

MEMORIAL TABLET TO LORD LISTER.

A TABLET in memory of the late Lord Lister was unveiled by Lord Rayleigh at King's College, London, on January 14. The unveiling was preceded by an impressive ceremony in the chapel, among those present being Dr. Herringham (Vice-Chancellor of the University), Sir Rickman Godlee (president of the Royal College of Surgeons), Sir William Crookes (president of the Royal Society), Sir Henry Miers (principal of the University), Dr. Caldecott (Dean of King's College), Sir St. Clair Thomson, Prof. Halliburton, Prof. J. M. Thomson, Sir David Ferrier, Sir John Rose Bradford, and Mr. and Mrs. J. J. Lister.

Lord Rayleigh expressed his pleasure at thus being able to pay a small tribute to the memory of Lister, under whom he had been privileged to serve for a time at the Royal Society. It is now a commonplace that by his advances in surgery he had saved more lives than Napoleon had destroyed. Lister, in addition to his extreme modesty, was always ready to acknowledge obligations, and delighted his French colleagues by his generous insistence that his work was a natural development of that of Pasteur.

Lord Rayleigh was followed by the Vice-Chancellor of the University, Dr. Herringham, who pointed out that Lord Lister, at the invitation of King's College Hospital, gave up the chair he held at Edinburgh. Dr. Herringham expressed the wish that such translations were more common, for they conferred honour not only on those translated, but also on the institutions from which they emanated.

Sir Henry Miers, Prof. Halliburton, and Dr. Caldecott also spoke briefly.

The tablet, which has been erected in the corridor outside the chapel, bears the inscription:—

"In affectionate and respectful memory of Joseph, Baron Lister, F.R.S., O.M., Professor of Clinical Surgery in King's College from 1877-1892, and for many years consulting surgeon to the King's College Hospital, Member of the Council and Life Governor of the College, this tablet is erected. His name will be handed down to posterity as the founder of anti-septic surgery, one of the greatest discoveries in history and a source of inestimable benefit to mankind."

THE "DAVON" MICRO-TELESCOPE.

MESSRS. DAVIDSON AND CO. have recently produced a "micro-telescope," an instrument which is essentially a microscope of ordinary construction carrying a short focus telescope objective and tube below the stage. It may here be remarked that the ordinary terrestrial telescope with erecting eyepiece is nothing more than an object-glass, and a microscope, for an erecting eyepiece is nothing more than a microscope of low power. This is at times of great use in the workshop or laboratory, where a low-power reading microscope may be wanted in a hurry, but it is not everyone who remembers that a pocket telescope contains within itself this instrument also. While, therefore, the micro-telescope and the ordinary telescope with erecting eyepiece have the same sequence and function of lenses, and each gives an erect image, yet in proportions and practically the micro-telescope is a very different thing. The triple objective in the micro-telescope, though of only $5\frac{1}{2}$ in. focal length, instead of the usual 8 or 9 in., successfully withstood the following severe test. At a distance of a rod, pole, or perch and a half, and a yard and a quarter (which works out as 342 in.), a Bellows French Dictionary could be read perfectly and with a $\frac{2}{3}$ in. microscope objective a circle of

$3\frac{1}{8}$ in. in diameter could be seen at once all in focus and with no sign of colour. As a more severe test a number of groups of artificial double stars, made by small needle-holes in tin foil, of which the closest group were all separated by $1/100$ in. centre to centre, were set up at the same distance, and all were clearly double stars as seen in the micro-telescope, clear, sharp, and without colour, but with the first diffraction ring clearly showing. These stars subtended centre to centre an angle of almost exactly $6''$ of arc, and as the needle-holes were not geometrical points, this test shows that the object-glass was up to the optical limit imposed by the size of the wave-length of light.

Some crumbs were then placed on the floor at a distance of four yards, and strongly illuminated, and the microscope with a 1 in. object-glass focussed on the crumbs. Presently some mice came out, and made themselves at home with the crumbs. The mice could be examined at this distance without their being aware of it so well that individual hairs were easily visible and about half a mouse was in the field of view. In point of size it appeared about the same as a beaver within a foot or two. The magnifying power was measured and found to be 42.

A plane mirror silvered on the front face is provided to be clipped on in front of the telescope objective, so that objects may be examined without tilting the micro-telescope to an inconvenient angle. This has the two motions necessary to bring an object into the field of view. The double-star test showed that the mirror interfered slightly with the perfection of the image, but not to such an extent as to be noticeable except with so severe a test. A more serious difficulty, however, is that of finding an object when seen in this way. It would be easy enough with the moon, for instance, and perhaps with a bright planet like Venus or Jupiter, but it would probably require some practice to find such a star as β Cygni.

A further attachment is provided by means of which the microscope tube is replaced by a camera so that either microscope photographs may be obtained if the telescope element is replaced by a substage illuminator, or if the telescope fitting is in its place the combination enables telephotographs to be taken; some of these submitted by the makers show that in this domain also excellent results are possible.

Altogether the new instrument is one with many possibilities, and it will appeal to people with widely different interests.

C. V. Boys.

A NEW INCANDESCENT ELECTRIC LAMP.

A NEW incandescent electric lamp with an efficiency of about 0.5 watt per candle-power has just been placed on the market by several of the leading manufacturers in this country. It is only a few years since the tungsten filament lamp, with an efficiency of between 1 and $1\frac{1}{4}$ watts per candle-power appeared, to displace the carbon filament lamp the efficiency of which was between 3 and 4 watts per candle-power. In the case of the "half-watt" lamp, however, there is no change in the material of the filament. This is still tungsten.

Hitherto the tungsten lamp has been run at a temperature of about 2100° C., for although this is roughly 800° C. below the melting point of the metal, an effort to obtain a higher efficiency by employing a higher working temperature produced a deposit of metallic tungsten on the bulb. Analysis of the residual gases left in the bulb after exhaustion showed that the only one which could cause this effect was water

vapour, and a cyclic process was traced. The water vapour attacked the heated filament, producing a volatile oxide of tungsten and atomic hydrogen; the oxide which became deposited on the bulb, was again reduced by the hydrogen, leaving metallic tungsten and forming water vapour, which again attacked the filament. Even when practically every trace of water vapour was removed, however, a certain blackening of the bulb still occurred, and this was eventually found to be occasioned by evaporation of the metal. To overcome this, nitrogen or some other inert gas is introduced into the bulb at about atmospheric pressure, and this is one of the features of the new lamp.

This, however, introduced another effect. The filament is more rapidly cooled by the convection currents induced in the gas, and in consequence more energy is required to maintain the temperature. With filaments of large diameter this is of less relative importance, but with filaments of the usual size the loss was found actually to reduce the efficiency in spite of the higher temperature, as the small filaments are cooled relatively more rapidly by the convection currents. As a result the high-temperature half-watt lamps are only made in large sizes—from 600 c.p. upwards—and in order to diminish this cooling effect the filaments are constructed in the form of a helix of very small pitch. Last week's issue (January 15) of *Electrical Engineering* is devoted largely to the new lamp, and the opinions of leading central station engineers in various parts of the country upon it are quoted.

THE ASSOCIATION OF PUBLIC SCHOOL SCIENCE MASTERS.

THE annual meeting of the Association of Public School Science Masters was held at the Imperial College of Science and Technology on January 13-14. The president, Prof. H. B. Baker, F.R.S., in his address, extracts from which are given separately in this issue, regretted that so few science masters were engaged in research, and suggested that the interest of boys would be stimulated by the thought that such work was being carried out in the laboratory attached to their own school. Mr. C. E. Ashford (Dartmouth), in seconding a vote of thanks, disagreed with this view, and, speaking as a headmaster, maintained that it was of greater importance for a schoolmaster to spend his spare time in the playing fields getting to know his boys than it was for him to be undertaking research in the laboratory.

On the afternoon of the first day an interesting demonstration of the application of the gyroscope to mono-rail traction was given by his Excellency Monsieur Pierre Schilowsky, who exhibited a model of a new and improved form of the appliance he has recently invented. Mr. H. O. Hale (Oundle) read a paper upon agricultural experiments in public schools; he urged that agricultural research was well within the capacity of the average boy, and was more real than most of the "mock research" carried out in the chemical laboratories. The idea is excellent, and many of the results obtained were of considerable interest; it was, however, rather disappointing to find during the course of the subsequent discussion that much of the work, and even of the observations, were made for, instead of by, the boys themselves: the impression left being that, although the "experiments" afforded the foundation of a useful future hobby, they did not, under the conditions which prevail at present, provide a basis for a scientific education.

Wednesday morning was occupied by a discussion upon the "Present Condition of Science Teaching in Public Schools," which was opened by Dr. E. H. Tripp (Bedford) and Mr. J. R. Eccles

(Holt). Dr. Tripp deplored that the pamphlet published by the Board of Education in 1906 referred to a few only of the public schools, and that its aim was to state facts rather than to make suggestions; he urged the need of a fresh report which should not only state the conditions under which science was taught in all schools represented by the Headmasters' Conference, but should contain expressions of opinion from external authorities, e.g. university teachers and employers of ex-public school boys engaged in scientific occupations. He maintained that the chief drawbacks to progress in science teaching were (a) the undue preponderance of literary headmasters; (b) the conservative influence of the older universities; and (c) the evils of the present examination system. The address was chiefly of a destructive nature, and the subsequent discussion, although well maintained, was less fruitful in producing constructive proposals than in pointing out the defects of the existing system.

The discussion opened by Mr. D. Rintoul (Clifton) upon the "Place of Acoustics in a School Course of Physics," fell rather flat, owing, probably, to the unanimity of the members in considering that, whilst acoustics afforded a valuable introduction to the study of the wave theory, the difficulty in devising suitable laboratory exercises made it educationally the least valuable branch of physics. The most useful suggestion was that made by Mr. G. F. Daniell, that the determination of the velocity of sound in various gases might be introduced into the ordinary work of the chemical laboratory; he urged that if this were done something would have been accomplished towards breaking down the watertight compartment which too often separated chemistry from physics.

Mr. H. A. Wootton (Westminster) read a paper upon the "Relative Educational Value of Physics, Chemistry, and Biology," maintaining that chemistry, when properly taught, was the most useful subject. During the discussion which followed the paper it was pointed out that it was impossible to teach chemistry without also giving considerable instruction in physics, and several speakers urged that organic chemistry should be commenced at an earlier age than is at present the practice.

At the business meeting, Sir William Osler, F.R.S., Regius professor of medicine at Oxford, was elected president of the association for 1915.

SCIENCE IN THE PUBLIC SCHOOLS.¹

ONE of the chief difficulties which besets a science master is that few of his colleagues will have sympathy with his work. There are some, but I am afraid not very many, classical scholars who have some knowledge of studies which are so different from their own, but, too often, there is actual hostility on their part to science subjects, and since the first years of a boy's life are usually under the charge of a classical master, there is often instilled into his mind a contempt for the subjects which may be useful to him in his after life.

In most schools which I know, there is a system of selection of the boys by which those of the best ability are induced to continue on the classical side. It is, with comparatively few exceptions, only the weaker boys, or those whose ability has escaped notice, who are allowed to make science their chief study. But, in spite of this fact, which is known to most schoolmasters, how often is it triumphantly declared that a boy who has been educated on the classical side of a school is superior to one brought up on the science side? I wish, for just one year, that the science

¹ From the presidential address delivered to the Association of Public School Science Masters on January 13 by Prof. H. B. Baker, F.R.S.