

there have been official investigations on kala-azar, malaria, Malta fever, plague, typhoid, and other diseases, and on veterinary subjects; the Government has long set an example to other countries in the sale of cheap quinine in malarious areas, and something like a third of many municipal budgets is spent on sanitation, mostly water supply, conservancy, and drainage. Outside India we have recently seen very fine official researches on Malta fever and sleeping-sickness, so that matters are improving. But in my own humble opinion even this is not enough, and I think that the expenditure on research should reach 5 per cent. of that on all medical and sanitary work. Numbers of subjects, such, for example, as measles and scarlet fever in this country, remain almost untouched, greatly to the disadvantage of the public, and in a hundred directions we find action crippled by want of knowledge, and, therefore, correspondingly expensive and inefficient.

But the whole subject of science and the State possesses a most important, and indeed ominous, political significance. The invention of locomotives, by reducing the time required in travelling to about one-third or less, has, so to speak, diminished the world's diameter in the same proportion, and, by bringing the nations more closely face to face, has greatly increased the acuteness of international competition. In this competition scientific organisation becomes more and more vital to success, and in the wars of the last decade we have actually witnessed the complete collapse of two unscientific peoples before their more intelligent adversaries. Now no one will deny that the British stand in the front rank of scientific nations, but it is equally evident that this eminence is due entirely to private individuals, and not at all to the Government, that is, to the party politicians. For years they have allotted only about one three-thousandth part of the national income for scientific work, that is, for obtaining knowledge, equivalent to the annual expenditure for that purpose of six shillings and eightpence by a person possessing a thousand pounds a year; and it may be suggested that the amount of scientific intelligence and knowledge shown in our party political administration should be calculated at about the same rate. Nor can it be contended that the people at large show a much greater interest in science, a much greater knowledge of scientific facts, or a much greater proficiency in scientific habits of thought. Quite recently the Boer war gave us an explicit warning of what such nescience is likely to lead to, and we can only hope that the nation will have the sense to reform its methods in consequence before it is too late. For a full discussion of the subject, however, I must refer the reader to a recent book called "The Problem of National Defence," by my brother, Major Charles Ross, D.S.O. (Hutchinson and Co.), in which he examines from a military standpoint the same defects as I have alluded to above in connection with medical matters. The two cases are really parts of the same problem—how are we to be governed in the future by science rather than by nescience? But whether a nation so wedded to old habits will be able to change in time to save itself is another question which it is impossible to touch upon here.

I fear that some of these remarks will appear to many to be too severe, or perhaps too personal; but I can only state my own opinions, however small their value; and have attempted to do so as frankly as possible, because otherwise there is little use in writing on the subject at all. I should like to add, in conclusion, that my object is not to find fault, but to suggest lines of improvement for the future; and, unfortunately, the one cannot be attempted without the other.

RONALD ROSS.

INCANDESCENT ELECTRIC LAMPS.¹

THE closing months of 1906 and the opening months of 1907 are likely to be long remembered by electrical engineers as a period of a remarkable recrudescence of interest in the subject of incandescent electric lamps. For many years the familiar carbon filament lamp has been the only commercial incandescent electric lamp, in spite of its threatened extinction by the invention of the Nernst lamp in 1897-1898. The feeling of uncertainty caused by this discovery was short-lived; after a wealth of prophecy on its probable effect on the industry it was soon found out that months, even years, of experiment were necessary to perfect the Nernst lamps commercially, and the drastic changes recommended to supply engineers were postponed for a time in consequence. Finally, the lamp, capable though it proved of taking a definite place in the art of electric lighting, was found to be hardly even a serious competitor of the carbon filament lamp.

In spite, therefore, of the predictions of 1898, the electrical world settled down with the conviction that the threatened revolution was not destined to be achieved. But in the meantime inventors were busy—foreign inventors that is to say, the English manufacturers being always too busy to invent—and from time to time rumours were heard of other approaching revolutions. Rendered callous, possibly, by the history of the Nernst lamp, little attention was paid to these warnings until the introduction of first the osmium lamp of Dr. Welsbach and then the tantalum lamp of Messrs. Siemens proved the truth of the old saying connecting smoke with fire. Finally came the practical realisation of the tungsten lamp almost simultaneously by Kuzel, Just and Hannaman, and Welsbach, and this for some unknown psychological reason seems to have suddenly awakened English engineers. Once awake they atoned for their long slumber by a copious use of ink, and the technical Press of the period referred to at the beginning of this article simply teems with matter relating to the new lamp developments.

All that is valuable in these articles will be found conveniently crystallised in the papers and discussions in the Journal of the Institution of Electrical Engineers. A paper by Mr. Swinburne on the new lamps opens the latest volume; it is followed by one on light standards and the present condition of high-voltage carbon filament lamps, by Mr. C. Paterson, and the series is rounded off by a paper on carbon filament, Nernst and tantalum lamps, by Messrs. Haworth, Matthewman, and Ogley. Combining these papers with M. Rodet's excellent little book on incandescent electric lamps, the reader can obtain a very fair idea of the present position of this subject.

So far as the carbon filament lamp is concerned, the position is far from satisfactory, as the study of Mr. Paterson's paper shows. It may justly be argued that the test results shown by the author are hardly numerous enough to justify the title. Six lamps each from ten British makers is a small number on which to base a condemnation of British methods, and a lamp-maker who manufactures four or five million lamps a year may rightly complain on being judged by the performance of a chance six. But making all allowance, it must be admitted that there is still much to be desired; nor does it seem probable that a much nearer approach to perfection is likely to be attained without cooperation between manufacturers and supply engineers. To make a lamp for a given voltage to have a definite candle-power and take a definite cur-

¹ "Les Lampes à Incandescence électriques." By J. Rodet. Pp. xi + 200. (Paris: Gauthier-Villars, 1907.) Price 6 francs.

² "Journal of the Institution of Electrical Engineers." Vol. xxxviii. No. 182. Pp. 211-371. London: E. and F. N. Spon, Ltd., 1907.) Price 5s.

rent involves the solution during a difficult manufacture of two simultaneous equations, and the percentage of lamps correctly solving them is small. It is the unavoidable outfalls which play such havoc with his balance-sheet, so that it is small wonder if the lamp-maker is tempted to be a trifle lax in his rating. If cooperation existed and station engineers would see the sweet reasonableness of adjusting their supply voltages in different districts or different towns, so as to afford a market for all the lamps a manufacturer produces, it would be possible for him to turn out a better article at a lower price with undeniable advantage to the industry generally.

The information concerning the new lamps is much more meagre and conjectural. It would seem that the osmium lamp is already moribund or dead, and that we have only to reckon with the tantalum and tungsten filament lamps, the former taking 2 to 2.5 watts and the latter 1 to 1.2 watts per candle. The tungsten lamp appears to have a brilliant future before it. A lamp working at a little more than 1 watt per candle brings electric lighting almost to the level of gas for cheapness. The light units, though at present large (30 candles and upwards), are no larger than the gas mantle units, and so it may reasonably be supposed that the public will not object to them, though they undoubtedly do away with one of the benefits of electric light. The chief drawback in England is the low voltage, the lamps being at present only suitable for voltages of about 100. It is conceivable, should lamp-makers fail in producing a high-voltage tungsten filament lamp, that engineers will change back to low voltage, in spite of the eagerness with which they struggled to enforce the change to high voltage a few years ago. The competition of gas is excessively severe, and in some way must be met; at present the tungsten lamp offers the only means of meeting it in interior lighting.

The next few years promise to be of exceptional interest so far as the development of electric lighting is concerned; a radical improvement has long been wanting, and there seems every reason to believe that it has at last been made. The present condition of affairs is full of possibilities, and no one can say what the position will be a few years hence. Perhaps to his interesting account of the birth of the carbon filament lamp M. Rodet may be able to add in his next edition the melancholy tale of its death.

MAURICE SOLOMON.

DR. MAXWELL T. MASTERS, F.R.S.

THE botanical and horticultural world has sustained a severe loss by the death on May 30 of Dr. Maxwell T. Masters, the well-known editor of the *Gardener's Chronicle*, and the author of many botanical works.

Dr. Masters was born in 1833, and was educated at King's College, subsequently removing to Oxford, where he became sub-curator of the Fielding Herbarium under Dr. Daubeny. He was botanical lecturer at St. George's Hospital from 1855 to 1868, and was elected to the fellowship of the Royal Society in 1870. He was a corresponding member of the Institute of France, and was also an officer of the Order of Leopold. He achieved distinction in his earlier days by the publication of his "Vegetable Teratology," a most valuable work, which has been translated into several European languages. But his most definite contributions to botany in later years were those dealing with the Coniferæ, a difficult group which had long interested him, and in which he displayed a remarkable and detailed knowledge. He contributed many papers on the structure and taxonomy of the

species to the publications of the Linnean and Horticultural Societies.

But it is especially in matters appertaining to horticulture that he will be best known to most people. His position as editor of the *Gardener's Chronicle* gave him considerable influence, and he always used his best efforts with single-hearted devotion to promote the welfare of horticulture and to look after the interests of those who were engaged in gardening as the practical business of their lives.

He always took the keenest interest in the Royal Horticultural Society, and for many years presided over the Scientific Committee.

He will be sorely missed by a large circle of friends, as well as by many others in the gardening world, to whom his name has become almost a household word.

NOTES.

At the meeting of the council of the British Association on Friday last, June 7, Mr. Francis Darwin, F.R.S., was unanimously nominated to the office of president for the year 1908-9.

We have to deplore the deaths at Cambridge, on Friday last, June 7, of Prof. Alfred Newton, F.R.S., professor of zoology and comparative anatomy in the University, and Dr. E. J. Routh, F.R.S.

The ladies' dinner of the Royal Society will be held at Burlington House on Wednesday next, June 19.

SIR WILLIAM PERKIN, F.R.S., has been elected president of the Faraday Society for the session 1907-8.

TWELVE tables were unveiled in the Hall of Fame of New York University on Memorial Day, May 30, among them being one in memory of Maria Mitchell, the astronomer, and another in memory of Louis Agassiz.

DR. NANSEN, president of the Social and Political Education League, will deliver his presidential address, on "Science and Ethical Ideas," at University College, Gower Street, on June 26. Sir Oliver Lodge will preside.

REUTER reports that a typhoon occurred in the Caroline Islands in the latter part of March and devastated the Olcai group of those islands. A great wave swept the land and buried it under a layer of sand.

We learn from *Science* that Dr. C. R. Wieland, of the Peabody Museum, Yale University, has left America for a stay of five months in Europe, where he will visit the plant collections of northern and southern Europe for a special study of cycads. The results of his investigations will be published in his second volume on cycads.

A MEETING of the International Council for the Exploration of the Sea is being held in London during the present week. In the absence through illness of the president of the council, Dr. W. Hering, his place is being taken by the vice-president, Dr. Otto Pettersson, of Stockholm. Among the members of the council and experts now present in London are Dr. P. P. C. Hoek, general secretary, and his assistant, Dr. H. M. Kyle; Dr. Lewald, Prof. Krümmel, Prof. Brandt, Prof. Heincke, Dr. Hening, and Dr. Ehrenbaum, from Germany; Mr. A. Hamman and Prof. Gilson (Belgium); Captain Drechsel, Mr. Martin Knudsen, and Dr. C. G. J. Petersen (Denmark); Dr. Homen and Mr. J. A. Sandman (Finland); Prof. Nansen, Dr. Hjort, and Dr. Helland Hansen (Norway); Prof. Max Weber, Dr. Redek, and Dr. Wind (Holland); Prof. Otto Pettersson, Dr. F. Trybom, and Mr. G. Ekman (Sweden); Mr. Waiter Archer, Prof. D'Arcy Thompson, Dr. Mill, Dr. Garstang, Dr. Masterman, Dr. H. Reid, Mr. E. W. L. Holt, Dr. Wemyss Fulton, Dr. E. J. Allen,