months, and are rare in December, January, and February, and in July and August. A considerable variation in the yearly number is also apparent, the extremes being 14 in 1902 and 21 in 1908. Dividing the total duration, 305 days, by the total number, 118, gives the average duration 2.6 days. It is the popular impression that these winds always last 3 days; but, though the average length just found might tend to confirm this belief, the records in detail show its inaccuracy. For instance, in Table 1 we find 25 northers lasting only 1 day, 40 of 2 days' duration, 27 of 3 days', 17 of 4 days', and 9 of more than 4 days'. Table 3 gives for each month the maximum wind velocity and direction occurring during the prevalence of a norther. The highest velocity during this period was 45 miles from the northwest in May, 1902, Though known as "northers" these winds are more frequently and characteristically from the northwest.

TABLE 1.—*Duration of northers (in days).*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual duration.
1902...	2	0	2,4	1,3	3	4,2	0	1	3,2,4	1	1	0	33
1903...	0	4,3	2	3,3,2	4,4,2	3,1	3,1	1	3,2	2	0	0	44
1904...	3	0	3	5,2	2,4,1, 5,2	3,2,3	1	2	4	4	0	0	46
1905...	0	1	2,3	2,1	1,1,3	0	6	0	2,2	5,1,2,2	4,2	4,3	47
1906...	1	0	2	5	1	3,3	0	0	2,2	5,1,1,10	4,3,2,2	0	46
1907...	0	2	2	4,1	2,1,5	4	0	2	1	4	5,2,2,1	0	38
1908..	0	2	3,2,3	3,3,1, 1,2	2,4, 2,3	1,2,3	0	3	4	2,3,2	0	0	51
Duration.	6	12	28	42	52	34	11	9	32	44	28	7	305

TABLE 2.—*Number of northers.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1902...	1	0	2	2	1	2	0	1	3	1	1	0	14
1903...	0	2	1	3	3	2	2	1	3	1	0	0	18
1904...	1	0	1	2	5	3	1	1	1	1	0	0	16
1905...	0	1	2	2	3	0	1	0	2	4	2	2	19
1906...	1	0	1	1	1	2	0	0	2	3	4	0	15
1907...	0	1	1	2	3	1	0	1	1	1	4	0	15
1908...	0	1	3	5	4	3	0	1	1	3	0	0	21
Sums..	3	5	11	17	20	13	4	5	13	14	11	2	118

TABLE 3.—*Maximum wind velocity and direction of northers.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1902.	33 n.	0	28 nw.	23 nw.	45 nw.	28 nw.	0	18 nw.	32 nw.	24 nw.	15 nw.	0	45 nw.
1903.	0	40 nw.	15 nw.	35 nw.	40 nw.	15 nw.	40 nw.	15 nw.	40 nw.	24 n.	0	0	40 nw.
1904.	18 n.	0	15 nw.	22 nw.	36 nw.	30 nw.	15 nw.	15 nw.	16 nw.	24 nw.	0	0	36 nw.
1905.	0	16 n.	20 nw.	30 nw.	36 nw.	0	15 nw.	0	20 nw.	38 nw.	40 n.	27 nw.	38 nw.
1906.	29 nw.	0	16 n.	35 nw.	15 nw.	16 nw.	0	0	22 nw.	33 nw.	36 n.	0	36 n.
1907.	0	20 nw.	15 nw.	31 nw.	25 nw.	16 nw.	0	19 nw.	15 nw.	29 nw.	28 nw.	0	31 nw.
1908.	0	26 nw.	33 nw.	36 nw.	39 nw.	22 nw.	0	28 nw.	24 nw.	34 nw.	0	0	36 nw.

The desiccating effect of these winds on soil and vegetation is marked; the soil quickly bakes and cracks, vegetation refuses to grow, lawns and alfalfa fields droop and wilt. Disagreeable and depressing effects are felt by man also; the skin becomes dry, sensitive persons have headaches, and all are cross and irritable. It is said that in the early days of rough and ready justice in California, if murder or violence resulted from a quarrel occurring during a norther, the fact that the north wind was blowing was taken into consideration as an extenuating circumstance! The air at these times is always said to be "full of electricity," and, as was suggested by the investigations made in connection with the foehn, the excess of positive electrons in the lower air may account for some of the disagreeable physical effects of these northers.

These dry and descending winds, cool at night and hot by day, were observed in 1871 and 1872, and in fact occurring as predicted in the early California forecasts. The explanation then given agreed with that of Mr. Thomas A. Blair, adding only that the high area did not always appear first over the north Pacific coast, but more often formed over the mountains of Oregon and Canada and moved southward, spreading westerly a little but mostly to the eastward. Several of the great areas of high pressure studied by Prof. Thomas Russell showed this overflow westward down into the valleys of the San Joaquin and Sacramento. The table given by Mr. Blair is exceedingly instructive and opportune.—*C. A.*

THE FORCE OF GRAVITY AT THE EARTH'S SURFACE.

We have often called attention to the importance of properly appreciating the influence on the atmosphere of any variations in the force of gravity. The subject is now almost definitely set at rest by the researches of Prof. Dr. O. Hecker, of the Prussian Geodetic Institute. In his memoir of 1908 Doctor Hecker states that the most important result of his latest measurements on the ocean is—

That the force of gravity is normal over the Indian as well as over the Pacific Ocean and corresponds to the gravitation formula published by Helmert in 1901. Therefore, for both of these oceans, as well as for the Atlantic, Pratt's hypothesis as to the isostatic location of the masses that form the earth's crust is proven to be correct, so that we can now call it a general law, except for local anomalies. Hence, it can be considered as proven that the smaller density of the water of the ocean is compensated by the greater density of the crust forming the ocean bed. Inversely the continental masses, rising above the surface of the ocean, are not true accumulations of masses upon the earth's crust, but the apparent excessive mass is compensated by a deficiency of mass below the continents.—*C. A.*

METEOROLOGY AT HARVARD COLLEGE OBSERVATORY.

The Astronomical Observatory at Harvard College has carried out several special researches bearing on meteorology in addition to the extensive meteorological work which it has conducted in South America. Especially are we indebted to it for studies into the transparency of the atmosphere from an astronomical point of view. In its Annals, Vol. LXI, part 1, Cambridge, 1908, Prof. W. H. Pickering (the brother of the Director, Prof. E. C. Pickering) summarizes the work recently done by the Boyden department, the expenses of which are defrayed from the fund left by Mr. Boyden.

The late Uriah A. Boyden left $230,000 in trust to aid in the establishment and maintenance of an astronomical observatory on some mountain peak so as to be as free as possible from atmospheric influences. In the search for favorable localities Mr. Pickering says:

It is well known that the deserts of the world lie in two bands, one on either side of the Torrid Zone. They extend in general between 20° and 35° north and south latitudes. These bands nearly coincide also with the regions of calm and of high barometer. As might be inferred from these facts they are also the regions of greatest freedom from cloud. The earth, indeed, according to Leon T. de Bort, (Annales du Bureau Central Météorologique de France, 1884,) as seen from without, must present the appearance of a belted planet, although not so markedly so as Jupiter. The terrestrial belts, however, have this peculiarity, that they move north and south with the sun, but are always a little behind it. Accordingly in tropical countries the rains do not begin until after the sun has crossed the latitude of the place, after which they last for several weeks. Also, as we leave the equator the two rainy seasons approach one another, coinciding near the Tropics.

If we divide the Torrid Zone into two parts, north and south, making with the temperate zones four in all, we shall find that the cloud conditions in these regions show a tendency to alternate throughout the year. Thus, in January the North Torrid and South Temperate zones are clear and the alternate zones are cloudy, while in July the reverse conditions prevail. Since, in the temperate regions, it is clear in summer and cloudy in winter, the presence or absence of the sun accentuates the difference in temperature between these seasons, while in the Tropics the reverse is the case. This furnishes an additional reason why the temperate zones possess such an intemperate climate, while in the Tropics more equable conditions prevail. Thus, at Verchoiansk, Siberia, latitude 66° 42', on the northern boundary of the North Temperate Zone, the temperature ranges from the lowest recorded air temperature at the surface of the earth, —81° F. to +96° F. The highest known air temperature, +130° F., was recorded at Murzuk, Fezzan, in the North Temperate Zone, latitude 25° 49'. Total range of temperature between the two places, 211° F. Both towns are located near the sea level.

The cloudiest part of the world, of which we have accurate knowledge, is the town of Iliuliuk in the Aleutian Islands, latitude +54°, where the observed cloudiness is 82 per cent. The clearest part of the world is Suez, latitude +30°, where the cloudiness is but 6 per cent. The clearest place in the Southern Hemisphere is Omaruru, latitude —22°, on the west coast of Africa, where the observed cloudiness is 11 per cent. The clearest place in the Western Hemisphere is Yuma, Ariz., latitude +33°, cloudiness 17 per cent.

The second of the four atmospheric conditions, the transparency of the air, is met more completely in tropical regions, where hazy skies are almost unknown, than in any of the higher latitudes. The fourth condition, freedom from dew, necessarily implies a dry climate, such as would be found in a desert region.

Especial attention has been given to the optical steadiness of the air. Modern astronomical research demands that observations shall be made when and where the seeing is practically perfect. In many parts of the globe this condition is almost never fulfiled, and in other portions only rarely. Expeditions to determine this feature in the condition of the atmosphere, were made to Colorado in 1887 when the summit of Pikes Peak was occupied as well as many other stations. The old Signal Service records for the station at the summit were published in full. It was found that altitude was not the most important factor. In 1888 an expedition was sent to California and the search for a good station included Mount Wilson. The next expedition was sent to Arequipa, Peru, in 1890–91.

The results of all these expeditions are given in detail in the volume above referred to. It was found that variations in pressure and currents of air are not so important as the slight changes in temperature. Calm nights are better at the tops of mountains than in the valleys.

In 1899 an expedition was sent to the West Indies where the summit of Blue Mountain Peak, Jamaica, was occupied; but the formation of dew on the lenses caused great trouble.

Twinkling of the stars only occurs when atmospheric waves are large in proportion to the diameter of the objective, and was several times noted with the 5-inch telescopes in Jamaica. Good seeing and bad seeing alternate during the night and may depend upon warm and cool currents brought by the wind. The poorest seeing occurred when a hurricane center was aboue 450 miles east of Jamaica.

A slight haze improves the seeing. A dry climate has certain advantages in avoiding dew. A low latitude is better than a high latitude. A considerable elevation is better than a small elevation.

Extensive observations were made of the brightness of the sky at different altitudes in Colorado. The diminution of the diffused sunshine amounts to about one-half for an ascent of 14,000 feet.—*C. A.*

METEOROLOGY AS A STUDY FOR PRACTICAL MEN.

In an address on "What the United States has to Learn from the Educational Institutions and Technical Training of Germany" President Hadley of Yale University said: * * * The children are forced to go to elementary schools for a time, and during that part of their education they are kept out of the shops and factories. They, however, receive instruction in the rudiments of the shop and factory work. They then enter the high schools, going to the "Gymnasiums" for their classical training and to the "Realschule" for the technical instruction. They are graduated as high school students when they finish what would be considered equivalent to freshman studies in a college in this country in so far as the breadth of knowledge is concerned. * * * Following this course, the German young men enter the universities and take up graduate courses in law and medicine or go to the technical schools for their training in civil engineering and other technical courses.

Doctor Hadley laid particular stress upon the growth and usefulness of the technical schools in Germany during the last half century. "Before the spread of these schools in Germany," he said, "the Germans were considered an idealistic and sentimental people. To-day they are intensely practical. They are, indeed, more practical than the Americans."

Our good technical schools are rare. The graduates of our technical schools get most of their training in the shop, on the farm, or in the mine. In Germany the best part of the student's training is received in the schools. The objects of the system in the German schools are two—to develop the individual, and to advance the the welfare of the country by teaching students what will best advance the interests of the country.

The attitude of the public mind in Germany and America toward the respective educational systems is significant. In this country it is regarded as an accident if a man who has been taught the theories of commercial life in the schools succeeds when he begins his active career. In Germany it is considered an accident if success comes to those men who have not been trained in the schools, and an accident that should not be repeated. * * * If such methods succeed in commerce they will succeed in all things. Individual action can not contend successfully with the united front of the Germans in the long run.

I believe there is developing in this country the spirit of organization. There has been a tendency to crowd the technical man out. We are beginning to profit from the lessons of the German educational system, giving our men good training in all lines adapted to practical life.

May we not take up these last words of President Hadley, as printed in the New York Times, November 11, 1908, and urge that meteorology and climatology, with all their applications are eminently practical branches of knowledge, as much so as engineering or astronomy and eminently worthy of being introduced into college and university curricula.

To read the daily weather map correctly and to thus make an intelligent forecast should be an acquirement taught everybody and denied to none. Life and success often depend on this one little art attainable in a six months college course.—*C. A.*

THE RELATION OF THE MOVEMENTS OF THE HIGH CLOUDS TO CYCLONES IN THE WEST INDIES.

By JOHN F. QUINN. Dated St. Croix, Danish W. I., March 18, 1909.

In an article published in the MONTHLY WEATHER REVIEW for May, 1907, the present writer tried to show that, as far at least as concerns the Danish West Indian Islands, the relation of the movements of the high clouds to cyclones is as follows:

The high clouds here, which normally come from a westerly point, go round during the passage of a cyclone, even if the cyclone should be passing at a great distance, to some point in the eastern semicircle, the extent of the deviation from the normal depending on the distance and direction of the cyclone center, the movements of such center governing the movements of the high clouds.

Reference was made in the article[1] to the theory of Father Viñes, that while the lowest air currents in a cyclone tend inward toward the center, the higher currents are divergent and become increasingly so as we ascend, until at the level of the cirrus clouds they move in a "completely divergent radial direction." It was pointed out that Father Viñes maintained that this was the case irrespective of the distance of the cyclone's center, being true even for so great a distance as 550 miles, as he had observed in the case of a cyclone whose center was at that distance east-southeast of Habana, while the the high clouds passing over the city were moving from the same point. Hence, Father Viñes argued that the direction of the cirrus clouds is a direct indication of the position of the vortex of the cyclone.

By comparing observations of high cloud movements here in St. Croix with the charted movements of certain cyclones

[1]Monthly Weather Review, May, 1907, 35:215–18.