terior of the anticyclone. The entire system of high and low areas seems to be constructed by the counterflow, chiefly in the cumulus and strato-cumulus levels, of long currents, due to horizontal convection, the double action on the pressure—that is, the formation of high and low pressures simultaneously in adjacent districts—being referred to the general circulation of the atmosphere, especially the deflecting and centrifugal forces, rather than to local temperature accumulations. The North American Continent is the region where cyclones *form* in large numbers, and Europe-Asia the region where they *dissipate*, so that the violent general circulation over the United States in the lower strata, as compared to that of Europe, is chiefly responsible for this excess in the production, near or in the United States, of the local storms of the Northern Hemisphere.

A careful study of these vectors in all strata up to 11,000 meters, 7 miles high, reveals the very important fact that there is little disposition to conform to the canal theory of the circulation over the hemisphere, as ordinarily taught, namely, consisting of a southward movement in the lower strata from the polar zone toward the tropics, with reversal of the component from east to west at latitude 35°, together with an overflow northward in the higher strata from the tropics toward the poles. While the general circulation conforms to this type in many features, there has always been the greatest difficulty in accounting for the comparatively slow eastward drift in the upper strata of the higher latitudes. Ferrel attributed a large part of the required retardation to the effect of friction, but this is in reality a comparatively small term. Also, he stated that the difference in the eastward velocity of the northward and southward moving strata at different elevations represented the expenditure of retardational energy. As a matter of fact, the lower strata do not move southward *as a whole*, and our observations do not indicate that the higher strata are vigorously moving northward, because that component is very small. What takes place is this: In each stratum from the surface to the cirrus level about as much air moves north as south, for there are enormous counter currents *passing by each other at the same level, and not over one another at different elevations.* This puts a new aspect on the entire problem of the general circulation. It looks as if the solar radient energy was absorbed chiefly in the lower strata, and that, instead of going the rounds, overflowing above from the tropics, there is developed a continuous leakage in the lower strata, which is observed as our persistent winds from the south. These meet the north winds, which flow in obedience to the general circulation, as figured by the form of the land and ocean areas. This escape from the tropical belt diminishes the pressure in low latitudes, which would require to be balanced by an excessively rapid eastward drift. Furthermore, the formation of cyclonic vortices discharging into the eastward drift and distorting it also retards the eastward velocity. It is along these lines that a more probable explanation of the existing moderate eastward motion may be found than in Ferrel's theory, which has been widely accepted by students.

There is a chapter treating of the barometric diurnal wave and its relation to the magnetic diurnal vectors, as developed in Bulletin No. 21, 1898, together with a comparison of the diurnal components of the motion of the atmosphere locally, which shows some interesting relations. I have been unable, in the time at my disposal, to utilize the new general tables of motion in connection with the vectors just described. Something has been done in the way of a theory of the local cyclone and the tornado, which is promising, though its completion must be postponed to a future day. I have been most efficiently assisted in this work by the faithful labors of Messrs. H. H. Kimball, H. L. Heiskell, and R. H. Dean, who have taken great interest in the observations and the computations. The Chief of the Weather Bureau has always placed at our disposal all the resources of the office, and the other officials have uniformly rendered all the aid in their power.

NOTES BY THE EDITOR.

WIRELESS TELEGRAPHY.

We copy the following from Nature, February 8, 1900, p. 350:

In his lecture at the Royal Institution on Friday last, Mr. Marconi made a statement as to the use of his system of wireless telegraphy in connection with the war. He is reported by the Times to have said that six of his assistants were sent out to South Africa. The war office intended that the wireless telegraphy should only be used at the base and on the railways; but the officers on the spot, realizing it could only be of practical use at the front, asked if the assistants were willing to go to the front, and accordingly on December 11 they moved up to De Aar. The results at first were not altogether satisfactory, owing to the want of poles, kites, or balloons, which are needed to elevate the vertical wires; but the difficulty was overcome by the manufacture of kites, in which work Major Baden-Powell and Captain Kennedy, R. E., took part. It has been reported that the difficulty was due to the iron in the hills, but, as a matter of fact, iron has no more destructive effect on these Hertzian waves than any other metal, and Mr. Marconi has been able to transmit messages across the high buildings of New York, the upper stories of which are iron. However, when kites were provided it was easy to communicate from De Aar to Orange River, some 70 miles, and now there are stations at Modder River, Enslin, Belmont, Orange River, and De Aar. Two of the assistants volunteered to take instruments through the Boer lines to Kimberley, but the military authorities would not grant them permission, as probably too great risk was involved. It seemed to Mr. Marconi regrettable that installations were not established in Ladysmith, Mafeking, and Kimberley before the commencement of hostilities, but he found it hard to believe that the Boers had any workable instruments. Some intended for them, which were seized at Cape Town, were of German manufacture, and not workable, and Mr. Marconi said that as he had supplied no apparatus to any one, the Boers could not possibly have any of his instruments. In conclusion, he said he did not like to dwell on what might be done in the immediate or distant future. But he was sure that the progress made this year would greatly surpass what had been accomplished during the past twelve months, and, speaking what he believed to be sober sense, he said that by means of wireless telegraphy telegrams would become as common and as much in daily use on the sea as they are at present on the land.

LIGHTNING RODS.

There appears to be an unusual interest in the matter of lightning rods and the protection of buildings from injury by lightning. Much of this activity is traceable to the efforts of several enterprising manufacturers of lightning rods. One such company extends a general invitation to a certain Weather Bureau observer to "arrange to deliver lectures on electricity at a series of places in the State," and adds—

We will attend to having the matter announced and the time fixed and notify you of the same. We don't ask that this lecture should be in our interest, or that of any other manufacturer, but want the subject of electricity better understood, and then the people will protect their homes in some way and we will take our chances in the business with the others.

Although the Weather Bureau observer might not say a word about the rods manufactured by this company, yet, its enterprise in getting up this series of lectures would, undoubtedly, be heralded far and wide, and lead the Weather Bureau into undesirable complications. The observer did wisely to decline the request.

On the other hand, similar requests have, and may again,

come from the fire and life insurance companies. These have nothing to gain by the manufacture and sale of lightning rods but, in common with the people themselves, do wish to know the best method of protecting life and property. Under their auspices, Weather Bureau observers can, in most cases, safely arrange for public lectures on lightning without involving the Weather Bureau in any objectionable relations.

The question as to whether it pays to protect buildings, and if so, which forms of protection are the best, are matters that can not be decided except by a careful study of local statistics. A few experiments in a laboratory, or on a given building, can not safely be made the basis of an argument because the varied locations of buildings with reference to underground strata, hills and valleys, trees, and water courses or lakes, have a very important influence, to say nothing of the character of the building itself. Any Weather Bureau observer who contemplates lecturing on this subject should make a special study of the region within 10 miles of the lecture room, so that his audience will be able to apply what he says to their own local and individual needs. Such a discussion will also undoubtedly be a contribution to the subject proper for publication in the MONTHLY WEATHER REVIEW.

A KITE AND BALLOON STATION NEAR BERLIN, GERMANY.

The Berlin correspondent of the Standard announces that the Royal Prussian Meteorological Institute in Berlin is about to make arrangements for the systematic examination of the higher strata of the atmosphere by means of special apparatus. In the grounds of the Aeronautical Observatory at Tegel—a suburb of Berlin, where Alexander and William von Humboldt were buried—registrations of the atmospheric conditions at a height of three to five thousand meters will be carried on, if possible, day and night with kites and kite-balloons. The registering apparatus, which automatically records the pressure, temperature, humidity, and wind velocity at these heights, is taken up by a kite-balloon connected with the earth by piano wire. An elevation of 4,500 meters has been attained by a train of kites even without balloons when there was sufficient wind.—*Nature, February* 8, 1900.

SOUTH AFRICAN METEOROLOGY.

The study of climatology in Africa has been diligently prosecuted for many years past within the regions that are respectively presided over by England, Germany, France, Belgium, and Portugal. A complete review of the work done by Belgium is published on pages 481–878 of the second volume of the reports submitted to the National Congress of Hygiene and Medical Climatology for Belgium and the Congo. The congress was held at Brussels in August, 1897, and the volume in question was published about a year later. It gives reports from about 190 stations in the basin of the Congo, and has very properly been designated as an unequalled collection of data relative to Central Africa. The preceding part of the volume is devoted to medical climatology, properly so called, and gives much additional data relative to temperature, moisture, rainfall, cloudiness, and sunshine. The daily records of the bright and black bulb at the station Banana, are in fact, printed in full for nearly two years, July, 1893–March, 1895.

Important reports of the work done under English auspices in South Africa, are published annually by the Meteorological Commission of Cape Colony. A general summary of the rainfall records with excellent monthly maps of rainfall was published by the Commission in 1897, as compiled by Alexander Buchan. The last annual report, viz, that for the year 1898, has just been received and gives us the latest details with regard to the organization of the service. The stations that report to the Commission are as follows:

(*a.*) First order stations	1
(*b.*) Subsidiary first order	1
(*c.*) Barometric or second order stations	54
(*d.*) Thermometric or climatological stations	17
(*e.*) Special rainfall stations	370
(*f.*) Evaporation stations	7
Total	450

Over 50 of these were started during the year 1898, and therefore, have incomplete records for that year.

Of these stations 58 are located outside Cape Colony and Bechuanaland, viz:

Basutoland	8
Orange Free State	12
South African Republic	18
German Southwest Africa	10
Zululand	6
Rhodesia	2
Swaziland	1
Natal	1
Total	58

As the remaining 392 stations are, therefore, in Cape Colony proper, this serves to show how active the English have been in the matter of climatological records. A rather large proportion of these stations, however, are south of latitude 31°, leaving us still too much in the dark as to the rainfall over the western half of Cape Colony. Students of physical geography will quickly recognize the fact that the Orange River, which runs due west along the twenty-ninth parallel, derives the greater part of its water from the rains that fall over the eastern and rainy mountainous portion of the Continent, just as is the case with the Congo River itself, a thousand miles further north. As the Orange River flows westward through a region of less than 10 inches annual rainfall, it has necessarily cut deep ravines in a country where there are no side streams but plenty of dry water courses that represent the accumulated actions of occasional showers and cloudbursts. From the study of these dry valleys and starved streams one can presumably restore the several climatic periods during which the Continent has risen with increase of rainfall, and then fallen with diminution of rainfall. The area of 40 inches annual rainfall which has moved further and further to the east, is now confined to a narrow coast belt 150 miles either side of Durban, while the region of 30 inches rainfall nearly covers all of Zululand, Natal, Basutoland, and the southern coast of Cape Colony.

The most noteworthy feature of the report for 1898 is the inclusion for the first time of returns from the well-equipped first-order station established by the De Beers Company at Kenilworth, near Kimberley. This meteorological observatory and nine associated rainfall stations distributed over the neighboring district are under the management of J. R. Sutton, Esq., B. A. The observatory is furnished with a Kew barograph, recording photographically, as also a battery, consisting of two sets of twelve each of Negretti and Zambra's patent reversing thermometers, with cylindrical bulbs, one set mounted for dry-bulb observations and the other for wet.

With regard to the accuracy of the temperature of the air, as given by the standard maximum and minimum thermometers inside of the Stevenson screen and by another pair within a much larger screen, Mr. Sutton prints a table of mean values for 1897, showing that the average tempera-