and also that the great circle through Krakatoa and Washington passes nearly over the poles, and in this direction the velocity seems to be still smaller; so that the phenomena for this region become more and more complicated for each succeeding transit, and, after the first two or three in each direction, rather difficult to unravel. Unfortunately, the other few barographs in use on this side the Atlantic — to all of which the great circles from Krakatoa take an entirely different direction from that to all the eastern stations — are not so sensitive as the best Washington barograph, and do not help much beyond the first two transits of the waves in each direction.

It is noteworthy that these barometric disturbances were first noticed at Mauritius early in September, soon after their occurrence, and were at once independently attributed to the Krakatoa eruption, but were supposed to be due to successive series of explosions day after day, until the publication long after, in *Nature*, Dec. 20, of the discovery of Mr. Scott and Gen. Strachey, showed them to be due to a single series of waves, travelling round and round the globe, from the explosions of Aug. 27.

Perhaps the most interesting and important fact appearing from these Mauritius records, in connection with these waves, is the difference in time of transit round the earth, as compared with that deduced from the European stations by Gen. Strachey. The paths of the waves from Krakatoa to the latter stations are, on the average, something like 40° north of west (from Krakatoa), and, to Mauritius, about 20° south of west; so that the great circles make an angle of about 60°. The difference in time of transit on these circles, and in the two directions on each, are best shown in the table below, where, following Gen. Strachey's nomenclature, the successive waves are numbered from i. to vii., and the odd numbers denote the transits from east to west, and the even those from west to east.

	i. to iii.	iii. to v.	v. to vii.	Mean.	ii. to iv.	iv. to vi.	Mean.
	S. E. to N. W.				N. W. to S. E.		
European . . .	*h. m.* 37 4	*h. m.* 36 54	*h. m.* 36 48	*h. m.* 36 57	*h. m.* 35 24	*h. m.* 35 9	*h. m.* 35 17
	N. E. to S. W.				S. W. to N. E.		
Mauritius . . .	*h. m.* 34 34	*h. m.* 34 37	*h. m.* 34 43	*h. m.* 34 38	*h. m.* 35 15	*h. m.* 36 13	*h. m.* 35 44

Of course, all the above numbers are liable to an uncertainty of several minutes; but, even when this is considered, the differences are quite marked. While the average time of transit *via* Europe is 1m. - 40m. *greater* going west than going east, *viâ* Mauritius it is 1h. 6m. *less;* indicating, as far as atmospheric currents are concerned, an opposite effect on these two great circles, which make, roughly, an angle of 60° with each other. The peculiar progression in the individual periods for successive transits can hardly be wholly accidental, and is in opposite directions; the waves *viâ* Europe going (in each direction) faster and faster, and *viâ* Mauritius being retarded. Perhaps the most striking difference is, that the mean period, regardless of direction, is nearly 1 h. less *viâ* Mauritius than *viâ* Europe, — a fact most strikingly shown by taking the whole interval vii.–i., which, for the five European stations where vii. was traced, gives 110 h. 50 m., and, for Mauritius, 103 h. 54 m.; showing the wave to have gone three times round the earth *seven hours quicker viâ* the more equatorial route, which is probably partly due to the higher temperature of the atmosphere along this path, and also, perhaps, to the fact that this great circle passes over about as little land as any that can be drawn through Krakatoa.

These facts show more forcibly how complicated the phenomena must have been near the antipodes of Krakatoa, and also at the latter place, upon the returns of the waves there. It is evident, that, when the Krakatoa committee of the Royal society shall have collected all the data, many interesting problems will arise in connection with these atmospheric waves; and, in connection with the distribution of Krakatoa dust by the upper currents (which, it may now be regarded as pretty well settled, was the cause of the wide-spread red-sunset phenomena), the explosive eruption of Krakatoa promises, if thoroughly investigated, to teach us more about the circulation of our atmosphere than years of ordinary meteorological study could have done. H. M. PAUL.

Washington, July 29.

OVERWORK IN GERMAN SCHOOLS.

AFTER forty-two years' experience, it is now virtually conceded in Germany that physical exercise is not a sufficient antidote to brain-pressure, but that where the evil exists, the remedy must be sought in the removal of the cause.

Official action with reference to over-pressure has been taken in Prussia, Saxony, Würtemberg, Baden, Hesse, and Alsace Lorraine. In each instance it is based upon the report of a commission of inquiry, consisting of school directors, and members of school boards, as well as physicians.

The official action based upon the reports of the commissions is embodied in decrees dealing with the scope and method of teaching, the number and hours of study in school, and the amount of home-study.

The Hessian government issued decrees about home-study in 1877, and again in 1881. Complaints of overwork increasing, a commission was appointed to make further investigation, and report in full. Their recommendations were, in the main, embodied in the decrees of Feb. 23, 1883. By these decrees a maximum of home-study was fixed for each class, amounting for the lowest classes to an hour a day; the quantity of Latin and Greek required was diminished; and all tests of the student's progress that

necessitate much reviewing were forbidden. It was expressly ordered that the day and hour for test-exercises "shall not be announced to students more than twenty-four hours before they take place."

The Saxon decrees dated March 4 and 10, 1882, give particular directions as to the scope and methods of instruction, leaving the matter of study-hours untouched. They set forth that instruction in the classical languages is carried to excess in the gymnasia, being in many cases turned into teaching philology as a profession instead of being conducted as a means of general intellectual training. With reference to the '*extemporalia*' that form a prominent exercise in many of the Saxon gymnasia, the decrees are very pronounced. These essays which the students are required to translate and write down in a foreign language from dictation, are often, it is asserted, mere collections of questions in syntax, calculated to produce in the student "a feeling of anxiety and vexation instead of an agreeable consciousness of knowledge." The result in the student is nervous excitement and subsequent intellectual torpor,—conditions from which the young should be carefully guarded.

The Baden ministry published an outline of a decree, March 18, 1883, that had been prepared by the board of health, in conference with a number of teachers. Previous to this time, the different classes of the gymnasia had thirty, thirty-one, thirty-two, and thirty-four hours of study a week, without counting elective studies and gymnastics. These are now reduced to twenty-eight and thirty-two hours for the two groups of classes below and above the secunda. Before 1869 the total number of hours of study for a Baden gymnasium of nine classes was 269 a week, in 1869 it was raised to 286, and it is now 268. Each study-hour is limited to fifty minutes. The amount of home-study is also definitely fixed, and the course of instruction modified somewhat. As an evidence of the necessity of these changes, Professor Baumeister points out that in the lowest class of a gymnasium 1,300 Latin words have to be learned the first quarter of the year, and nearly as many the second, making a daily average of about twenty words. These words, he observes, are not met with in any authors read by the boys till they reach the upper classes, and are generally expressions of ancient life, of which a nine-year old boy knows nothing. The intellectual effort required to memorize these words, leads, he holds, to injurious and lasting effects.

The commission appointed by the stadtholder of Alsace Lorraine recommended that the number of study-hours should be restricted to twenty-six a week for the lowest classes of the gymnasia, and to twenty-eight and thirty-two for the higher; that the hours of home-study should be eight, twelve, and eighteen a week, progressing from the lowest class to the highest; and that six hours a week should be devoted to general physical exercise, including swimming, open-air sports, skating, and excursions. While the existing conditions will be somewhat ameliorated by these decrees, they do not seem to have brought about a final solution of the difficulty. Last year a petition upon the subject, signed by eminent teachers, physicians, and other citizens, was addressed to the Prussian chamber of deputies. After setting forth the deplorable effects of the excessive strain upon the nervous system of scholars, it appealed to the patriotism of the deputies to put an end to the abuse which, the petition asserts, "threatens little by little to reduce the cultivated classes of society to a state of moral weakness that shall render them incapable of great and manly resolution."

A PROPOSED NEW DEPARTURE IN HYGROMETRY.

IN the *Comptes rendus* for June 30, Mr. Jamin, the newly elected perpetual secretary of the French Académie des sciences, proposes a new departure in hygrometry.

The present system of expressing the amount of vapor of water in the atmosphere is to give the ratio $\frac{f}{F}$, of the observed elastic force f, to the maximum F, which the vapor would have at the same temperature if the atmosphere were saturated with it, i.e., were at the dew-point; and this is called the 'relative humidity.' Now, as this maximum F for the point of saturation does not by any means correspond to a constant ratio between the mass of the vapor of water in the air and the mass of its other constituents, but varies largely with the temperature, so that cold air will not hold nearly so much vapor of water as warm air, this system of expressing the amount of this vapor as a percentage of another percentage which is itself very variable, is, in the opinion of Mr. Jamin, a vicious one, at least for many purposes of meteorology.

In its stead he proposes to substitute just what a chemical analysis of the air in question would give; viz., its 'hygrometric richness' as given by the ratio of the amount of vapor of water to that of the other constituents, and as expressed in *volume* by the fraction $\frac{f}{H-f}$, or in *mass* by $0.622\frac{f}{H-f}$, in which H is the total pressure of the atmosphere, and the denominator consequently denotes that of dry air, or of all the other constituents but water-vapor.

Since observation does not give directly the relative humidity, but this is derived from an auxiliary table, Mr. Jamin shows that a table can be constructed which will just as readily give the hygrometric richness, for which he proposes to adopt the volume-measure $\frac{f}{H-f}$; and he states that such a table will hereafter be published in the *Annales du bureau central météorologique.*

While the present system has its advantages in showing approximately the nearness to the dew-point, and hence to cloud-formation and possible fall of rain or snow, yet it would seem, that for the wider study of total rainfall and evaporation, in fact of the general diurnal and annual circulation of water between