between the liquid and vapor phase, the phases having become identical."

Let us take any value M in the region of liquid, and pass to any value N in the region of vapor; this may be done in a variety of ways and may therefore be represented by straight or curved lines in the figure. However, let us choose to pass from M to N by changing either pressure or temperature, keeping the other constant meanwhile.

First let us change the temperature to that indicated by the value N (which is value L). Now the pressure at L is greater than vapor pressure at constant temperature, therefore at L the substance is a liquid only. Then let us decrease the pressure to that of N. At the pressure and temperature Z where the line LN (LN being any line cutting OA), indicating the drop in pressure, intersects OA, the curve of vapor-pressure, there is a discontinuity in the passage, the phenomenon of "boiling" will ensue, and no further drop in pressure can take place until all of the substance is vaporized. Then the pressure can be lowered till the value N is reached.

If, on the other hand, we follow the line $MPQN$, which does not cut the line OA, we can pass from the state of liquid at M to the state of vapor at N, without any discontinuity whatever. We first increase the temperature, following the line MLP to a value above the critical value. This takes us into the region where there is no distinction between liquid and vapor, so that by first reducing the pressure and then lowering the temperature, we pass without any break, to a substance in the truly vaporous state at N, the substance at no time having been in the state of two distinct phases.

To this last clause we take exception on the ground that we started with the substance a liquid at M, and ended with substance as a vapor at N, and therefore there must be a place in the transition where the substance ceases to be a liquid and begins to be a vapor. This follows just as naturally as it follows that when a ball is thrown into the air it reaches a point where it ceases going up and begins coming down.

By hypothesis, A was the critical value, which means that any further increase in temperature or pressure acting either singly or together can not produce any change in the state of the substance, and it also follows that any decrease of pressure or temperature acting either singly or in unison will place the resultant condition in the liquid or vapor region or on OA. If, as in Fig. 2, we draw

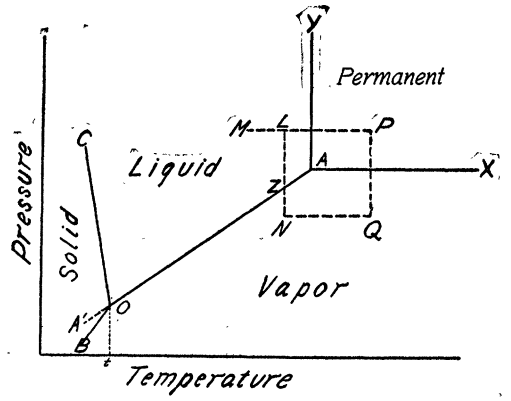

FIG. 2

the limits at which the critical condition can exist, we have YA and AX, because, taking the lowest temperature, that of A, and keeping it constant, and increasing the pressure, we get AY of infinite extent, any value to the left of which, as M, is liquid, and any value to the right, as P, resembles the critical condition at A. Now if we take the minimum pressure, that of A, keep it constant, and increase the temperature, we have AX, any presso-temperature P above AX resembling the substance when at A, while any value below AX, as Q, is vapor.

It is seen, then, that any value within the region YAX is in a special condition, which, for want of a better name, I propose the name "permanent phase."

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CURRENT NOTES ON METEOROLOGY AND CLIMATOLOGY

BULLETIN OF THE MOUNT WEATHER OBSERVATORY

VOL. I., Part 1, of a new publication, *Bulletin of the Mount Weather Observatory*, has

been issued by the United States Weather Bureau. It bears the names of William J. Humphreys, director, and William R. Blair, assistant director, and is prepared under the direction of the chief of the Weather Bureau (Washington, 1908). In the announcement, signed by the Secretary of Agriculture, it is stated that the *Bulletin*, of which this is the first number, will contain more or less detailed accounts of the researches conducted at Mount Weather. The *Bulletin* will appear quarterly. The chief of the Weather Bureau discusses briefly "The Origin and the Purpose of the Mount Weather Observatory," the last sentence being as follows: "The whole aim of the observatory is the discovery, no matter how nor by whom, of fundamental truths of nature, and of their application to human welfare." Dr. W. R. Blair considers "The Methods and Apparatus used in Obtaining Upper Air Observations at Mount Weather, Va.," which includes the results of the kite flights during June–September, 1907. Professor A. J. Henry concludes with a paper on "The Use of Upper Air Data in Weather Forecasting." The *Bulletin* is illustrated by means of several half-tone views of the kite equipment. There are also diagrams showing the upper air isotherms as determined on different kite flights. This number of the *Bulletin* directs attention, in a striking way, to the work which the Weather Bureau has undertaken at Mount Weather.

EVAPORATION IN THE SALTON SINK

To the *National Geographic Magazine* for January, 1908, Professor F. H. Bigelow contributes some "Studies on the Rate of Evaporation at Reno, Nevada, and in the Salton Sink." Professor Bigelow has been in charge of the Weather Bureau work on evaporation in the southwest, and his preliminary results are full of interest. He states that, although it has been quite generally supposed that as much as eight feet of water will evaporate from the Salton Sea each year, there are now reasons to think that the evaporation may not be more than four or five feet. A temporary experiment station was set up at Reno, Nev., where five towers were built by August 1, 1907, and regular observations were continued until September 15. By that time 100,000 readings of the instruments had been made. It became clear that the reservoir at Reno, which is about 1,000 feet long, covers itself with a sheet of invisible vapor about 30 feet thick, and this vapor acts like a blanket upon fresh evaporation rising from the water. It is proposed to erect two or three towers at the Salton Sea in order to get some idea of the behavior of the vapor sheet lying over that body of water.

TROPICAL TEMPERATURES

THE continuation and conclusion of Hann's investigation entitled "Der tägliche Gang der Temperatur in der äusseren Tropenzone" appears in Vol. LXXXI. of the *Denkschr. Wien. Akad. Wiss., math.-naturwiss. Kl.* (1907). The object of this laborious study, so characteristic of the tireless energy and unfailing accuracy which has distinguished all the work of the author, is to obtain, for the tropics, the values needed in order to reduce temperature observations made at different hours to the twenty-four-hour mean. It appears that means based on the daily extremes are quite inaccurate. Hann has, in this second part of his investigation, extended his study to the Indian and Australian tropical region.

FROST IN CALIFORNIA

PROFESSOR A. G. MCADIE has prepared a short and useful paper entitled "Protection of Fruits and Vegetables in California from Injury by Frost," in which he summarizes the various methods of protection against frost in California, already treated at length in previous publications of the Weather Bureau. The daily weather map for December 21, 1907, is reproduced as illustrating the type pressure conditions upon which frosts are found to occur in California. R. DEC. WARD

BOTANICAL NOTES

FUNGUS NOTES

IN a recent number of *Rhodora* (January, 1908) Dr. W. G. Farlow begins the publica-