March quarters of 1838, 1845, 1847, 1853, 1855, 1864. 1865, 1866, 1875. 1890, 1891, which, with the exception of the third quarter of 1849 (the cholera year), are the most fatal seasons on record.

There is no doubt that the sanitary condition of the district greatly influences the results of the movements of the ground water, and the greater the amount of disturbance or the number of disturbances of the ground water in the course of the season in insanitary districts, the greater and more marked the influence upon health until the period arrives when the soil has been washed free from its impurities, and the waters have accumulated in the ground.

Certain diseases have their allotted seasons and conditions favorable for their development and spread, and there are a number of diseases usually most rife when the ground waters are low, such as enteric fever, cholera, small-pox, diphtheria, and others.

The state of low ground water as being a condition accompanying epidemics of typhoid fever is a matter of constant observation, and it is a well-authenticated fact that all epidemics of this disease in this country have occurred in periods only of low water, or when immediately following a very low state of the ground water.

Ground water influences both small-pox and diphtheria in a most marked manner, but in directly opposite ways, so that when one of these diseases is present the other is absent. Small-pox is accompanied or preceded by intense dryness of the ground, while diphtheria occurs only when the condition of the ground is one of continued dampness. The year 1871 was a very fatal year from small-pox in this country, and in that year the percolation experiments showed that the ground was intensely dry. In 1876 an outbreak of small-pox occurred at Croydon, and continued until the autumn of 1877. Outbreaks of this disease have subsequently occurred in this place in 1881–82 and 1884–85. Since September, 1885, there have been no deaths recorded from small-pox at Croydon, but diphtheria has been very prevalent during the whole of that period, and the ground has been in a constant state of dampness, so much so, that, with the exception of one month, October, 1886, a measurable quantity of water flowed from the percolation gauges every month during all this long period. The last outbreak of small-pox in 1884–85 was preceded by seven months, and that of 1881–82 by five months, when no water percolated through the ground.

Since the time when the author first observed this marked coincidence between the dryness of the ground and outbreaks of small-pox, he has learned from the report of Surgeon-Major G. Hutcheson, M.D., Sanitary Commissioner of the Northwestern Provinces and Oudh, that the counterpart of this has been observed in India in reference to small-pox, which, it is stated, "is controlled or kept in abeyance by damp and moisture."

The most marked incident in connection with ground water is the remarkable parallelism between the deaths of children under five years of age and the lowness of the ground water; in fact, it is found that the deaths in this case fluctuate inversely in proportion to the volume of the water in the ground.

In 1882 the excess of deaths was no doubt due to the direct pollution of the water-supply of the district. And it should be observed that since 1884 the low waters in this well are lower than would be the case naturally, as since this period the waters have been abnormally lowered by the establishment of the New Croydon Water Works Company's station at Addington. If the deaths from diarrhœa are eliminated as being affected more by temperature than by conditions affecting the state of the ground water, the parallelism between the volume of water in the ground and the death-rate becomes even more marked.

This coincidence between the rates of mortality of children and ground water occurring period after period is tantamount to positive proof that ground water, at least, if not the direct cause, is the measure of the influences at work which seriously menace the lives of young persons.

Those who require further information upon this subject will find it in the author's recent presidential address to the Royal Meteorological Society.

NOTES AND NEWS.

THE *Annals of Hygiene* states that the legislature of Michigan has recently passed a bill making it a misdemeanor, punishable by fine and imprisonment, to manufacture or sell, give or deliver, cigarettes of any kind of tobacco, or cigarette paper in books or blocks for wrapping cigarettes.

— The operations of the Geological Survey of Missouri during the month of August were as follows: Examinations of the zinc and lead deposits have been extended into Greene, Stone, Webster, Howell, Oregon, Carter, Texas, Wright, and Shannon Counties; inspections of iron ores have been made in Cape Girardeau, Bollinger, Wayne, Stoddard, Reynolds, Carter, Ripley, Shannon, and Howell Counties; detailed mapping has been prosecuted in Macon, Chariton, and Henry Counties, and about 70 square miles have been covered. The study of the Quaternary deposits has been continued over the central portion of the State adjacent to the Missouri River; and the mapping of the crystalline rocks has been continued in Madison, St. Francois, Washington, Iron, and Reynolds Counties, as has also the geological mapping in Greene County. For the purpose of constructing models illustrating the conditions of occurrence of ore bodies, detailed surveys have been completed of two important iron deposits. In the laboratory, analyses have been made of clays and iron ores; in the office the plotting of maps preparatory to publication has proceeded uninterruptedly, and work has been continued on the preparation of the report on paleontology. With reference to future work, steps have been taken towards securing for the State the determination of the latitude and longitude of a series of points, which determinations are necessary for the further prosecution of the detailed mapping now in progress.

— Persistent attempts have been made to produce a good artificial substitute for ivory. Hitherto none have been successful. A patent has recently been taken out, says the *Engineer*, for a process based upon the employment of those materials of which natural ivory is composed, consisting, as it does, of tribasic phosphate of lime, calcium carbonate, magnesia, alumina, gelatine, and albumen. By this process, quicklime is first treated with sufficient water to convert it into the hydrate, but before it has become completely hydrated, or "slaked," an aqueous solution of phosphoric acid is poured on to it; and while stirring the mixture the calcium carbonate, magnesia, and alumina are incorporated in small quantities at a time; and lastly the gelatine and albumen dissolved in water are added. The point to aim at is to obtain a compost sufficiently plastic and as intimately mixed as possible. It is then set aside to allow the phosphoric acid to complete its action upon the chalk. The following day the mixture, while still plastic, is pressed into the desired form in moulds, and dried in a current of air at a temperature of about 150° C. To complete the preparation of the artificial product by this process, it is kept for three or four weeks, during which time it becomes perfectly hard. The following are the proportions for the mixture, which can be colored by the addition of suitable substances: quicklime, 100 parts; water, 300 parts; phosphoric acid solution, 1.05 sp. gr., 75 parts; calcium carbonate, 16 parts; magnesia, 1 to 2 parts; alumina, precipitated, 5 parts; gelatine, 15 parts.

— In a paper read before the American Association for the Advancement of Science at the recent meeting in Washington, Professor Joseph James gave the results of a visit to Point Pleasant, Ohio, made to ascertain the age of the rocks. The paper has just been printed in full in the Journal of the Cincinnati Society of Natural History. In it is given a notice of such papers as have considered any of the rocks of south-western Ohio to be of earlier age than the Hudson River group of New York. There are also given the details of a section studied by him at Point Pleasant during the summer of 1890. Vanuxem, in 1829, was the first to correlate the Cincinnati strata with the Trenton of New York, and he was followed in this by Conrad in 1841. In 1843 Hall referred the rocks to the Hudson River group of New York. In 1865 Meek and Worthen proposed for the series the name Cincinnati group. This name was generally accepted, but in 1879 a committee of the Cincinnati Society of Natural History advocated abandoning the

term Cincinnati, and substituting Hudson River and Utica slate. The committee also supposed the Trenton was exposed on the Ohio River twenty or twenty-five miles above the city. This opinion was adopted by Professor Orton and others, but Professor James concludes that there is no difference between the lowest beds exposed on the Ohio at Cincinnati and the rocks at Point Pleasant. He says the beds of the two localities cannot be placed in two separate terranes unless an arbitrary line be drawn at some point in the series. The paper is illustrated by two plates of views of the strata at Point Pleasant, and at Ludlow, Ky., opposite Cincinnati.

— A German specialist, Dr. Cold, has recently pleaded for giving young people more sleep. A healthy infant sleeps most of the time during the first weeks, and, in the early years, people are disposed to let children sleep as much as they will. But from six or seven, when school begins, there is a complete change. At the age of ten or eleven the child sleeps only eight or nine hours, when he needs at least ten or eleven, and as he grows older the time of rest is shortened. Dr. Cold believes, according to *Nature*, that up to twenty a youth needs nine hours' sleep, and an adult should have eight or nine. With insufficient sleep, the nervous system, and brain especially, not resting enough, and ceasing to work normally, we find exhaustion, excitability, and intellectual disorders gradually taking the place of love of work, general well-being, and the spirit of initiative.

— An interesting paper upon the slow combustion of explosive gas mixtures (of which *Nature* gives a brief abstract) is contributed to the current number of *Liebig's Annalen* by Dr. Krause and Professor Victor Meyer. The experiments described were made with electrolytic mixtures of hydrogen and oxygen, and denotating mixtures of carbon monoxide and oxygen. The first experiment consisted in heating in a bath of vapor of diphenylamine (305°) a denotating mixture of hydrogen and oxygen contained in a U-shaped tube closed by mercury. The heating was continued without intermission for a fortnight, at the end of which time very little gas remained, almost the whole having slowly combined to form water. The experiment was then repeated in an apparatus constructed entirely of glass, and in which the use of mercury was avoided, except in a small manometer used to indicate the pressure. It was then found that no trace of water was formed at the temperature of diphenylamine vapor (305° C.); at the temperature of boiling sulphur (448°) the amount of combination was exceedingly small; while at 518°, the boiling-point of phosphorus pentasulphide, a considerable amount of combination occurred, but no quantitative rule could be deduced. In all these experiments the gases employed were moist, and no particular care had been taken to remove the last traces of admixed air. Now Bunsen and Roscoe, in their celebrated work on denotating mixtures of hydrogen and chlorine, showed that regular results were only obtained when the film of air condensed upon the surfaces of the glass vessels employed was removed by allowing the gas to stream through the apparatus for several days previous to the experiment. A fresh series of experiments were therefore made, in which these precautions were most rigidly observed; most complicated pieces of apparatus were constructed of glass throughout, which admitted of the drying of the gases prepared (in case of hydrogen and oxygen) by the electrolysis of hot water, so as to exclude ozone and hydrogen peroxide; and the pure gases thus obtained were allowed to stream through the series of bulbs united by capillary tubes for a fortnight, night and day, before the bulbs were sealed off at the capillaries. It was found that, with pure dry gases, scarcely a trace of combination occurred by the fusion of the very fine capillaries. As regards the temperature of ignition of electrolytic hydrogen and oxygen, or denotating carbon monoxide and oxygen, it was found that bulbs containing them do not explode when placed in boiling pentasulphide of phosphorus (518°), but do explode in vapor of stannous chloride (606°). The temperature of ignition lies, therefore, between 518° and 606° C. The mode of explosion differs considerably under different circumstances. In case of explosion in vapor of stannous chloride, the bulb was never shattered, but a sudden appearance of flame within the bulb occurred, accompanied by a slight detonation, and in some cases the point of the capillary was blown off. It is also astonishing how long one requires to hold such a bulb in a Bunsen flame before explosion occurs; it never occurs until the flame becomes colored yellow, and the glass begins to soften, and frequently only causes a swelling out of the glass at the heated spot. Thin-walled bulbs, however, are sometimes shattered. In two cases it was noticed that the glass at the softened part was violently forced in, owing to the previous heating having caused a large percentage of combination, and hence the production of a partial vacuum. Even after taking the rigid precautions to insure purity above described, no definite quantitative rule connecting the time and percentage of combination has been discovered, experiments performed simultaneously upon similarly treated mixtures yielding widely different results; showing that the irregularities of glass surfaces, even after removal of their air-films, are quite sufficient to modify very sensibly the conditions under which combination occurs.

— The settlement founded by Mrs. Humphry Ward, on the principles laid down in "Robert Elsmere," and which has its home in University Hall, Gordon Square, London, has shown itself intellectually active during the last year, according to the London *Journal of Education*. The warden, the Rev. Philip Wicksteed, M.A., has completed his arrangements for the winter lectures. He will himself undertake a course of lectures on Dante. Mr. Wicksteed has been for some years a university extension lecturer, and is one of the foremost English exponents of Dante. The more immediate ends of the "Robert Elsmere" position will be illustrated by the warden's course on the criticism of the Old Testament. Professor Knight of St. Andrew's, whose Wordsworth studies have earned him a permanent place amongst literary men, will give a series of lectures on "Some Aspects of Theism," a course which will be treated both historically and philosophically. Mr. R. G. Moulton, a university extension lecturer of high reputation, will treat of "The Literary Study of the Bible." The energetic warden will, further, lecture on the "Elements of Political Economy." One of the great difficulties for the ordinary man in the study of economics is the development of the mathematical exposition of the subject. Thus Professor Jevon's "Theory" is founded on mathematics; so, too, the notes and appendices of Professor Marshall's "Economics" are mathematical in treatment. To meet the needs of those whose mathematics are shaky, a class will be held after lectures, so as to enable all to follow, as closely as possible, modern theoretical economics

— In a lecture on "Old-time Winters in Essex County," delivered before the Essex (Mass.) Institute in May last, Mr. Perley gave interesting particulars on many subjects, including weather, some of which appear in the bulletin of the institute. The lecturer spoke of the watch, church services, dress, food, and schools of the early winter seasons; how the people spent their evenings, the winter employment of the people in cutting off the forests, sledding timber and wood, making pipe staves and barrel hoops, and, most interesting of all, the institution of the old-fashioned shoemakers' shops, of which nearly every farm had one a century ago. Women in those days engaged in spinning and weaving. The holidays were referred to, Thanksgiving, Christmas, and New Year's; and the winter's pleasures, such as sleigh-rides, dancing, spinning and quilting parties, and games, shuffle-board, coasting, skating, trapping, gunning, fishing, singing-schools, and girls' samplers. He also spoke of the old modes of travel, snow-shoes, etc. Nearly all the heavy teaming was done on sleds, and he mentioned the winter of 1768–69, when the travelling was so bad that the farmers in the western part of the State could not get their grain and provisions to the coast to market. Snow remained on the roads as it fell until about a century ago. Mr. Perley then spoke of particular winters: that of 1641–42, when the Indians said they had not seen the ocean so much frozen for forty years; of 1646–47, when there was no snow to lay; of 1696–97, said to be the coldest winter since the first settlement of New England; of 1701–2, which was "turned into summer;" of 1717–18, when the snow was from ten to fifteen feet deep and the drifts twenty-five feet, many one-story houses being buried; of 1740–41, said to be the severest winter known by the settlers, Salem harbor being frozen over as early as October; of 1774–75, a wonderfully mild

winter; of 1779–80, when for forty days, including March, there was no perceptible thaw, and the snow was so hard and deep that loaded teams passed over the fences in any direction, arches being dug under the snow so that men on horseback could ride under them, and which was long remembered as *the* hard winter; of 1784–85, when, as late as April 15, snow was two feet deep, and frozen hard enough to bear cattle; of 1785–86, when in the remarkable storm of Nov. 25, the snow blew into balls, one of which had rolled seventy-six feet, measuring seventeen and a half by twenty-two inches; of 1794–95, when the "Betsey" was launched in Salem on Christmas Day, the thermometer indicating 80° above zero at noon, and men and boys went in swimming; of 1801–2, when the "Ulysses," "Brutus," and "Volutia," three Salem vessels, which sailed out of the harbor on a summer-like morning in February, were all cast away at night on Cape Cod, in a terrible snow-storm, which continued a week. He also referred to more recent seasons, and to the cold winter of 1856–57, when in one week in January was the coldest day by the thermometer ever recorded of late years, mercury in Salem 20° below zero; travel on the railroad between Boston and Salem entirely suspended from Tuesday morning to Thursday afternoon. The recent mild winters were also alluded to.

— At the Bournemouth meeting of the British Medical Association, a discussion on the subject of alcohol was initiated by a paper by Dr. Samuel Wilks. In the course of his paper, as we learn from *Nature*, he stated that he had no acquaintance with any organic changes attributable to alcohol in the lungs and kidneys, but it seemed that the digestive and nervous systems suffered. Physiologists had failed to demonstrate the chemical changes which it underwent in the body, and consequently it was impossible to say whether it was of the nature of a food or not. No one had yet seen a person who lived on alcohol, although there was evidence of persons taking large quantities of alcohol who yet preserved their weight with a minimum of food; and that supported the theory that, although alcohol was not nutritive in itself, it prevented the wear and tear of the body. The opposite theory also existed, that alcohol acted as a spur to the nervous system and quickly wore it out. He could not disapprove of the use of wine and beer, if taken in moderation, by the masses of the people; but as to spirits, or spirits and water, he had not made up his mind that they were in any way useful, and he seldom recommended them. Dr. Bucknill thought that the wise use of wine might cure some cases and be useful in others. Dr. Norman Kerr said that alcohol was a poison, analogous in many respects to other poisons. Sir Risdom Bennett agreed with Dr. Wilks in not approving of spirits as a beverage. He believed it to be useful in fever and in some nervous diseases, but he did not think it desirable at the present time to lay down any broad principles with regard to alcohol with reference to the whole community.

— In the hamlet of Sewardstone, England (as we learn from *Amateur Gardening*), Mr. W. Melles, J.P., the leading landowner in the district, has, at his own expense, supplied and planted a collection of apples, pears, plums, cherries, and bush fruits for the purpose of enabling the principles of fruit culture to form part of the educational curriculum at the Sewardstone Board School. The collection embraces all the most useful varieties, and the trees are planted in such a manner that they form a border of some width to the spacious playground. The boys and girls will share in the work of attending to the culture of these trees, and on certain days the head master, Mr. Spink, who is an enthusiast on the subject, will give lessons on theory and practice. Mr. Spink has drawn up a graduated scheme for teaching fruit culture as a specific subject to his scholars, and this is being submitted to the inspectors for their approval, so that the children may in due course be examined thereon. According to Mr. Spink's scheme, the children will first be taught the botany of an apple blossom and fruit, followed by difference between seedling and parent, planting, mulching, summer and winter pruning, thinning the fruit, insect pests, packing, and storing the fruit: this will constitute the first stage. The second stage will deal with the food of fruit trees, manures, course of sap; and the third, the art of propagation. The first stage in the scheme covers a variety of subjects, but Mr. Spink has been obliged to do this because most of the boys leave the schools when they have passed the fifth standard, and hence it is needful to let them know as much of the first stage as possible before they do so. This is an excellent idea, and one which might be followed with advantage by other schools in country districts. "The exterior walls of schools might be turned to good account for growing peaches, apricots, and the finer kinds of pears and plums. If the head master could not undertake the practical management of such trees, some of the gentlemen who reside in the parish would, in such a case, be doing an excellent service by allowing their gardener to pay occasional visits, and advise, as well as give practical illustrations of the systems of pruning, disbudding, etc. If the correct principles of fruit culture could only be firmly instilled in the minds of boys and girls when at school, they would grow up into men and women armed with information that would, whether as servants or masters, be of the greatest possible value to them and to the welfare of the country generally."

— The *Photographic News* says that the great progress that has been made in the methods by which rapid movements can be analyzed is well seen in a series of photographs lately taken by Anchütz of Lissa, who has already given to the world some of the best instantaneous pictures ever taken. The subject of the pictures at present under consideration is a dog jumping over a small bush. In the act of making one jump the animal has been photographed twenty-four separate times, and each picture is not a mere silhouette, as was the case with Muybridge's first attempts of this kind, but a little picture showing half-tone and detail. Some of the attitudes are, of course, comic in appearance, for they represent phases of a movement which the eye is unaccustomed to, and cannot possibly appreciate. Notably is this the case in the commencement of the jump, when the dog's hind toes only touch the ground; and again at the finish of the jump, when his legs are gathered together in a heap.

— We have received from Mr. Mostyn, says *Nature*, an interesting letter on the well-known appearance of the green ray at sunrise or sunset caused by the refraction of the air. He states: "This 'green ray' is seen to best advantage at sun-*rise*, owing, I imagine, to the eye not being wearied with watching the previous glare, as is apt to be the case at sunset. At the same time, I had many very satisfactory observations at sunset, one in particular, when we were running before a very heavy sea in the Southern Ocean, and the 'green ray' was seen no less than three times in as many seconds, as the ship rose and fell on the huge waves, causing as it were two sunsets, with a sunrise between them. The best displays took place when the refraction near the horizon was of such a character that the sun assumed a balloon, or vase, shape as he came close to the sea-line. When, on the contrary, the sun appeared flattened out in its horizontal diameter, the 'green ray' was either entirely absent, or was seen only in an indistinct and uncertain manner."

— Public interest in industrial and commercial exhibitions will doubtless be somewhat stimulated this year by the extensive preparations now making for the World's Columbian Exhibition at Chicago. Among the many attractions of this kind offered to the public, and presenting valuable opportunities to inventors and artisans ready to invite attention to their work, perhaps there are none which have a longer or more useful record than the annual fairs of the American Institute of this city. The sixtieth exhibition of the institute will open this year on Sept. 30, and continue in operation until Nov. 28, giving two months' time to exhibitors improving the full period. The general superintendent, Mr. Charles Wager Hull, is ready at the offices of the institute, No. 113 West 38th Street, to give information and receive applications for space. The fair will be held in the Exhibition Hall on Third Avenue, which is now open for the reception of machinery. Other exhibits will be received on and after the 21st. The entries for the forthcoming exhibition already show a continued interest in the American Institute, and indicate that the exhibition of the present year will be in no respect less successful than its many predecessors.