

DEATH-RATE AND SANITATION IN RUSSIA.

A SERIES of admirable articles on vital statistics and the importance of sanitary measures is now appearing in one of the St. Petersburg daily papers, says the *Lancet*, founded on a paper by Dr. Eck. The statistics given are certainly of a nature to set every one in Russia thinking seriously about taking measures to improve them. Thus for the year 1882, which seems to be the last year whose vital statistics are available, the mortality in the ten southern provinces was 2.6 per cent; in the seven eastern provinces, 3.9 per cent; in the thirteen middle provinces, 6.2 per cent; in the sixteen western provinces, 3.1 per cent; and in the fourteen northern provinces, 3.7 per cent. After mentioning the various sanitary improvements called for, as drainage of various kinds, a supply of wholesome drinking-water, attention to and regulations about buildings of all descriptions, and the establishment of infectious hospitals, Dr. Eck goes on to say: "There is no need for us to puzzle ourselves how these matters are to be done; England has accomplished so much, that we need simply adapt what is ready to our hands to our own circumstances. In Germany, France, Austria, and Italy, steps are already being taken in the same direction, and all these countries take England as their chief model, so that we need not be ashamed to do so too." He then appeals to the economic importance to Russia of a reduction of the mortality.

On the principle of example being better than precept, he goes into a long but easily comprehensible calculation of the comparative working-value of horses whose ages at death vary; and he then takes the respective death-rates of Russia (35), Germany (27), and England (19), and, by means of a method of computation unusual amongst British statisticians, explains that they show that an Englishman has 53 years of life, while a German has 37, and a Russian 29 only. Reckoning a man's working-years to commence at the age of 18, an Englishman has 35 years in which to earn, against the Russian's 11; and the latter will probably not save much more in his 11 working-years, above what it costs him to live, than has been already expended upon him during his 18 unproductive years; but an Englishman will have 24 years more in which to go on earning and saving. Again, out of 1,000 inhabitants in Russia, only 373, or 37 per cent, are of an age to earn, while in England there are 660, or 66 per cent; or each individual of working-age in Russia has to provide for two non-workers, while in England he has only half a non-worker for whom to be responsible.

MUIR'S THERMAL CHEMISTRY.

THE recognition of the dual character of the phenomena involved in chemical operations is no new thing; but it is only of late that the attempt has been made to determine the relationship between transformations of matter and concurrent changes of energy, and the efforts to this end have been made almost wholly in the direction of thermal phenomena, — in the investigation of the quantities of heat which enter or leave a chemical system during the transition between accurately defined initial and final states, in a so-called chemical change.

Mr. Muir's presentation of the condition and aims of the thermal chemistry of to-day is opportune. Based as a matter of necessity upon the researches of Thomsen and Berthelot, it fairly bristles with references to the works of these masters, and, indeed, to all original papers of importance in the discussion of the subject. Following an outline sketch of the theory of energy and the molecular hypothesis, the author discusses successively the methods of thermal experimentation and their application to the phenomena of allotropy; isomerism; the neutralization of acids by bases, and bases by acids; the relative avidity (as Thomsen terms it) of acids; the classification of elements and compounds in accordance with thermo-chemical properties; the phenomena of melting, boiling, evaporation, dissociation, solution, and hydration; and, finally, the chemical interpretation of thermal data. Only such facts as are immediately of use for purposes of illustration appear in the body of the book; but all well-established data of the subject (excepting such as relate to boiling and melting points and specific heats, for which reference elsewhere is made) are to be found in the five appendices, which comprise a third of the matter between the covers of the volume.

The work is for the most part independent in opinion, and, with no pretence to exhaustiveness, sufficiently full for the purposes of the general reader, and quite intelligible to one acquainted with the elements of general chemistry and modern ideas of energy. Facts are presented fearlessly and as separate as may be from the constraint of theory, and the explanation is fitted to the facts.

The stumbling-block in the way of the interpretation of thermal values is the difficulty, often the impossibility, of determining what portion of a thermal change is of chemical origin, and what is physical; and it is not surprising to find the use

The elements of thermal chemistry. By M. M. PATTISON MUIR, assisted by David Muir Wilson. London, Macmillan, 1885. 8°.

of thermal relations in the matter of classification regarded as only supplementary, and even the 'law of maximum work' degraded to a mild assertion of the general probability of the occurrence, under physical conditions as nearly constant as possible, of that one of conceivable operations which shall evolve the greatest quantity of heat. Fortunately in the measure of relative affinities the effect of physical disturbance is at a minimum; and it is on this line that the author predicts, and rightly, as it seems, the surest advance. Mr. Muir has laid his audience under obligations; and, in view of the excellence of the work, some few depreciatory (perhaps quixotic) references to the baleful influences of structural chemistry and the bond theory will doubtless be passed over lightly.

NEW YORK AGRICULTURAL EXPERIMENT-STATION.

THE fourth report of the New York experiment-station contains the results of a vast amount of work upon various branches of agricultural inquiry; and, if the first impression which it makes is of a certain vagueness and lack of definiteness in its conclusions, a further study shows that much of this effect is due to the magnitude of the problems attacked, and the consequent incomplete character of the work at present.

As in former years, the work of the station has been largely botanical and horticultural in its nature, although other subjects have also received considerable attention, particularly stock-feeding and related subjects.

The work of the chemist upon the relative volume of the fat-globules in milk from different sources, and upon the structure of these globules, is full of interesting and suggestive results. By means of an ingenious method of his own devising, he has been able to determine microscopically the number of fat-globules in a given bulk of milk, and, by combination with the results of chemical analysis, their average volume. By this method he has shown, that, when milk is churned at a temperature above the melting-point of butter-fat, the number of fat-globules is increased: in other words, the fat-globules can be divided. He has thus, it would seem, disposed finally of the theory of a membrane surrounding the fat-globules, and completed the proof that milk is an emulsion, and behaves essentially like any other emulsion.

Fourth annual report of the Board of control of the New York agricultural experiment-station, for the year 1885; with the reports of the director and officers. Rochester, N.Y., E. R. Andrews, pr., 1886. 8°.

But it is on the botanical and horticultural sides, as already intimated, that we find the greatest amount of work expended, and the most comprehensive plan of operations. There are, among other things, a botanical description and provisional classification of forty-three varieties of wheat, and a description of the leading varieties of lettuce (eighty-seven in number, according to the station's classification, and gleaned from at least two hundred differently named lettuces by the labor of three seasons). There is also a description of the products of a hundred and forty-eight varieties of maize, planted under such conditions as to insure extensive cross-fertilization, and tending to show that the variations thus produced can be referred to named varieties. All this, it will be observed, is in the line of agricultural botany; and the report contains the records of a large amount of other work, with many species of plants which may sooner or later be available in the same direction.

We shall watch with interest this attempt to reduce to system the present chaos in the nomenclature of agricultural varieties. The director of the New York station is confident that these varieties are much more persistent than is usually supposed; and, in the interest of both science and practice, it is to be hoped that his confidence will be justified by the outcome of his own and his assistant's labor.

The report of the botanist deals largely with plant-diseases, the most interesting portion being the demonstration that pear-blight is due to the activity of a bacterium.

The student of agricultural science may be inclined to regret the time which has been spent upon numerous side-issues and single experiments of no scientific value, and to wish that the large resources of the station had been expended in more extended and thorough scientific work upon a few problems; but he will not forget that a public experiment-station is not a purely scientific institution, but has duties to the man of practice as well, which are often best subserved by experiments, in which the purely scientific man can see no value. We have before now taken occasion to express freely our belief in the greater ultimate value of scientific investigation; but we desire to record also our appreciation of the value of carefully performed and conscientiously reported 'practical' or 'empirical' experiments, such as are to be found in this report. The New York station appears to us to be doing excellent work in both directions, and it is to be hoped that the liberality of the state in providing means for its prosecution will serve as an incentive to other commonwealths.