, operating on comparatively short wave lengths. The information thus broadcast will cover limited areas and will supplement the general broadcasting from the high-power stations at Arlington, Key West, San Juan, Point Isabel, and Great Lakes, as described in Weather Bureau circular of October 26, 1920. This will provide quite adequately for the needs of shipping.

Although the war crippled the vessel weather service to a considerable extent, this work has since been gradually restored and it is expected that this year there will be nearly 100 active stations of this class. With the exception of reports radiographed during the entire year from ships in the Pacific, ship observa-

tions are now confined to vessels plying the southern North Atlantic, the Caribbean Sea, and the Gulf of Mexico, during the hurricane season, June to November, inclusive. Two observations daily, supplemented by special observations at frequent intervals when conditions are threatening, are radiographed from these ships. Arrangements have been completed also to have the United States Shipping Board vessels, when within prescribed ocean zones, take and telegraph weather observations daily, beginning June 1, 1921, and radiograph them to certain Weather Bureau forecasting centers.

Aviation is more effected by day-to-day weather than any other class of navigation, and for some time special flying weather forecasts for 13 zones, covering the entire country, have been issued for the benefit of aviators of the Post Office Department and the air services of the Army and of the Navy. On June 1, 1921, the bureau began to disseminate from the naval radio station at Arlington a daily bulletin for the benefit of aviation and marine interests, but designed especially to meet the needs of the former. It consists of surface observations from about 40 regular Weather Bureau stations, a synopsis of general pressure distribution, wind and weather forecasts for the Atlantic coast and Gulf of Mexico, and flying weather forecasts for six aviation zones east of the Mississippi River. This bulletin is broadcast each morning at 10.30 o'clock, 75th meridian time, and is the first radiographed bulletin of the kind ever issued in the interest of aviation in the United States. If it meets with the success that is expected, similar bulletins will be issued from other Weather Bureau centers, eventually covering the entire country.

The use of radio telegraphy for the benefit of marine interests is well systematized, but such is not the case so far as land interests are concerned. Although it is now being utilized to some extent for the benefit of agriculture and commerce, such use is largely of sporadic character. In these fields it is desired to systematize the employment of aerial communication and extend it to every State and section as soon as it is practicable to do so. Forecasts and warnings are now broadcast from a number of colleges and private organizations and from radio stations at Washington, D. C.; Bellefonte, Pa.; Cincinnati, Ohio; St. Louis, Mo.; Omaha and North Platte, Nebr.; Cheyenne, Wyo.; and Reno, Nev., which are operated by the Post Office Department in connection with its trans-continental air mail service.

The ultimate plan in mind will provide for the distribution on fixed schedules of weather forecasts and warnings from at least one radio station in each State. Existing Government radio stations will be utilized as far as practicable, but cooperative arrangements with commercial companies licensed to engage in radio communicative service are desirable in States where Government agencies are not available. There are in the neighborhood of 500 of these commercial companies. By using Government, amateur, and commercial agencies, it is hoped that a system of distribution for the entire country may be established without cost to the Weather Bureau for broadcasting service.

The proposed wireless distribution will be made a part of the present forecast distribution system and will be placed under the general supervision of officials in charge of State climatological centers, but every station official will be expected to assist in developing the work in his vicinity and in securing for the system the necessary publicity.

Radio telephony is in an advanced state of development, and eventually may prove more effective than wireless telegraphy, because no more skill and experi-

ence is required in picking up messages thus broadcast than in using the ordinary telephone. Radio telephone receiving sets are now on the market and the Bureau of Standards is engaged in perfecting inexpensive apparatus suitable for amateur use that can be used interchangeably for receiving by telegraph code or by telephone.—*Edgar B. Calvert.*

VISIBILITY.

I was much interested in Mr. Palmer's remarks on this subject in the May, 1921, number of the BULLETIN, page 65, and wish very heartily to endorse his suggestions. It may interest the readers of the BULLETIN to know that visibility is already being given some attention in the aerological work of the Weather Bureau. Prior to November 15, 1920, the visibility was recorded at the time of each pilot balloon observation and was expressed in general terms only. On that date, however, we began the use of a more detailed scale, viz., the one adopted by the British Meteorological Service. This scale consists of 10 terms, ranging from "zero" (prominent objects not visible at 50 meters) to "nine" (prominent objects visible beyond 30 kilometers). Not only has the visibility been recorded, but a word expressing it has also been included in each telegraphic report of pilot balloon observations. Recently a slight modification has been made in the scale in order that it may conform exactly to that unanimously adopted by the Commission for Weather Telegraphy in November, 1920. This scale, which has thus received international sanction, is as follows:

Scale.	Descriptive term.	Limiting distance, m.
0	Dense fog—prominent objects not visible at	50
1	Very bad—prominent objects not visible at	200
2	Bad—prominent objects not visible at	500
3	Very poor—prominent objects not visible at	1000
4	Poor—prominent objects not visible at	2000
5	Indifferent—prominent objects not visible at	4000
6	Fair—prominent objects not visible at	7000
7	Good—prominent objects not visible at	12000
8	Very good—prominent objects not visible at	30000
9	Excellent—prominent objects visible beyond	30000

It is comparatively simple to set forth and define a visibility scale, but quite another matter to determine at any particular time just what the visibility is. To an aviator going in one direction the visibility will often be entirely different from what it is to an aviator going in the opposite direction. Then too the visibility at the surface may be good, whereas that at a moderate height may be poor, and vice versa. At the present time we endeavor to give the average condition, but in the future we must undoubtedly differentiate.

Even if the visibility is fairly uniform in different directions it is still difficult to estimate it with much accuracy. The method now employed is to mark off the proper distances on a map and select prominent objects as points of reference. But it is not always possible to find a suitable object in the desired direction. Some more systematic method, applicable to both day and night, must be devised. The whole subject presents many difficulties and, as Mr. Palmer suggests, is worthy of considerable study by someone who can devote the necessary time to it.—*W. R. Gregg.*