trol of environment. The extent to which preparations must go to be effective may be indicated by the equipment of the Boyce Thompson Institute for Plant Research. Work in the laboratory, however, to be at all satisfactory and complete must be checked, supplemented and rounded out in the forest itself. Until it has we cannot be sure that we have not in the laboratory set up conditions which do not correspond at all with the conditions in the forest which we are attempting to measure.

AMERICAN MOUNTAIN OBSERVATORIES

In the early years of the Signal Corps meteorological service in the United States, there was a keen appreciation of the value of weather information from heights above the lowlands and valleys where most people live. Two mountain observatories, therefore, were established on Pike's Peak and Mt. Washington, and maintained for nearly two decades, until shortly after the weather service was transferred to the Department of Agriculture. As can well be imagined, the observers had no sinecure. Nevertheless, the observations they made during those years have given us not only a fine indication of the climates of the peaks of the Rockies and of the White Mountains, but have also afforded the basis for many interesting comparisons with lowland weather. With the development of meteorological kites during the late nineties the need for mountain observatories was decreased, and interest in them has generally diminished. Several are still maintained in Europe, however, and two in the United States.

After Pike's Peak and Mt. Washington, Blue Hill Observatory (near Boston) was established, in 1885, by the private enterprise of A. Lawrence Rotch. Though Blue Hill is but 635 feet high, its observatory is distinctly of the mountain type. Indeed it must be, to withstand the severe winds of this isolated summit. Since Professor Rotch's death, in 1912, the observatory has been maintained by Harvard University, and its director has been Prof. Alexander McAdie.

A mountain observatory, without attendant, was maintained by the Harvard Observatory for a few years, from 1895, on the summit of El Misti, Peru, about 19,000 feet high.

On high mountain peaks it is not often practicable to maintain weather stations with observers throughout the year. Yet continuous records from a few such points are of considerable scientific interest. For the purpose of obtaining such records, long period meteorographs are used. Some of these make automatic records of the weather sometimes for a whole year without attention.

S. P. Fergusson, designer of such instruments, points out that the chief problems of maintenance are supplying sufficient ink, adequate lubrication for the anemometers, and protection from injury, moisture, dirt, and insects. Special large closed pens are employed to hold the ink, or occasionally pencils with small soft leads, while siphon lubricators are used to deliver oil periodically to the anemometer bearings.

Meteorographs have been greatly improved recently by the invention of duralumin, "thermostatic" metal, and Friez's distance thermograph. This thermograph will record indoors, which allows most of the meteorograph apparatus to be installed under substantial shelter, only a few elements being exposed outside.

The highest meteorological observatory equipped with recording instruments in North America is on the summit of Mount Rose, Nevada, 10,800 feet above sea level. Dr. J. E. Church, Jr., who established the station 20 years ago and is still in charge of it, first placed maximum and minimum thermometers on the summit to obtain some idea of winter temperatures in the high Sierras. Soon he discovered that "frost forecasts could be made with considerable certainly from the mountain top in advance of instrumental indications below." This proved sufficient to obtain government support for the observatory to erect a building and devise instruments that could make a very complete record without attention for weeks or months together.

A large tank was provided to catch and hold the entire snowfall of the winter, to aid in estimating the probable irrigation water for the Reno district the following summer. Mr. Fergusson, designer of the meteorograph for the observatory on El Misti, Peru, made a similar instrument for Mount Rose. It records pressure, temperature, wind direction and velocity, and relative humidity. The observations obtained on this mountain summit have formed the basis for a study of the general climatology of Mount Rose, the relation of climate to the plant environment, and the relation of timber to the conservation of snow.—*Adapted from C. F. Brooks' "Why the Weather" (Science Service).*

MEASUREMENTS OF SOLAR RADIATION AND THEIR INTERPRETATION

A correction by C. F. MARVIN

Following the publication of my note on "Measurements of Solar Radiation and their Interpretation" in the February BULLETIN, p. 29, Dr. Abbot called at the Weather Bureau on March 21, in order to discuss certain differences of view concerning statements therein. I am happy to say that as a result a better understanding has been reached on a number of points.

(1) *Geometric* vs. *effective angular aperture.* The angular apertures given in the table on page 29 of the February BULLETIN were computed by the formula for *geometric* aperture,

$$\tan \tfrac{1}{2}\theta = \frac{a+b}{2D} \qquad (1)$$

in which θ is the angle, and a, b and D the diameters of openings in the inner and outer diaphragms and the distance between diaphragms, respectively. I recognized that this was only a simple and convenient definition, based purely upon geometric relations. Dr. Abbot, however, now points out that while technically correct, it conveys an exaggerated