kinds of frequency, that is the average interval is plotted against the average number of days with the temperature selected.

To show the relations over a larger area, curves are obtained from data of first-order stations all over the United States, showing the average number of days per month with minimum temperature of 32.0° or lower, and zero or lower, plotted against normal monthly mean minimum temperatures. This diagram shows, among other things, that when the normal mean minimum temperature is 4° or lower, temperatures of 32° or lower are recorded on every day of the month, on an average. If the monthly mean minimum temperature is 32° the number of days with minimum temperature of 32° or lower is about half the number of days in the month. Similarly, as we approach a monthly mean minimum temperature of zero, the number of days with minimum temperature of zero or lower approaches half the days of the month, a condition that is found in some parts of the Upper Missouri Valley.—*Author's abstract.*

"Weather types and pressure anomalies," by T. A. BLAIR, was published in the *Mo. Weather Rev.*, July, 1933, pp. 196-197, 10 figs.

A NATIONAL CENTER OF METEOROLOGY [1]

By ROBERT ALLEN WARD [2]

Meteorology, although the youngest of the sciences, has, chiefly because of its vital concern to agriculture, commerce, and navigation both on the sea and in the air, assumed a position of paramount importance in the modern world. As a science, meteorology may be considered to date from 1856, in which year Le Verrier had begun to issue reports of simultaneous meteorological observations in the *Bulletin International de l'Observatoire,* while in the United States Ferrel had published the first of his pioneer papers on the theory of atmospheric motions. Prior to that time observations of the weather had been made in many places for centuries, but they had been largely haphazard in character and attempts to analyze and to correlate them sporadic. Such facts as had been deduced from them were of doubtful value. Shortly after 1860 various governments began to establish meteorological bureaux which functioned entirely independently of other institutions. The reports from these observatories were collected several times daily by means of telegraphy, and synchronous maps of weather conditions were drawn. It was found possible to forecast impending developments from these maps, and the modern science of synoptic or dynamic meteorology came into being.

The first international conference on meteorology was held at Leipsic on August 14, 1872. Since that time the international aspects of the science have become yearly more important, and the eminent British meteorologist, Sir Napier Shaw, in Volume I of his monumental *Manual of Meteorology,* urges the establishment of an international center of Meteorological research to concentrate principally upon the problems offered by "World Weather," Upper-air Investigation and Long-range Forecasting.

[1] A Thesis submitted for the degree of Bachelor of Fine Arts in Architecture at the School of the Fine Arts, Yale University, June 13th, 1932. Revised for Publication.

[2] Recipient of the Medal of the American Institute of Architects, offered annually by the institute and awarded to the graduating student of the Department of Architecture who has the highest average of excellence throughout the four-year course.—*Editor.*

The United States Weather Bureau was established on February 9, 1870, on which date the following joint resolution was approved by Congress:

"Be it resolved by the Senate and House of Representatives of the United States of America in Congress Assembled, That the Secretary of War be, and hereby is, authorized and required to provide for taking meteorological observations at the military stations in the interior of the continent and at other points in the States and Territories of the United States, and for giving notice on the northern lakes and on the seacoast, by magnetic telegraph and marine signals, of the approach and force of storms."

In 1891 the meteorological work of the Signal Service of the United States Army was transferred to the Department of Agriculture, under which it was created a separate bureau. The Act of Congress authorizing the transfer, was approved Oct. 1, 1890, and read as follows:

"The Chief of the Weather Bureau, under the direction of the Secretary of Agriculture, shall have charge of forecasting the weather; the issuance of storm warnings; the display of weather and flood signals for the benefit of agriculture, commerce, and navigation; the gaging and reporting of rivers; the maintenance and operation of seacoast telegraph lines and the collection and transmission of marine intelligence for the benefit of commerce and navigation; the reporting of temperature and rainfall conditions for the cotton interests; the distribution of meteorological information in the interest of agriculture and commerce; and the taking of such meteorological observations as may be necessary to establish and record the climatic conditions of the United States, as are essential for the proper execution of the foregoing duties."

With the rapid development of commercial and popular aviation additional duties have been added to the work of the Bureau within the last ten years, and, from a comparatively modest beginning, the size and importance of the Bureau has steadily increased until it may now be likened to a gigantic corporation with an annual outlay exceeding three million dollars.

The Central Office of the Bureau in Washington functions not only as a regular first-class observatory, but as the headquarters for the administration of its more than two hundred regular substations scattered throughout the United States and its possessions. The introduction of the radio has enabled the Weather Bureau to obtain daily reports from the Orient and ships at sea, as well as from Alaskan and European stations. These reports, covering a major portion of the northern hemisphere, are utilized in the preparation of the Weather Map from which forecasts for the ensuing thirty-six hours are made. So efficient is the organization of communications that within one hour after the taking of observations at 8 a. m. and 8 p. m., 75th Meridian Time, reports from most of the two hundred stations are pouring into Washington, and the forecasts are ready for the public within an hour and a half or two hours after the observations have been taken. In addition to forecasting, the collection and tabulation of a vast amount of climatological information from more than five thousand voluntary stations forms an important duty of the Central Office.

At present the headquarters of the Weather Bureau in Washington are in a rambling structure of uncertain architecture at the corner of Twenty-fourth and M streets. Here not only are certain of the instruments poorly exposed, because of the proximity of higher structures, but considerable confusion prevails because of the hopeless inadequacy of the antiquated quarters provided. The Library, for example, unquestionably the largest and finest collection of meteorological

publications in existence, presents the distressing spectacle of books piled on the floors, on top of shelves and cabinets, under desks, and hidden away in various corners of other rooms. Rooms that might comfortably care for twenty thousand volumes are being forced to care for fifty-six thousand volumes, with accessions at the rate of eleven hundred to thirteen hundred per year. The need for a new building, or group of buildings, adequately to care for the needs of this important government service is imperative.

It is proposed, therefore, as the subject of this thesis, to combine the growing requirements of the Government Meteorological Service with the necessity for an international center of meteorological research and study, and to create, at Washington, an Institute of Meteorology, to serve as the Central Office of the United States Weather Bureau, as a means of education and the dissemination of knowledge to the general public, and as a haven of study for scholars from all over the world.

The site selected for the Meteorological Center is in Washington N.W., bounded on the north by H Street, on the east by 26th Street, on the south by E Street, and on the west by the Potomac River at a point opposite Analostan Island. This area, adjacent to the Lincoln Memorial and representing potentially one of the most beautiful sections of the city, is at present occupied by small, unattractive structures unsuited to their proximity to official Washington. It is proposed to extend the Speedway northward along the bank of the river as Rock Creek Parkway, connecting ultimately with one of the beautiful drives through the Park. This location would permit of a free exposure for the various instruments, and would, moreover, be sufficiently near the center of the city to afford facilities for the rapid distribution of reports, forecasts, etc.

It is fitting that meteorology, the youngest of sciences, should be enshrined in architecture of the most modern type. There is no place here for unnecessary ornamentation, for the fetters of tradition to cramp the buildings into a mould unsuited for their purpose. While the situation of the Center is such that an extreme use of bizarre motifs would be intolerable, it would be equally intolerable to house a science in the traditional type of monumental building. An attempt has been made in the design of the Institute to have the buildings harmonize with their surroundings in the unassuming beauty of their proportions, and yet, by their lack of ostentation and their functional qualities, to express something of the "clear, cold light of science." A glance at the elevation of the entire group as seen from the Potomac (Fig. 1) will show that it is dominated by the one hundred and twenty foot tower which contains the Observatory and is surmounted by the wind instruments. This tower was designed to minimize the obstruction to normal wind flow which such an object might cause, and is, in a sense, "streamlined." All the other buildings of the group, as is shown by the elevation, have been deliberately kept as low as possible, and the tower thus, both functionally and artistically, becomes the central motif, symbolizing the purpose of the whole.

The arrangement of the various elements of the general plan (Fig. 2) has been worked out with the idea of separating the group into that portion with which the public is directly concerned and that portion which is concerned purely with the activities of the employees and scholars. Thus, in

FIG. 1.
Elevation of the Center from the Potomac. (Scale of original: one inch equals 20 feet.)

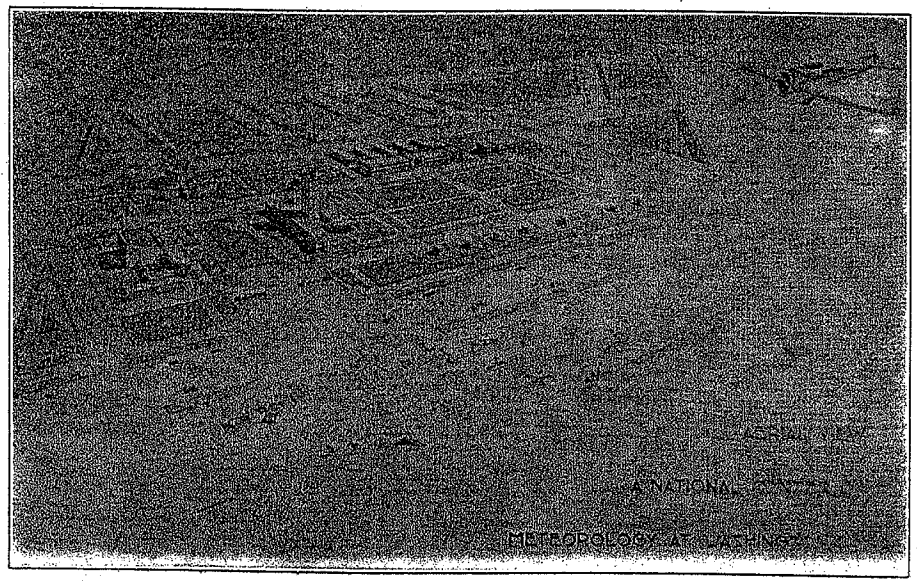
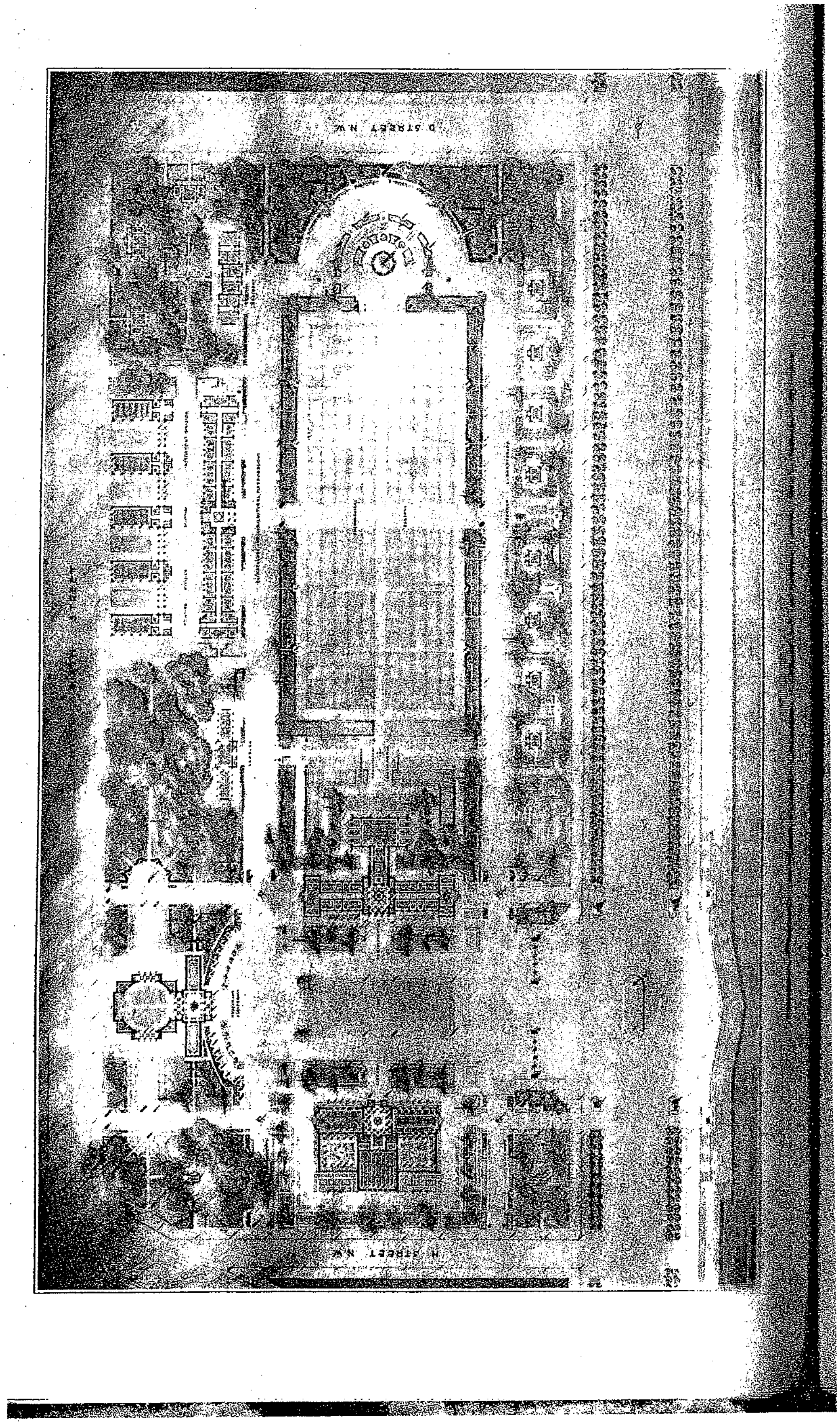


FIG. 2.


D STREET N.W.
H STREET N.W.

the north end of the plot, grouped about a central court and readily accessible from Rock Creek Parkway, as well as H and 26th Streets, are the Administration Building with its lofty tower, the Library, and the Auditorium and Museum Building. South of these, and extending along 26th Street, are buildings devoted to Aerology, Agricultural Meteorology and Climatology, and a single large unit housing the divisions of Printing, Mailing, Shipping, and Instrument Manufacture and Repair. Across the spacious Phenological Gardens are several small laboratories in which visiting savants may live and study. The general disposition of these elements is perhaps more clearly shown by the conventionalized Aerial Perspective (Fig. 2).

The Administration Building and Tower, as being the *sine qua non* of the Center, were selected for further study in the rather limited time alotted to the project, and the elevation, plans, and section of them are shown at larger scale and in considerable detail in Figures 4 and 5. The exterior of the building is typical of the other units, and displays a complete lack of extraneous ornament, long, sweeping horizontal lines which are accentuated by the treatment of the fenestration, and broken only by the soaring vertical mass of the tower. As designed, the buildings are constructed of skeleton steel framing with walls of some light, insulating material, but a simlar etxerior effect could be secured with ferro-concrete or stone veneer. The functions and equipment of all the units are described in the following list of the detailed requirements of the program:

I. ADMINISTRATION, FORECASTING, OBSERVATION. Since their functions are so closely interwoven, these elements have been combined into a single structure. This, the most important building of the Group, contains the following:

A. A large Lobby, providing access to the various corridors and the stairway, with an Information Booth prominently located opposite the main entrance. On the walls are several Relief Maps of the United States on which are indicated the Average Rainfall, Temperature, Humidity, Dates of First and Last Killing Frosts, Snowfall, and Sunshine over the country. Also two large glass Base Maps, one of the Northern Hemisphere, on which the weather conditions are drawn daily in colored chalks; the other of the United States on which conditions at the various Airports and Airways Weather Stations will be indicated several times daily by means of colored lights. Built into the wall are large Dials, actuated by remote control apparatus, indicating the direction and velocity of the wind, the pressure and temperature of the air.

B. A suite of rooms for the Chief of the Bureau, consisting of private office, secretary's office, small conference room, and small laboratory.

C. A private office for the Assistant Chief, with secretary's office adjoining.

D. A suite of rooms to serve as the National Headquarters of the American Meteorological Society, comprising a large reading or conference room equipped with numerous bookshelves, and one or two small offices.

E. Two seminar or class rooms for instruction in forecasting and theoretical meteorology.

F. For the following divisions, an office for the chief of the division and working space for the required number of employees:

1. The Chief Clerk—13 employees.
2. Editor—2 employees.
3. Marine Meteorology—10 employees.
4. Meteorological Physics—3 employees.
5. Solar Radiation—2 employees.
6. Station Accounts—17 employees.
7. Supplies Division—14 employees.
8. Telegraph and Radio—14 employees.

G. For the Forecasting Division, a large chart room with draughting tables and direct communication with the telegraph and radio room, where reports are received and the information contained thereon decoded and entered immediately upon the maps. In addition to the draughting room, several private offices are provided for the forecasters.

H. Telegraph and Radio room. Here the reports from all over the country are received, typed, and sent at once to the Forecast Room. Here, too, are facilities for the immediate broadcasting of forecasts, warnings, special reports for aviators, etc. by telegraph, telephone, and radio.

I. Observation Tower. This Tower, 120 feet high, is the dominating feature of the group. On the top floor is located the Observatory, reached by a special lift (and by emergency stairs), a large room, aproximately 30 feet square, equipped with "walls of glass" providing a complete outlook in every direction. On a penthouse above the elevator shaft, is located the 50-foot stainless-steel wind instrument support, especially designed to harmonize with the architecture of the tower. Below the Observatory is a water tank, while succeeding levels of the Tower are devoted to filing space for the immense amount of data collected the Central Office—approximately 00 cubic feet of filing space is made available in this way. A glance at the section in Fig. 5 will show the arrangement of the Tower, as well as the Lobby and Forecasting Room to advantage. The Observatory contains the latest recording and indicating instruments, together with desk space for three employees—the Director and two assistants, together with a considerable amount of shelf and storage space. The instrumental equipment of the Observatory is as follows:

1. Located in the Observation Room
   a. Two Fortin Type Standard Mercurial Barometers.
   b. Marvin Mercurial Barograph.
   c. Aneroid Barograph.
   d. Telethermograph, the thermometric element being exposed in the Instrument Shelter at the base of the Tower.
   e. Quadruple Register (Station Meteorograph, providing automatic records of sunshine, rainfall, wind direction and velocity.
   f. Dines Pressure Tube Anemograph.
   g. Anemograph and Dial actuated by a magneto-type anemometer, for gustiness.
2. Located on the roof of the Observatory:
   a. Nephoscope for determining the direction and velocity of motion of the clouds.
   b. Marvin electrical Sunshine Duration Transmitter (Black Bulb in Vacuo), electrically connected with the Quadruple Register.
   c. Campbell-Stokes Sunshine Recorder.
   d. Pole-Star Recorder.
   e. Ombroscope, for recording the beginning and ending of precipitation.
   f. Solar Radiation Recorders.

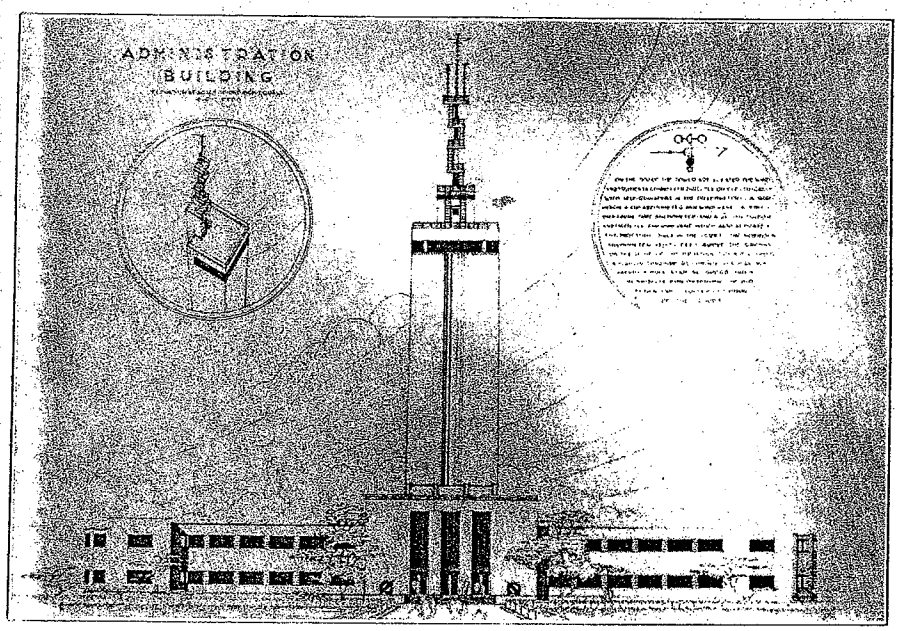


FIG. 4.
Front (North) Elevation of the Administration Building and Tower.
(Scale of original: one inch equals eight feet.)

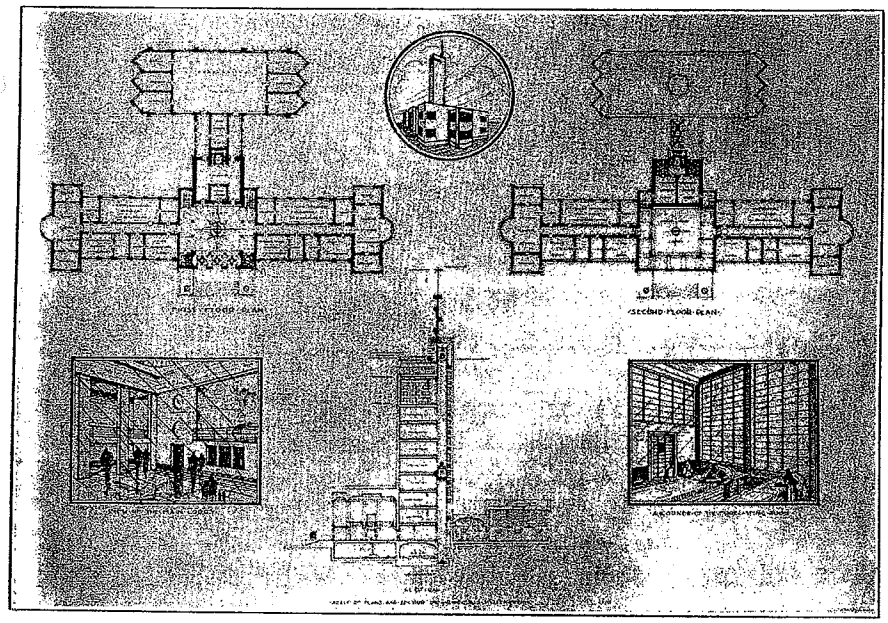


FIG. 5.
Floor Plans and Cross Section of the Administration Building and Tower.
(Scale of original: one inch equals 16 feet.)

3. Located on the Wind Instrument Support:
   a. Robinson 4-cup anemometer and electrically recording wind vane, connected with the Quadruple Register.
   b. Dines Pressure Tube Anemometer and Anemoscope.
   c. Magneto-type anemometer and wind vane.
   d. Extra support for experimentation.
4. Located on the ground, at the rear of the building, and well away from any obstruction:
   a. Thermometer Shelter, containing the following instruments:
      1. Standard Mercurial Thermometer.
      2. Standard Maximum Thermometer.
      3. Standard Minimum Thermometer.
      4. Townsend Support for Maximum and Minimum Thermometers.
      5. Whirling Psychrometer.
      6. Hair Hygrograph.
      7. Thermometric Element for Telethermograph.
      8. Electric Aspiration Psychrometer.
   b. Fergusson weighing Recording Rain and Snow Gage.
   c. Standard Tipping Bucket Rain Gage electrically connected with the Quadruple Register.
   d. 8-inch Standard Rain and Snow Gage.
   e. Evaporimeter.
   f. A Maximum Thermometer exposed to register the maximum temperature each day in the sun.
   g. A Minimum Thermometer exposed to register the minimum each day on the grass.
   h. Atmospheric Pollution Recorder.

J. In addition to the above requirements, the Administration Building contains cloak and toilet facilities for the public, locker rooms and toilet facilities for employees, and, in the basement, a cafeteria with a capacity of 200 persons. At the base of the tower is located a Seismograph.

II. LIBRARY. The library is housed in a separate building, across the Great Court from the Administration Building. It contains a large General Reading Room, a Periodical Room, offices for the Librarian and staff, and adequate stack space for 56,000 volumes and accessions at the rate of 1400 volumes per year.

III. AUDITORIUM AND MUSEUM. This, the third building available to the General Public, is located at the east end of the east-west axis of the Court. It is intended as a means of popular education in meteorology, as well as a gathering place for international conferences on meteorology. It contains a small, but well-appointed, auditorium, seating approximately 700 persons, equipped with a small stage and facilities for the showing of slides and motion pictures. Serving as an entrance lobby to the auditorium is a Meteorological Museum, containing old maps, charts, etc. of historic value, together with an exhibit of early instruments and others showing their gradual development into the highly accurate instruments in use today. A small office for the Director and public lavatories complete the equipment of Unit III.

IV. CLIMATOLOGY, STATISTICS, AND AGRICULTURAL METEOROLOGY. This

building, facing the Phenological Gardens, contains the following divisions:

A. Agricultural Meterology—5 employees.
B. Climatology—18 employees, arranged as follows:
   1. An office for the chief and one for his assistant.
   2. General office space for 16 employees.
   3. Filing space for the monthly reports from more than 5,000 stations.
   4. Small reading room for persons wishing to study these reports.
C. Meteorological Statistics — 10 employees.
   1. Office of the chief.
   2. Two draughting rooms.
D. River and Flood Division—5 employees.

V. PRINTING AND INSTRUMENT DIVISION. This large building, east of the Climatology Building and fronting on Twenty-Sixth Street, contains the following:

A. Instrument Division:
   1. Office for the chief and one for his assistant.
   2. Work space for 17 employees.
   3. A large laboratory.
   4. Machine shop.
   5. Paint shop.
   6. Designing room.
   7. Shipping and mailing room.
   8. Adequate storage facilities.
B. Printing Division:
   1. An office for the chief and one for his assistant.
   2. Working space for 24 employees.
   3. Composing room.
   4. Large press room.
   5. Adequate storage facilities.
   6. Mailing room.

VI. AEROLOGY. This important division is housed in a small structure just north of the Climatology Building, containing the following:

A. Office for the chief and one for his assistant.
B. Working space for 30 employees.
C. Large draughting room.
D. Storage space and files.
E. On the roof, provision for the release of small balloons for determining the winds aloft. Also a Theodolite, Alidade, and nocturnal Alidade or Ceiling Light.

VII. In addition to the six major buildings described above, 8 small laboratories have been provided for the use of visiting research students as well as quarters for a permanent staff of 3 and 3 small houses for the use of visiting savants. Spacious phenological gardens landscaped to set off the various buildings to advantage complete the Group.

"The Influence of Climate on Library Architecture" [1]

By CLARENCE EDGAR SHERMAN, Librarian, Public Library, Providence, R. I.

The author considers the influence of climate on the development of various type of architecture—Egyptian, with flat roofs and open colonnades suitable to the warm dry climate of the Nile valley; Greek, with slightly pitched roofs to accommodate the greater rainfall; Gothic, with high roofs to shed the rain and snow of the northern climate, thick walls for heat, and greater window space for light; and modern domestic architecture in the United States, with its use of sky lights, fireplaces, cellars, and vestibules in the north, and thin walls, no cellars, open patios, and overhanging cornices for shade, in the south. Each of these styles of architecture was determined primarily by the tempera-

[1] Bull. Am. Library Assn., July, 1933.