higher grades of his profession. An examination is necessary before every promotion; so that he must not only teach well, but must keep up with what is going on in the branches which he is required to teach. He teaches about thirty hours a week for ten months of the year, receiving a salary ranging from twenty-five dollars to ninety dollars per month, and a house free of rent. Considering the price of living, this is better compensation than the average American teacher gets. The average salary of the 23,681 teachers in Pennsylvania is $34.35 per month, and the report from which these figures are taken does not give the lowest salary paid. In some instances it is probably not more than ten dollars a month. As showing the transitory nature of the teacher's occupation in this country, it may be stated, that, of the above twenty-three thousand teachers, over eight thousand had been in the work less than five years. To judge from a statement made some years ago by a prominent Ohio educator, the tenure in that State is still more unstable. Besides, the German village schoolmaster is socially the equal of any of his neighbors, and he and the pastor are the most important personages in the place.

After the German teacher has served ten continuous years, his salary is increased by a small yearly pension; and if he should, on account of age or for any other reason, be unable to continue his labors, his pension is so increased as to afford him a comfortable living. If he dies and leaves a widow, she is pensioned, as are also all children under the age of twelve years whom he may happen to have. The State thus recognizes the teacher in the public school as being of equal value with the soldier; for, if either is disabled in the service, he is pensioned; and if he dies, his family is provided for.

It must not be inferred, from what has been said above, that it is advocated to transfer, as a whole, the German public-school system to the United States. We must make our own system, not borrow one already made. The only object has been to show that in the way of public schools we have more to learn of some European countries than they of us. While it is freely admitted that we have many schools quite as good as any that can be found elsewhere, yet one need only keep his eyes open in order to become fully aware that we have many schools and school-teachers that could not exist under the system sketched above.

## DO WARM SUMMERS FOLLOW WARM WINTERS?

ALMOST every newspaper of Boston has recently had something to say about what the weather is to be during the coming summer; and it seems to be an almost unanimous conclusion that the following summer is to be warm because the winter and spring have been warm, or because last summer was cool. This has led Mr. H. H. Clayton to examine the temperature observations made in Milton during the last forty years by Mr. Charles Breck. These observations have been made twice daily from the same thermometer, hanging in the same place since the beginning of the observations in January, 1849. During the forty years, nineteen winters have been warmer than the average, and eight of the following summers have been warmer than the average. There have been eleven cases in which both the winter and spring have been warmer than the average, and following these there have been five summers warmer than the average. There have been six decidedly warm winters, that is, winters whose mean temperature was three degrees or more above the average; and four of the following summers have been warmer than the average. It is seen, then, that only about half of the warm winters were followed by warm summers; or, in other words, cool summers have followed warm winters as often as the reverse. The number of times warm summers have followed cool summers is nine, while the number of times cool summers have followed cool summers is twelve.

In the above, what has been called a warm winter is one in which the mean temperature of the three winter months — December, January, and February — has been higher than the average of forty years; and what has been called a cool summer is one in which the mean temperature of the three months of June, July, and August has been lower than the average of forty years, etc. This, however, is evidently not the definition adopted by people generally in deciding whether a winter or summer is colder or warmer than usual, for a decided departure of the temperature of a single month in any direction may determine the impression people retain of the entire season. Thus it will surprise most people to learn that the mean temperature of last summer was slightly higher than the average of the last forty years. Both June and August were warmer than usual, and only July was very cool. It will probably be a still greater surprise to learn that the winter of 1887–88, which was generally thought to be a cold winter, was really slightly warmer than usual. December and February were both warmer than usual, and January alone was very cold. Thus people's opinion of a season seems to be largely moulded by the special character of what is usually the most extreme month of the season. If in winter January happens to be exceptionally warm or cold, the winter is decided to be of the same character; or if July happens to be decidedly warm or cool, the summer is thus characterized. It seemed, then, worth while to ascertain from Mr. Breck's record how many warm Julys followed decidedly warm Januarys. There were eight Januarys during the forty years whose average temperature was above 30°, and following these were five Julys warmer than the average of forty years; which indicates but a slight tendency for warm Julys to follow warm Januarys, since the law of chance would indicate that four warm Julys ought to follow eight warm Januarys. The number of times warm Julys have followed cool Julys is twelve; and the number of times cool Julys have followed cool Julys is eight.

Another method frequently used in predicting the weather of a coming season is based on the conclusion that during every year the average conditions remain about the same; and if the first part of the year is very warm, the latter part must be cool. This assumption, however, appears to be entirely unsupported. Mr. Breck's observations show that the mean temperature of one year may differ as much as five degrees from another. Eleven months of 1877 were observed to be warmer than usual, and nearly as great departures in the opposite direction were found in other years.

All of these facts indicate that no conclusion of any value greater than could be gained by mere guessing can be formed in regard to the character of a coming season, merely by knowing the character of a past season, until some law connecting these is worked out. This has been demonstrated over and over again in different parts of the world; but since, of course, people generally cannot keep posted in meteorological literature, there will probably continue to appear such forecasts of coming seasons, based on apparent scientific conclusions. Mr. Clayton feels sure there is a law of recurrence of meteorological phenomena besides the daily and annual periods, and also that it is not of the character usually supposed and discussed above.

## NOTES AND NEWS.

IN an account of the Widdifield & Bowman Company's electric and automatic car-brake, in *Science* of May 31, p. 412, second column, 10 lines from the bottom, "in 11 seconds" should read "in 77 seconds." This company now have an office at Room 125, Temple Court, this city.

— Dr. Hellmann has published, in the *Centralblatt der Bauverwaltung*, a brief study of a cloud-burst, Aug. 2 and 3, 1888, in the Riesengebirge, in Silesia. The storm was on the west side of a storm area which was moving northward from Galicia. The rain fell from fifteen to eighteen hours, and in some parts of the Queiss valley its depth reached 200 millimetres, or 7.9 inches. Such a rainfall had not been known there before since 1804. A similar cloud-burst occurred in the region just south-east of this, in the Sudeten and Beskiden Mountains, in 1884, accompanied by a similar unusual progression of a storm area northward over Galicia and Polen.

— The governing committee of the Nineteenth Century Club of New York reports, that, notwithstanding the shadow cast over the club by the death of its founder and president, the last season has been a successful one. The meetings have been marked by a full and sometimes a crowded attendance, the membership is substantially unimpaired, and, so far as the committee can judge, the interest in the club's work remains unabated. The committee believes that nothing more is necessary than to continue on the same

lines, relaxing no effort to make the discussions as interesting as possible, but making no distinctive change in its policy. The secretary's report shows during the past half-year twelve resignations, balanced by the accession of twelve new members. There are at present seventy-one candidates upon the books. The number of gentlemen (104) is still considerably in excess of that of ladies (76). The lecture committee does not make a formal report till the fall meeting, but has reported informally that arrangements are making which will result in a very interesting and brilliant programme next winter. During the past season there has been a preponderance of political topics, owing to the fact that two discussions had to be postponed on account of sickness and death. Mr. Thomas Nelson Page will next season, however, deliver his lecture on the new Southern literature, Richard Watson Gilder of the *Century* to participate in the discussion. Mr. Bronson Howard will also deliver his address on dramatic construction, Mr. A. M. Palmer to be one of the other speakers. Hon. Seth Low has agreed to address the club on the subject, "A Metropolitan University." Three evenings are thus definitely arranged for. There may be also the postponed address from Mr. Frank J. Potter on folk-music, and Mr. George Kennan on some phases of Russian life. There are hopes of securing Sir Edwin Arnold and some other very distinguished men. A most important matter is the offer of Mr. Andrew Carnegie to furnish rooms for the club in his new Music Hall, to be erected at the corner of Seventh Avenue and 57th Street. This very generous offer will enable the club, after next season, to have permanent quarters. Meantime it is possible that in the autumn there may be other plans to consider, in addition to this one; but certainly the club will be obliged for the next winter to occupy the assembly rooms at the Opera House, though the effort will be made to get Tuesday, Thursday, or Friday evenings instead of Wednesday.

— The headquarters of the National Electric Light Association are now located at 18 Cortlandt Street, this city, to which place members are requested to send all notices of change of address or business. The secretary of the association desires to correspond with all present or prospective members manufacturing or dealing in electrical apparatus or supplies, with a view to arranging for an exhibition in connection with the summer meeting at Niagara Falls in August. Negotiations have been consummated with several railroad companies whereby visitors to that meeting will be enabled to travel at reduced rates, and similar negotiations with other companies are pending. A special limited vestibule train, for the exclusive use of delegates to the meeting, has been provided. A special car in this train will be reserved for gentlemen accompanied by ladies. In connection with the proposed exhibition, it is stated that the exhibit at the Chicago convention grew to so large proportions, and the expense was so great, that both the exhibiters and the executive committee took formal action before leaving Chicago, discouraging a large exhibit at Niagara Falls. It is found, however, that some members of the association are members for the sole purpose of making exhibits at the conventions; others have novelties brought out during the current half-year; and some insist on making an exhibit at any rate. It has been thought best, therefore, to provide for an exhibit on a moderate scale, and a number of rooms have been engaged in direct connection with the Convention Hall. Indications are that the Niagara Falls convention will be a large one. There seems to be a prevailing sentiment in favor of the attendance of the wives and lady friends of the members, and special arrangements will be made for their comfort and entertainment.

— Mr. W. H. H. Beadle writes from Chemawa, Ore., to the *American Meteorological Journal*, that as thunder is rare, and by some said not to occur in Oregon, it may be noted for record that at 11.53 A.M., standard time, April 22, peals of thunder and the characteristic rolls and reverberations were heard to the eastward from this place, which is near Salem in the Willamette valley, There was evidently a marked "low." It had rained heavily in the morning, after twenty-four hours southerly wind, and had partially cleared. The sun shone very warm, and a thunder-cloud, such as is common in Michigan summers, passed across the eastern sky from south to north.

— A rather singular personal discussion is just now going on in Vienna, over the new Court Theatre, which is very magnificent, but which has the defect that the actors cannot be heard in it. The architect is Baron von Hasenauer, one of the most distinguished architects in Europe, and the newspapers seem to have been stimulated by his conspicuous professional position to lay a good deal of blame on him for the bad acoustic quality of the building. Naturally, Baron Hasenauer does not like this; and his friends have undertaken to defend him by explaining that the plan of the structure is not due to him, but to the late Professor Semper, who prepared before his death the scheme which was carried into execution by Hasenaur. This explanation, which has probably some reason in it, far from allaying the trouble, has, as it seems, stirred up Professor Hans Semper, the son of the great architect, who demands an opportunity to demonstrate before a jury of architects that the defects of the theatre arise from errors in design and construction which do not exist in the original plans, but were introduced by Baron Hasenauer. Which of the disputants is right it is impossible to say; and, in fact, in matters of the acoustics of buildings, it is beyond the power of any person, architect or not, according to *The American Architect*, to make explanations that are of any value, beyond the most rudimentary observations, for the reason that no one knows, beyond such simple observations, any thing about the causes which make a building hard to hear in, or the remedy for such a state of affairs if it exists. Meanwhile, Baron Hasenauer's friends, including Baron Hansen and many other architects of high distinction, have shown their sympathy with him by presenting him with a eulogistic address.

— A device for secret writing by means of the type-writer is mentioned in the *Paper World* as a recent invention. It requires two type-writers similarly adjusted. They are so constructed that the types can be shifted from their normal position; so that the operator, striking the key in the usual way, really writes other letters than those in his copy, forming a cipher copy. The receiver adjusts his machine in an opposite direction, and writes from the cipher copy, and his machine records the letters of the original copy. The principle is very simple, says the *Mechanical News*, and it at once suggests the possibility of applying the principle of the combination lock to such a contrivance for all type-writers, so that each owner of a machine can set it to any combination, which only he and his correspondent should know. This must be feasible; and, if the new invention is of any use at all, its usefulness would be much increased by such a plan.

— Attention has lately been called by the *Philadelphia Press* to the peculiarly corrosive, and consequently destructive, effect of the creosote of wood-soot upon chimneys, owing to the fact that the creosote thus formed from the slow combustion of wood contains so large a proportion of pyroligneous vinegar or crude acetic acid, this acid being formed in large quantities when the combustion of wood is slow; many quarts, in fact, being condensed in cold weather where a large wood-fire is very much checked, only a few hours being required for such condensation. The acid in question dissolves lime readily, carrying it away in solution, and in this manner the mortar is frequently entirely removed from the tops of chimneys in the country, new ones suffering in the same way as the old, instances being numerous where the top courses of brick in chimneys only two years old have become entirely without support other than that afforded by the sand with which the lime was mixed.

— The annual commencement of the University of Pennsylvania — or rather its second yearly commencement, as the three medical faculties held theirs earlier in the year — shows, says *The American*, how much the old monotony of the single course in arts has been broken of late years. Graduates in science, in biology, and in finance, besides those of arts and of the law school, swelled the number to 106. The Wharton School of Finance graduated a strong class of young men deeply interested in the great public questions which are the especial subjects of instruction in this school. One of the class is Mr. Tamio Hayashi, who comes from Japan to learn political economy of the genuine American type. There are three of his countrymen in the class which graduates

next year, and others are preparing to enter. It is proposed to establish in the college faculty a course of study in which the biological sciences will hold the place of honor. In Drs. Leidy and Rothrock and their younger associates in the biological faculty, the university already possesses the means to create a strong school, and we hope the public support will be ample and encouraging.

— A new substance, singular alike in its chemical nature and in its properties, says *Nature*, has been discovered by M. Péchard. It is a mixed acid derived from oxalic and molybdic acids, and is therefore termed "oxalomolybdic acid." The crystals of oxalomolybdic acid, when dry, may be preserved unchanged either in sunshine or in the dark; but, if moist, they quickly become colored blue when exposed to the sun's rays. If characters be written on paper with the solution, they remain invisible in a weak light; but, when exposed to sunshine, they rapidly become visible, turning to a deep indigo color. It is curious that this effect only happens when the solution is spread over paper or other surfaces; for the solution itself may be kept unaltered in the bottle for any length of time, except for a trace of blue at the edge of the meniscus, where, by surface action, a little is spread against the interior glass walls. If a sheet of paper be immersed in a saturated solution of the acid, dried in the dark, and then exposed behind an ordinary photographic negative, a very sharp print in blue may be obtained by exposure to sunlight for about ten minutes. The color instantly disappears in contact with water; so that, if a piece of this sensitized paper be wholly exposed to sunlight, one may write in white upon the blue ground by using a pen dipped in water. If, however, the paper with its blue markings be exposed to a gentle heat for a few minutes, the blue changes to black, and the characters are then no longer destroyed by water.

— The Hydrographical Department of Russia has devoted since 1837, according to *Nature*, a good deal of attention to the secular rising of the coasts of the Baltic Sea, and a number of marks have been made on the rocky coasts of the Gulfs of Bothnia and Finland in order to obtain trustworthy data as to the rate of the upheaval of the coasts. Since 1869, observations have been carried on in a systematic way for measuring the changes in the level of the Baltic at several of the above-mentioned marks, and the results of the observations are now summed up by Col. Mikhailoff in the *Izvestia* of the Russian Geographical Society (vol. xxiv. 3). Taking only those stations at which the secular change could be determined for a number of years, varying from thirty-one to thirty-nine years (1839–78), the rise of the coast in a century would appear to be as follows: Aspö, 20.3 inches; Lehtö, 11.5 inches: Island of Kotkö, 26.7; Sveaborg, 22.8 and 25.1; Hangöudd, 33.7; Island of Skotland, 12.5; Island of Jussari, 31.6; Tverminö, 36.2; Island of Gloskär at Redhamn, 12.2. It thus appears that the figure of about three feet in a century, which was deduced from former observations, cannot be very far from the truth. As to local anomalies, they remain still unexplained.

— Carpenters and other tool-users who keep up with the times now use a mixture of glycerine, instead of oil, for sharpening their edge-tools. Oil, as is well known, thickens, and smears the stone. The glycerine may be mixed with spirits in greater or less proportion, according as the tools to be sharpened are fine or coarse. For the average blade, two parts of glycerine to one of spirits will suffice.

— The Elizabeth Thompson Science Fund, which has been established by Mrs. Elizabeth Thompson of Stamford, Conn., "for the advancement and prosecution of scientific research in its broadest sense," now amounts to twenty-five thousand dollars. As accumulated income is again available, the trustees desire to receive applications for appropriations in aid of scientific work. This endowment is not for the benefit of any one department of science, but it is the intention of the trustees to give the preference to those investigations which cannot otherwise be provided for, which have for their object the advancement of human knowledge or the benefit of mankind in general, rather than to researches directed to the solution of questions of merely local importance. Applications for assistance from this fund, in order to receive consideration, must be accompanied by full information, especially in regard to the following points: 1. Precise amount required; 2. Exact nature of the investigation proposed; 3. Conditions under which the research is to be prosecuted; 4. Manner in which the appropriation asked for is to be expended. All applications should be forwarded to the secretary of the board of trustees, Dr. C. S. Minot, Harvard Medical School, Boston, Mass., U.S.A. It is intended to make new grants at the end of 1889. The trustees are disinclined, for the present, to make any grant exceeding five hundred dollars: preference will be given to applications for smaller amounts. The following is the list of grants made: $200 to the New England Meteorological Society, for the investigation of cyclonic movements in New England; $150 to Samuel Rideal, Esq., of University College, London, England, for investigations on the absorption of heat by odorous gases; $75 to H. M. Howe, Esq., of Boston, Mass., for the investigation of fusible slags of copper and lead smelting; $500 to Professor J. Rosenthal of Erlangen, Germany, for investigations on animal heat in health and disease; $50 to Joseph Jastrow, Esq., of the Johns Hopkins University, Baltimore, Md., for investigations on the laws of psycho-physics; $200 to the Natural History Society of Montreal, for the investigation of underground temperatures; $210 to Messrs. T. Elster and H. Geitel of Wolfenbüttel, Germany, for researches on the electrization of gases by glowing bodies; $500 to Professor E. D. Cope of Philadelphia, Penn., to assist in the preparation of his monograph on American fossil vertebrates; $125 to E. E. Prince, Esq., of St. Andrews, Scotland, for researches on the development and morphology of the limbs of teleosts; $250 to Herbert Tomlinson, Esq., of University College, England, for researches on the effects of stress and strain on the physical properties of matter; $200 to Professor Luigi Palmieri of Naples, Italy, for the construction of an apparatus to be used in researches on atmospheric electricity; $200 to William H. Edwards, Esq., of Coalburg, W.Va., to assist the publication of his work on the butterflies of North America; $150 to the New England Meteorological Society, for the investigation of cyclonic phenomena in New England; $25 to Professor A. F. Marion, for researches on the fauna of brackish waters; $300 to Professor Carl Ludwig, for researches on muscular contraction, to be carried on under his direction by Dr. Paul Starke; $200 to Dr. Paul C. Freer, for the investigation of the chemical constitution of graphitic acid; $300 to Dr. G. Müller, for experiments on the resorption of light by the earth's atmosphere; $300 to Professor Gerhard Krüss, for the investigation of the elementary constitution of erbium and didymium; $50 to Dr. F. L. Hoorweg, for the investigation of the manner and velocity with which magnetism is propagated along an iron bar; $150 to Mr. William H. Edwards, to assist the publication of his work on North American butterflies.

— Charles A. Ashburner, the well-known Pittsburgh geologist, had the honorary degree of doctor of science conferred upon him at the commencement of the University of Pennsylvania, June 7, as an acknowledgment of the high scientific value and merit of his surveys and reports for the Geological Survey of Pennsylvania. Dr. Ashburner was graduated from the University of Pennsylvania about fifteen years ago with the highest rank in his class, and immediately entered the corps of the United States Lighthouse Service Survey. Upon the organization of the Pennsylvania Geological Survey, he resigned from the government work, and was appointed assistant of Professor Lesley, State geologist, with whom he has been associated ever since. About two years ago he gave up much of his active State work, and went to Pittsburgh to assume connection with Mr. Westinghouse in his extensive mining interests, particularly in the mining of natural gas; latterly, however, making extensive geological and mining examinations in the Rocky Mountains and on the Pacific slope.

— MM. Mannesmann of Remscheid, Westphalia, are manufacturing fly-wheels capable of double and even treble the speed of fly-wheels made of cast-iron, the resistance of which is generally limited to a speed of forty metres per second for the rim of the wheel. They have succeeded in obtaining fly-wheels which are capable of acquiring three times the speed of ordinary fly-wheels by constructing the nave and the spokes of iron or steel, and making a rim entirely of steel wire wound round and round itself a great many times.